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PROCEEDINGS OF THE SMART CITIES INTERNATIONAL CONFERENCE

10th Edition, 2022

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CUPRINS

Deep Learning. Viitorul inteligenței artificiale și impactul acesteia asupra dezvoltării tehnologiei

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Abstract

Ceea ce își propune acest eseu este prezentarea conceptelor Machine Learning (ML) și Deep Learning (DL), din domeniul științei informatice, concepte aflate acum în plin avânt mediatic dar, evident, și tehnologic. Pe măsură ce ne apropiem de cea de-a șaptezecea aniversare a noțiunii de inteligență artificială (AI) (anul 2026), investițiile globale în acest domeniu au atins un nivel record. În ultimii ani, tehnologiile mobile și cele cloud au apărut ca paradigme dominante, oferind o multitudine de oportunități întregii societăți începând cu comunitățile de utilizatori și până la cele de cercetători și dezvoltatori; acum însă credem că inteligența artificială, în special Deep Learning, ar putea deține un potențial și mai mare, depășindu-l astfel pe cel al tehnologiile anterioare. Motivul din spatele acestei convingeri va deveni din ce în ce mai clar în paginile care urmează.

Keywords: *Machine Learning, Natural Language Processing, Robotics.*

1. Introducere

Pentru a înţelege pe deplin implicaţiile acestor tehnologii şi a transformărilor pe care le promit întregii societăţi, trebuie mai întâi să înţelegem ce înseamnă inteligenţa artificială, ce înseamnă *Machine Learning* şi, evident, ce înseamnă *Deep Learning*?

> „Inteligența artificială este unul dintre cele mai profunde concepte la care lucrăm ca umanitate, este mai profundă decât focul sau electricitatea", a spus Sundar Pichai – *CEO*-ul *Alphabet*, în cadrul întâlnirii anuale din 2020 a Forumului Economic Mondial de la *Davos*, Elveția [1].
>
> „Cred că lucrăm la una dintre tehnologiile cu cea mai mare putere de transformare a lumii pe care le-a văzut vreodată industria noastră. Cea mai mare investiție a noastră este în dezvoltarea inteligenței artificiale și în integrarea acesteia în fiecare dintre produsele noastre", a declarat Mark Zuckerberg – *CEO*-ul *Meta*, pe blogul companiei (2023) [2].
>
> Bill Gates – co-fondator *Microsoft*, a declarat pe celebrul său blog – *GatesNotes* (2023), că "Inteligența artificială este la fel de revoluționară ca telefoanele mobile și Internetul" [3].

Aşa cum toată lumea ştie deja, *Silicon Valley* este considerat centrul lumii în ceea ce priveşte dezvoltarea tehnologiilor viitorului. Inteligența artificială a ocupat un loc deosebit de important în strategiile de cercetare şi dezvoltare ale celor mai influente companii de acolo şi, evident, nu numai. Manageri de top, precum cei citaţi, dar şi mulţi alţii, aşa cum vom vedea pe parcursul articolului, au declarat că inteligența artificială formează nucleul operațiunilor companiilor pe care le conduc – aceasta fiind forţa motrice din spatele strategiilor lor de cercetare şi dezvoltare. Încă din 2016, Sundar a declarat că „în curând vom trece de la o lume bazată pe tehnolgiile *mobile* la una bazată pe cele *AI*" [4].

Întrebarea care apare în acest context este: ce a generat schimbarea şi care este natura acestei transformări continue? Pentru a putea înţelege însă raspunsul la această întrebare este nevoie de o privire în perspectivă asupra dezvoltării conceptului, de a face câţiva paşi înapoi în timp, şi începem astfel prin a prezenta, foarte pe scurt, traseul evoluţiei acestor tehnologii.

1.1. (Deci) puțină istorie

Din fericire, începuturile nu numai că sunt bine documentate, dar se cunoaşte cu exactitate momentul şi locul în care conceptul de inteligență artificială (termenul consacrat în literatura de specialitate este *Artificial Intelligence* de unde şi acronimul *AI*), a luat oficial naştere: vara anului 1956, în *Dartmouth*, Statele Unite. În esență, atunci şi acolo a fost pentru prima dată când *Inteligența Artificială* a apărut oficial în inițiative științifice [5].

Conceptul de a construi maşini care să poată imita acțiunile umane, sau să dea dovadă de inteligență umană, a captivat de mult timp imaginația. Grecii antici vorbeau de statui care prindeau viaţă, în timp ce alte civilizaţii timpurii, cum ar fi chinezii şi egiptenii, au creat roboţi[1] acționați mecanic care prezentau comportamente asemănătoare cu cele umane [6, 7, 8]. Literatura, de asemenea, are partea sa de astfel de noțiuni, *Frankenstein* al lui Mary Shelley fiind un prim exemplu (1818) [9]. Aceste cazuri sunt ecoul unei dorințe umane adânc înrădăcinate – aspirația de a crea entităţi care ar putea reflecta caracteristicile şi comportamentele omului.

Cu toate acestea, aşa cum am menționat, geneza oficială a *AI*, aşa cum o cunoaştem astăzi, este marcată de vara anului 1956, când un colectiv de cercetători ambițioşi s-a întâlnit, aşa cum am spus, la *Dartmouth*, inițiind o serie de proiecte ce urmăreau un obiectiv specific: *conceperea unor computere care să imite comportamentul uman* [5].

Marvin Minsky, John McCarthy, Claude Shannon, Nathaniel Rochester şi alte nume din domeniul matematicii şi al informaticii s-au adunat în acea vară memorabilă cu un scopul comun de a face cercetare în vederea construirii unei entităţi inteligente. Astfel, din punct de vedere academic, ca ramură a informaticii, naşterea *Inteligenței Artificiale* este marcată în vara anului 1956.

[1] *Automatons* – pentru o înțelegere mai bună a conceptului recomand spre citire pagina *Wikipedia* dedicată acestora: https://en.wikipedia.org/wiki/Automaton

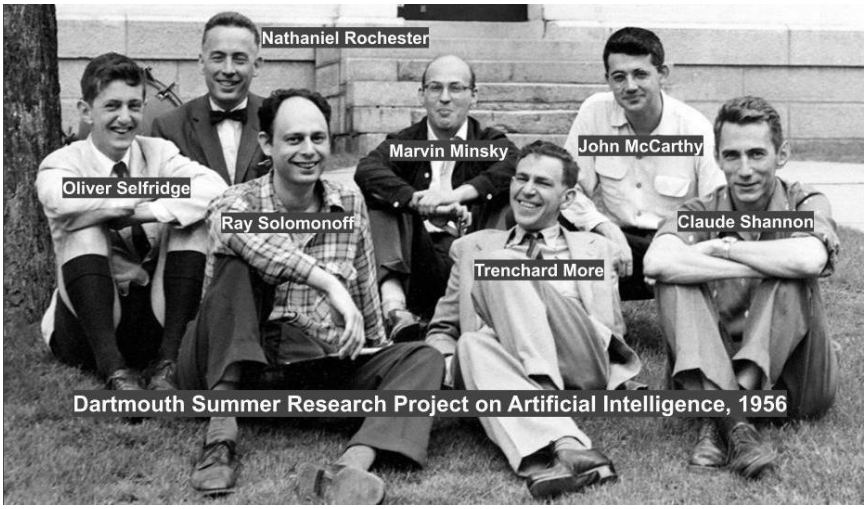

Fig. 1. Participanţi ai primului eveniment ştiinţific privind Inteligenţa Artificială – *Dartmouth*, 1956
Source: @macloo – Utilizator Twitter Mindy McAdams, profesor de jurnalism digital, Universitatea din Florida.

Obiectivele lor de cercetare – sau întrebările la care îşi doreau să răspundă, au fost cât se poate de explicite: *Având în vedere complexitatea computerelor şi cea de netăgăduit a oamenilor, ar putea membrii proiectului programa computerele pentru a îndeplini sarcinile cognitive complexe pe care le pot face oamenii?*

Ar putea computerele, în esenţă, să înveţe să raţioneze? Aceasta însemna să permită computerelor să îndeplinească sarcini precum jucarea unor partide de şah, rezolvarea problemelor algebrice, demonstrarea teoremelor geometrice şi diagnosticarea bolilor.

Fiecare dintre aceste sarcini implică un raţionament, în cadrul căruia este prezentată o problemă, urmând a se găsi o cale logică către răspuns – jocul de şah este un bun exemplu de raţionament pentru un computer, deoarece jucătorul (în acest caz, computerul) trebuie să explice de ce a ales o anumită mutare dintr-un număr uriaş de alte mutări posibile [10] – merită adăugat aici faptul că şahul a fost adesea considerat *Drosophila Melanogaster* în cercetarea întreprinsă în zona inteligenţei artificiale [11, 12].

Un obiectiv suplimentar a fost acela de *a învăţa computerele să dobândească cunoştinţe despre lumea reală.* Pentru ca un computer să înţeleagă şi să se implice cu adevărat în relaţia cu oamenii, trebuie să înţeleagă şi să interacţioneze cu lumea reală. Acest lucru implică înţelegerea unor concepte precum *obiecte* şi *oameni* precum şi *limbajul* pe care cei din urmă îl folosesc pentru a comunica. Pentru a realiza acest lucru, elementele naturale omului trebuiau să fie codificate într-un limbaj paralel, destinat înţelegerii lui de un computer. Ca urmare au fost create limbaje de programare (aşa cum au ajuns să fie denumite ele ulterior), dintre care îl amintim aici pe *Lisp*[2], inventat de John McCarthy în 1959 [13].

[2] Acronim al conceptului de *List processing.*

Cel de-al treilea aspect pe care cercetătorii l-au urmărit, a fost *să înzestreze computerele cu modele de înțelegere a modului de planificare și navigare prin lumea în care noi trăim.* Acest lucru implică înțelegerea modului de a se deplasa dintr-un punct în altul, recunoașterea ușilor, găsirea căilor de acces și distingerea între zonele sigure și cele nesigure (cum ar fi scările). În plus, atunci când există mai multe rute către o anumită destinație, computerul ar trebui să fie capabil să facă alegeri în funcție de elemente de context. Toate acestea intră sub incidența planificării și navigării, pe care cercetătorii acelor vremuri s-au străduit să le înglobeze în memoria computerelor.

Primele încercări de natura ultimelor descrise mai sus au avut loc la Institutul de Cercetare a Universității *Stanford* (*Stanford Research Institute – SRI*), la mijlocul anilor 1960, odată cu crearea primului robot autonom. Această mașină, echipată cu camere de luat vederi și roți, a reprezentat pasul inițial în acest demers absolut revoluționar [14] – vom reveni asupra acestor idei.

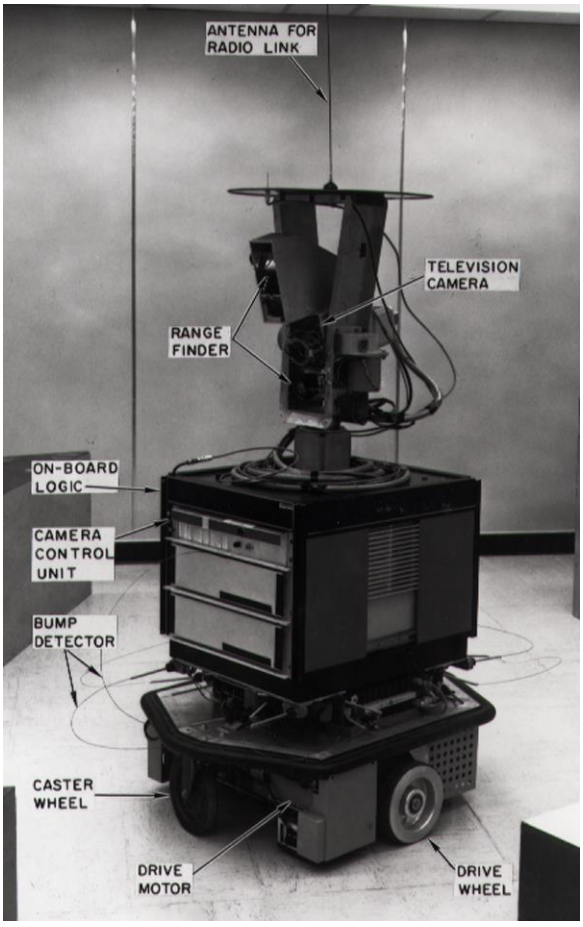

Fig. 2. Robotul *Shakey* creat la *Stanford* între 1966 și 1972
Source: https://en.wikipedia.org/wiki/Shakey_the_robot

Așa cum am menționat, o sarcină suplimentară a fost aceea de a face computerele să înțeleagă limbajul: cum să îl articuleze și să îl înțeleagă, cum să formuleze propoziții și cum să înțeleagă contextul acestor propoziții. Noi, oamenii, folosim zilnic limbajul ca un instrument sofisticat și puternic pentru a ne exprima gândurile, emoțiile și observațiile despre lume. Obiectivul membrilor proiectului a fost de a permite computerelor să emuleze cât mai mult posibil din acest proces complex.

Primele experimente de procesare a limbajului natural (*Natural Language Processing – NLP*) au fost efectuate la Universitatea *Georgetown*, folosind un *mainframe IBM*. Scopul a fost de a facilita traducerea între limbile engleză și rusă [15]. Vom reveni și asupra acestui experiment foarte interesant în paginile următoare ale articolului.

O altă capacitate crucială pe care cercetătorii intenționau să o „transmită" computerelor era *percepția* – înțelegerea modului în care noi, ca oameni, vedem, auzim și simțim lucrurile din mediul nostru înconjurător. Cercetătorii de la *Dartmouth* au emis ipoteza că, *pentru a ajunge la nivelul de inteligență al oamenilor, computerele ar trebui să învețe cum să perceapă lumea prin diverse simțuri, cum ar fi vederea, auzul, atingerea și mirosul.* Dintre acestea, ei credeau că vederea era cea mai fezabilă problemă de abordat.

În consecință, Marvin Minsky, în laboratorul său de la *Massachusetts Institute of Technology (MIT)*, a inițiat primul set de experimente pentru a determina în ce condiții computerele, atunci când sunt alimentate cu intrări video prin intermediul camerelor de luat vederi, pot înțelege lumea în același mod în care o facem noi [16]. Scopul era de a le învăța pe acestea să discearnă obiecte și să reacționeze în consecință – de exemplu recunoașterea unui set de cuburi și/sau alte obiecte tridimensionale, înțelegerea formei acestora și structurii pe care împreună o formează sau o pot forma – cam la fel cum învață, prin joc, copiii la vârste foarte fragede, să construiască.

Obiectivul stabilit în vara anului 1956 a fost remarcabil de ambițios. Este esențial să ne amintim aici că cel mai avansat calculator de la acea vreme era un *mainframe*, care avea nevoie pentru interfațare de cartele perforate. Prin urmare, cercetătorii care s-au reunit în acea memorabilă vară erau cu adevărat înaintea timpului lor.

Cu toate acestea, a urmat o succesiune de perioade de avânt (dar și de declin), marcate de demonstrații extrem de impresionante care au atras cercetări suplimentare, finanțări și inițiative de înființare a *startup*-urilor din zona de *IT*. Aceste faze aveau totuși să își urmeze cursul și să atingă în cele din urmă și un punct de minim atât de jos încât a apărut un scepticism profund cu privire la fezabilitatea creării inteligenței artificiale.

Astfel de cicluri nu au avut loc doar o singură dată, ci de șase sau șapte ori. În continuare, vom oferi câteva exemple pentru a ilustra de ce aceste valuri de entuziasm au fost urmate de deziluzii atât de profunde. Ele au intrat atât de adânc în conștiința cercetătorilor încât au primit chiar și un nume: *AI winters* – un nume care sugerează o iarnă nucleară (deoarece în urma unui atac nuclear nu ar mai fi posibil pentru nicio formă de viață să existe timp de decenii în zonele afectate de radiații). Analogia aplicată la cercetarea în domeniul *AI* sugerează că, din când în când, domeniul a fost atât de afectat de dificultăți încât progresul ulterior părea imposibil. În consecință, finanțarea a fost, de asemenea, oprită pentru perioade lungi de timp.

Acum, să analizăm câteva dintre aceste cicluri de avânt şi declin. Prima „iarnă *AI*" a fost declansată de iniţiativele ce vizau traducerea automatizată [17]. Pentru a pune acest lucru în context trebuie menţionat că Statele Unite se îndreptau spre Războiul Rece astfel încât exista o nevoie stringentă de a traduce texte din limba rusă în engleză şi viceversa. Lipsa unor vorbitori nativi de rusă în SUA a dus la ideea creeării unor maşini capabile să efectueze astfel de operaţiuni. Tocmai acesta a şi fost experimentul realizat în 1954 de către, aşa cum am menţionat mai sus, cercetătorii de la Universitatea *Georgetown* şi *IBM*. Aceştia au prezentat primul sistem capabil de astfel de traduceri, traducând şaizeci de propoziţii din rusă în engleză cu ajutorul unei maşini. Demonstraţia a fost un succes răsunător: folosind cartele perforate, un operator introducea propoziţii în limba rusă în calculator, acesta la rândul său le procesa şi, ca rezultat, dădea un set separat de cartele perforate cu traducerea în limba engleză. Experimentul, pentru propoziţiile alese, a fost remarcabil de precis. Această demonstraţie a declanşat un val de cheltuieli pentru cercetare şi dezvoltare, toate dedicate dezvoltării de sisteme de traducere universale.

Cu toate acestea, se pare că această sarcină era extraordinar de dificilă. Pentru a ilustra, să luăm în considerare exemplul care a fost folosit la vremea respectivă şi anume propoziţia *The Spirit is willing, but the flesh is weak* [18]. Pentru a verifica acurateţea, multe dintre aceste sisteme iniţiale au fost testate prin introducerea propoziţiei traduse înapoi într-un traducător din rusă în engleză. Utilizând aceste sisteme, cu propoziţia în limba engleză pe care am menţionat-o, rezultatul a fost: *Whisky-ul este tare, dar carnea este putredă!* Reflectând asupra acestui lucru, se poate înţelege cu uşurinţă de ce s-a produs o astfel de traducere – este vorba, în esenţă, de o traducere cuvânt cu cuvânt destul de bună. Cu toate acestea, chiar şi pentru un vorbitor mediu de limba engleză, este la fel de clar că traducerea este improprie, ea nesurprinzând sensul sau, ceea ce un informatician ar numi: *semantica propoziţiei*. În schimb, a realizat ceea ce tot un informatician ar numi *o traducere sintactică* sau *o traducere mot-a-mot*.

Şi, într-adevăr, ca traducere *mot-a-mot*, nu este tocmai greşită. Dacă însă astfel de tipuri de erori se acumulează în diverse propoziţii dintr-un corpus mare de text, sensul dorit devine în întregime distorsionat. Acest lucru a dus la apariţia primei ierni a inteligenţei artificiale – un sentiment de deziluzie în jurul capacităţii de a capta sensul autentic al textelor traduse. Perspectiva ca maşinile să înţeleagă contextul, expresiile idiomatice şi alte elemente care nu sunt prezente în mod explicit în cuvintele unei propoziţii părea descurajantă, iar cercetătorii, alături de cei care erau atenţi la eforturile acestora, au fost la rândul lor descurajaţi în a mai acorda atenţie acestor iniţiative.

Un comitet format din economişti şi politicieni, denumit *Automated Language Processing Advisory Committee (ALPAC)*, a declarat că progresul în domeniul traducerii automate era atât de lent încât investiţiile suplimentare ar însemna irosirea unor bani buni, sugerând că astfel de cheltuieli ar trebui să fie oprite [19]… ceea ce s-a şi întâmplat.

Cercetătorii au trecut atunci la o abordare radical diferită. Deoarece traducerea oricărui limbaj în oricare altul părea prea ambiţioasă, au decis să limiteze

spațiul de gândire al mașinilor la domenii foarte specifice. Acest lucru a dus la cercetări în jurul a ceea ce a ajuns să fie cunoscut sub numele de *micro-worlds*. Scopul era de a restrânge lumea reală într-una mai mica și de a încerca să facă mai multe progrese în înțelegerea acelui context specific.

Un exemplu de *micro-world* ar putea fi configurația de blocuri a lui Marvin Minsky care, analizată de un robot dotat cu un sistem de camere, să o poata manipula. Obiectivul într-o astfel de *micro-world* în domeniul limbajului uman era de a programa sistemul pentru a înțelege propoziții de genul: *Ridică un cub*; *Ridică un cub roșu*; *Pune cubul pe sferă*… și așa mai departe. Sistemul ar trebui apoi să discearnă dacă astfel de acțiuni sunt fezabile. De exemplu, ar putea fi amplasat un cub pe o sferă? Având în vedere forma naturală a acestor obiecte, sarcina nu este tocmai una ușoară și, prin urmare, sistemul ar trebui să răspundă cu *Nu este posibil!*

Aceasta ar fi un exemplu de *micro-world*: limitarea lumii la un domeniu de aplicare îngust și evaluarea progreselor în ideea capitalizării lor.

Un alt exemplu al unei astfel de *micro-world* a fost sistemul dezvoltat de Joseph Weizenbaum – sistem cunoscut sub numele de *ELIZA*, care continuă să fie și astăzi un subiect de studiu în cadrul cursurilor de inteligență artificială din întreaga lume [20]. Sistemul *ELIZA* se învârtea în jurul terapiei prin conversație – simula o vizită la un terapeut pentru a discuta un set de probleme din viața personală a unei persoane. Scopul era de a crea o inteligență artificială capabilă să se angajeze într-o conversație similară cu cea a unui psiholog clinician – dar, bineînțeles, la acea vreme, limitată doar la *input*-uri sub formă de text. Mai jos redau un exemplu real de funcționare a unui astfel de sistem [21] – poate fi testat căutând pe *web*: *ELIZA: a very basic Rogerian psychotherapist chatbot* [21]):

- *Persoană: Bărbații sunt toți la fel.*
- *ELIZA: În ce sens?*
- *Persoană: Mereu mă deranjează cu câte ceva.*
- *ELIZA: Vă puteți gândi la un exemplu concret?*
- *Persoană: Ei bine, prietenul meu m-a făcut să vin aici.*
- *ELIZA: Prietenul dvs. v-a făcut să veniți aici?*
- *Persoană: Spune că sunt deprimată în cea mai mare parte a timpului.*
- *ELIZA: Îmi pare rău să aud că sunteți deprimată.*
- *Persoană: Este adevărat. Sunt nefericită.*
- *ELIZA: Credeți că venind aici vă va ajuta să nu mai fiți nefericită?*
- *Persoană: Am nevoie de ajutor, asta pare sigur.*
- *ELIZA: Ce ar însemna pentru dvs. acest ajutor?*
- *Persoană: Poate că aș putea învăța să mă înțeleg cu mama mea.*
- *ELIZA: Spuneți-mi mai multe despre familia dvs.*

Acest exemplu prezintă o interacțiune incredibil de realistă. Ne putem imagina cu ușurință un terapeut care vorbește cu adevărat și care răspunde în același mod în care a făcut-o computerul. Entuziasmul a fost palpabil, deoarece terapia prin

conversaţie reprezintă o interpretare sofisticată a limbii şi o înţelegere nuanţată a oamenilor, a relaţiilor lor şi a luptelor pe care aceştia le poartă, exemplul fiind astfel foarte convingător.

Cu toate acestea, a apărut o problemă semnificativă: în momentul în care cineva încerca să converseze cu computerul despre orice subiect care nu se încadra în cadrul unei conversaţii tipice de terapie – practic atunci când se ieşea din sfera *micro-world*-ului în care acesta fusese programat, iluzia se destrăma imediat. Răspunsurile computerului deveneau absurde şi chiar halucinante; părea că se joacă pur şi simplu cu limbajul şi, evident, nu acesta era scopul. La acea vreme părea ca şi cum maşina ar fi încercat să manipuleze sintaxa propoziţiilor în limba engleză pentru a păcăli pe cineva să creadă că înţelege cu adevărat, când, în realitate, nu făcea decât să rearanjeze cuvintele şi să caute cuvinte cheie specifice precum „mamă" sau „depresie" pentru a reacţiona în consecinţă. Iluzia se spulbera în momentul în care cineva menţiona un cuvânt ce nu era inclus în dicţionarul programat iniţial.

Asta a condus la cea de-a doua „iarnă *AI*". Sistemele de această natură, extrem de constrânse, funcţionau excelent în contexte foarte specifice, dar se prăbuşeau imediat ce cineva se aventura, chiar şi puţin, în afara scenariului. Un raport al guvernului britanic a sintetizat acest sentiment, concluzionând că „AI nu a reuşit să atingă niciunul dintre obiectivele sale măreţe" [22] – şi odată cu acest raport (care de altfel l-a şi făcut celebru pe James Lighthill, autorul lui) s-a tăiat din nou finanţarea pentru cercetarea în domeniu.

În jurul anului 1980 au început să apară aşa numitele *sisteme expert* [23]. Geneza reală a acestei abordări a fost în anii '60, dar *startup*-urile au început să se formeze serios în jurul acestui concept la sfârşitul anilor '70 şi începutul anilor '80. Raţionamentul a fost următorul: traducerea automată a fost un eşec – computerele nu puteau converti orice text, ales aleatoriu, din engleză în rusă şi viceversa; la fel s-a întâmplat şi cu aceste *micro-world* de care am vorbit mai sus, medii în care cercetătorii au încercat să emuleze de la zero domenii foarte simple şi constrânse aşa cum ar fi fost „lumea" corpurilor geometrice sau a psihoterapiei. Noul val de idei – aceste *sisteme expert*, a presupus o tactică diferită; dacă „învăţarea" computerelor de la zero, la fel cum copiii îşi însuşesc cunoştinţele primite de la părinţi, nu a avut succes, poate merge invers.

Cercetătorii au început să se concentreze asupra sarcinilor care necesitau abilităţi intelectuale complexe, de exemplu: diagnosticarea bolilor sau executarea sarcinilor unui analist-programator. Cu alte cuvinte, această nouă abordare încerca să codifice domenii complexe în ceea ce se numea *sisteme expert* [23]. Conceptul a fost simplu: identificarea unui expert şi apoi transcrierea cunoştinţelor sale în aceste sisteme – cercetătorii considerând că maşinile ar putea avea ca obiectiv reproducerea comportamentului experţilor.

Aşa cum am spus, primele exemple în acest sens pot fi văzute în 1965, când Edward Feigenbaum şi Carl Djerassi au dezvoltat un sistem numit *Dendral* [24]. Acest sistem a fost conceput pentru a interpreta datele provenite de la un spectrometru de masă pentru a identifica moleculele reprezentate de aceste date – rezultatele au fost din nou impresionante. Succesul l-a stimulat pe Edward Shortliffe

– cercetător la *Stanford*, să creeze în 1972 un program cunoscut sub numele de *MYCIN* [25]. Acesta a fost conceput pentru a diagnostica bolile infecţioase ale sângelui prin analizarea simptomelor şi a datelor din sânge în vederea emiterii unui diagnostic.

În mod remarcabil, acest sistem a atins o rată de acurateţe de aproximativ 50-60%, comparabilă cu acurateţea de diagnosticare a medicilor umani [25]. Este astfel uşor de înţeles entuziasmul cercetătorilor care s-au gândit că, dacă ar fi posibil să codifice acest comportament de expert într-un set de reguli pe care un computer le poate procesa, poate că următorul pas ar fi dezvoltarea câtorva sute de sisteme expert similare şi astfel majoritatea problemelor oamenilor ar putea fi rezolvate.

Această abordare a întruchipat cu adevărat optimismul epocii; se credea că este viitorul inteligenţei artificiale. Strategia avea în vedere concentrarea pe sarcini specifice în ideea construirii unui sistem expert în jurul fiecăreia. Se presupunea că fiecare astfel de sistem va fi din ce în ce mai uşor de construit (graţie lecţiilor învăţate pe parcurs) şi, prin iteraţie continuă, crearea a mii de astfel de sisteme va duce în cele din urmă la inteligenţă artificială. Ideea era de a încapsula expertiza chimiştilor, medicilor, profesorilor, matematicienilor şi aşa mai departe, într-un sistem (de sisteme) care la final ar putea emula inteligenţa umană a tuturor acestora.

Investiţiile *IBM* de la acea vreme reflectau convingerea că dezvoltarea inteligenţei artificiale era inevitabilă. Prin urmare, aveau nevoie de un instrument de dezvoltare a sistemelor expert – un *software,* pentru ca dezvoltatorii să construiască astfel de sisteme expert, în aşa fel încât acestea să poată fi produse rapid, iar compania să poată atinge obiectivul preconizat prin această metodă. În această perioadă au apărut numeroase *startup*-uri, cel mai notabil fiind *Symbolics* [26] care era construit în jurul unei maşini *Lisp* – am amintit mai sus de John McCarthy care l-a inventat. Întreaga comunitate de cercetători a fost (din nou) incredibil de entuziastă, convinsă că aceasta era, fără îndoială, calea de urmat.

Din păcate, construirea unui sistem expert nu a oferit niciun avantaj în crearea următorului. Procesul de identificare a unui expert, de înţelegere a activităţii acestuia şi de codificare a setului de reguli a rămas lung, anevoios şi nu a oferit prea multe avantaje atunci când s-a încercat reproducerea lui pentru un alt expert. Acest lucru a dus la prăbuşirea sistemelor expert, ilustrată cel mai bine de prăbuşirea companiei *Symbolics* în 1987 [27], fapt ce a dus la cea de-a treia „iarnă a *AI*" (University of Washington, 2006).

1.2. Punctul critic

Apariţia unor concepte precum *Deep Learning* – subdomeniu al *Machine Learning* [29, 30] a marcat o schimbare substanţială în abordarea *AI*.

Cele mai multe dintre tehnicile menţionate anterior au fost fundamentate pe ideea programării computerelor prin încercarea de a înţelege şi codifica comportamentul sau limbajul oamenilor în reguli, care apoi să fie introduse în maşini. Tehnicile *Deep Learning* – un concept inspirat de creierul uman (vom reveni la acest aspect), funcţionează prin alimentarea structurilor de date cu cantităţi mari

(a se citi *uriașe*) de date, iar apoi, prin utilizarea de algoritmi, programarea mașinilor pentru a învăța singure pe baza acestor date. Este o abordare fundamental diferită de cele urmărite anterior.

Totuși, bazele acestor idei vin încă din anii 1940, de la doi cercetători, și anume neurologul Warren McCulloch și logisticianul Walter Pitts [31], care, încă de la acea vreme, au propus conceptul de modelare a structurilor de date și a algoritmilor pe baza creierului uman – ceea ce astăzi numim o rețea neuronală (*Neural Network - NN*) [32]. De-a lungul timpului, numeroși cercetători au rafinat și dezvoltat aceste idei pentru a spori viteza algoritmilor, a le îmbunătăți capacitățile de învățare în vederea sporirii acurateței și pentru a le crește performanța predictivă [33, 34, 35, 36].

Deși acest articol nu își propune să ofere o istorie completă, pentru cei interesați să afle mai multe, recomandăm pe scurt, în continuare, câteva resurse bibliografice care completează lista cercetătorilor și cercetărilor ce au contribuit la aceste idei și care astfel ar putea ajuta la o întregire a imaginii progresului din domeniu.

Yann LeCun – care ocupă în prezent funcția de *Chief AI Scientist* la *Meta/Facebook*, a folosit rețelele neuronale, încă de la sfârșitul anilor '80, în încercarea de a recunoaște codurile poștale scrise de mână [37, 38].

Ulterior, Geoffrey Hinton și Yoshua Bengio – Hinton a făcut parte până de curând din echipa de cercetare în domeniul inteligenței artificiale de la *Google*, în timp ce Bengio este profesor la Universitatea din *Montreal*, au dezvoltat aceste rețele neuronale în ceea ce se numește *Deep Belief Networks* [39]. Cercetările lor au influențat în mod direct tehnologiile pe care astăzi le folosim zi de zi; de exemplu, atunci când interacționăm cu dispozitivele mobile folosind comenzi vocale, algoritmii de conversie a vorbirii în text sunt descendenți direcți ai eforturilor celor doi. Împreună cu Yann LeCun, Geoffrey Hinton și Yoshua Bengio au primit în 2019 cel mai prestigios premiu în domeniul informaticii – echivalentul premiului *Nobel*, și anume *Turing Award*, pentru contribuția lor la domeniul *AI* [40].

Un alt contribuitor important la cercetarea în domeniul rețelelor neuronale este Jürgen Schmidhuber, un cercetător german care a introdus ideea unei structuri de date numită *Recurrent Long Short-Term Memories (LSTM)*, integrată cu rețele neuronale de tip *Deep Feed-Forward (DFF)* [41]. Oricât de ciudați și/sau amuzanți ar putea părea acești termeni, toți de fapt reprezintă progrese/îmbunătățiri esențiale ale unei premise fundamentale: rețeaua de neuroni ce formează creierul uman; prin urmare, accentul a fost pus pe proiectarea unor structuri de date și algoritmi care să imite această structură [42].

Continuând istoria rețelelor neuronale și păstrând aceeași idee centrală, *Google* a decis în 2012 să testeze acest lucru. Iar atunci când *Google* intră în luptă, ceea ce oferă în primul rând este volumul – dispune de o multitudine de resurse precum: rezultatele căutărilor efectuate de utilizatori, locația geografică a acestora, diferite alte interogări efectuate de utilizatori, imagini, clipuri etc. Andrew Ng – profesor la *Stanford* a utilizat zece milioane de videoclipuri *YouTube* ca bază de date pentru acest tip de rețele (setul de antrenament pe care l-a folosit a fost realizat din *frame*-uri de 200x200 de pixeli, capturate din aceste videoclipuri) [43].

Un alt aspect cu care *Google* a contribuit semnificativ la idee a fost cel al resurselor de calcul. *Google* foloseşte ceea ce se numeşte *distributed computing*, adică utilizează o multitudine de calculatoare şi nuclee pentru a procesa cantităţi uriaşe de date – spre deosebire de abordarea clasică în care, pentru volum mare de calcul, se folosea un (singur) *mainframe*. Astfel, pentru acest experiment, compania a pus la dispoziţie o mie de computere, fiecare echipat cu şaisprezece nuclee. Aceste maşini au fost puse să lucreze la cele zece milioane de videoclipuri *YouTube* timp de o săptămână, utilizând structura reţelei neuronale construită de Andrew Ng [44].

Interesant, şi totodată amuzant, este că, după analiza celor zece milioane de videoclipuri, algoritmii au început să recunoască ce conţin aceste videoclipuri şi, aici vine partea amuzantă, deşi poate că nu este surprinzător, primele elemente identificate au fost pisicile [45, 46, 47] – se pare că utilizatorii încarcă un număr extrem de mare de videoclipuri cu pisici pe *YouTube*. Cu toate acestea, reţeaua a recunoscut mult mai mult decât atât fiind în esenţă capabilă să discearnă alte câteva sute de obiecte. De fapt, dintr-o bază de date cu douăzeci de mii de obiecte diferite (din setul de antrenament), algoritmii au recunoscut cu precizie şaisprezece la sută dintre ele în videoclipurile *YouTube* la care sistemul a avut acces [43].

Aspectul frapant aici este că nu a existat niciun expert care să ofere descrieri detaliate ale trăsăturilor unei pisici, cum ar fi nasul, labele, mustăţile sau forma ochilor ori a urechilor. În schimb, reţeaua a fost pur şi simplu alimentată cu un volum masiv de date, iar aceasta a învăţat în mod autonom să le clasifice, fără a fi ghidată de vreun expert sau a se bucura de un set de reguli predefinite. Această abordare, cunoscută sub denumirea de *unsupervised learning,* constituie epicentrul revoluţiei din industria *AI*. Prin asta, Andrew Ng s-a îndepărtat de metoda de intervievare a oamenilor pentru a le extrage expertiza în vederea transferului către computere a acesteia, în schimb, a adoptat o metodologie bazată pe date. Prin simpla alimentare a sistemului cu cantităţi uriaşe de date, computerul a învăţat în mod independent să clasifice şi să distingă elemente diferite.

Dacă suprapunem experimentul lui Andrew Ng cu încercarea lui Yann LeCun de a recunoaşte codurile poştale scrise de mână, observăm că cel din 2012 a folosit o putere de calcul de un milion de ori mai mare şi a folosit algoritmi mult mai avansaţi. Unul dintre motivele pentru care reţelele neuronale sunt atât de în vogă astăzi, în ciuda faptului că acestea au fost cercetate încă din anii 1940, este scala la care se raportează întreaga industrie *AI* în ultimul deceniu.

Pentru a oferi o idee mai clară despre traiectoria cercetării din domeniul, de la atingerea acestei etape în 2012, ei bine, aceasta a fost susţinută de o finanţare substanţială din partea organismelor guvernamentale, a instituţiilor academice şi a *startup*-urilor. Afluxul de capital a declanşat un val de entuziasm pentru această ramură a cercetării în domeniul inteligenţei artificiale, cunoscută sub numele de *Deep Learning*.

În vederea aprofundării modului de operare al acestor reţele neuronale poate fi folosită aplicaţia *DL* a *Google*, *Tensor Flow* [48]. În figura de mai jos se poate vedea o problemă *Deep Learning* tipică: punctele albastre şi cele portocalii sunt reprezentări ale unui set de date ce cuprinde elemente distincte – un punct portocaliu ar putea simboliza *spam*, în timp ce un punct albastru ar semnifica *non-*

spam, în mod similar, un punct portocaliu ar putea indica o postare ofensatoare, în timp ce un punct albastru semnifică o postare non-ofensatoare [49]; sau, urmând experimentul lui Andrew Ng, un punct portocaliu poate reprezenta o pisică într-un videoclip *YouTube*, în timp ce un punct albastru ar reprezinta un câine. Toate aceste categorii sunt reprezentate în imaginea de mai jos prin puncte. Rolul rețelei neuronale este de a separa aceste puncte prin utilizarea rețelelor neuronale.

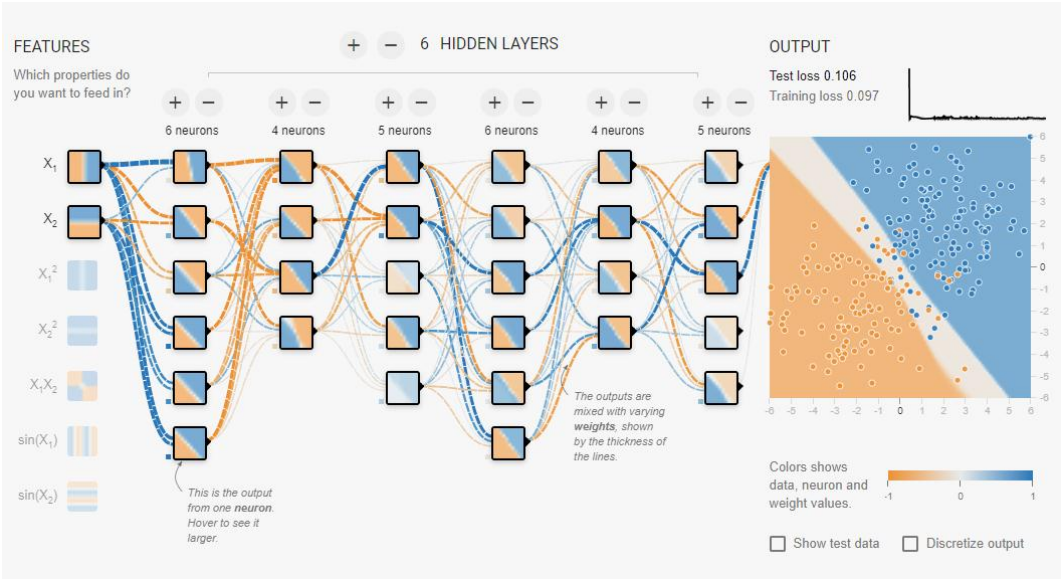

Fig. 3. Exemplu de lucru unei rețele neuronale folosind *TensorFlow*
Source: https://github.com/tensorflow/playground

După introducerea datelor şi construirea unei rețele neuronale, execuția acesteia reprezintă etapa finală. Rețelele de tip *Deep Learning* se caracterizează prin straturi multiple. În figura de mai sus, există evidențiate şase straturi, fiecare conținând propriul său set de neuroni. Încorporarea acestor neuroni duce la formarea de conexiuni între ei, ceea ce reprezintă aspectul fundamental al sistemului. Rețeaua neuronală se autoinstruieşte, utilizând datele de intrare pentru a determina puterea conexiunilor dintre nodurile individuale. Nuanțele variabile ale liniilor albastre şi portocalii, care interconectează toate nodurile (neuronii) din cadrul rețelei, corespund intensității acestor conexiuni.

În esență, rețelele neuronale ajustează valoarea conexiunilor ca răspuns la datele de intrare. Procesul de „învățare" este inițiat în virtutea capacității inerente a rețelei de a stabili interconexiuni ce, spre final, duc la detectarea şi clasificarea punctelor. Odată cu furnizarea de date suplimentare, rețeaua se autoinstruieşte rapid, reuşind astfel să distingă în mod şi mai eficient punctele albastre de cele portocalii. În mod remarcabil, în acest caz particular, doar treizeci de neuroni s-au dovedit a fi suficienți pentru ca rețeaua să delimiteze, cu un grad ridicat de precizie, limitele mulțimiilor.

Această demonstrație oferă o perspectivă valoroasă asupra mecanismelor operaționale ale acestor sisteme. De remarcat este că nu au fost transmise inițial

sistemului obiective explicite; în mod independent, calculatorul a dobândit capacitatea de a ajusta ponderile conexiunilor dintre toate nodurile din cadrul reţelei, facilitând astfel discriminarea sa matematică între punctele albastre şi portocalii.

Pentru a oferi o înţelegere contextuală, în figura descrisă mai sus este prezentat un număr modest de conexiuni – câteva zeci de sinapse, între nodurile reţelei. Dacă luăm în considerare experimentul *cat finder* – aşa cum a fost el denumit mai târziu, al lui Andrew Ng, caracterizat de un miliard de conexiuni [43], sau remarcabilul *GPT-4*, care se mândreşte cu un număr impresionant de o sută de trilioane de conexiuni [50], amploarea fenomenului devine evidentă.

2. Tehnici şi tehnologii AI

În articolele din *mass-media*, termenii *Inteligenţă Artificială*, *Machine Learning* şi *Deep Learning* sunt adesea utilizaţi în mod interschimbabil, în ciuda diferenţelor dintre ei. La nivel conceptual, *Machine Learning* cuprinde o gamă largă de metodologii menite să confere computerelor capacităţi cognitive asemănătoare celor umane. Acest domeniu extins cuprinde, de asemenea, diverse tehnici, inclusiv prelucrarea limbajului uman (*Natural Language Processing – NLP*), analiza sintactică, optimizarea căutării şi sistemele expert, toate acestea încercând să simuleze comportamentul uman în cadrul sistemelor de calcul.

Machine Learning poate fi considerată ca un subset distinct în cadrul unui spectru mai larg de tehnici de calcul [30]. Ea se aliniază cu alte metodologii, cum ar fi tehnicile de căutare, de satisfacere a constrângerilor şi a celor ce ţin de raţionamentul logic [51]. O examinare şi mai atentă a *ML* scoate la suprafaţă o gamă diversă de tehnici, inclusiv *Deep Learning, Rule Learning, Decision Trees, Random Forests* şi multe altele, toate acestea având rolul de a permite maşinilor să înveţe din date [52, 53, 54, 49]. Dintre toate acestea, *Deep Learning* a apărut ca fiind cea mai importantă metodă din domeniul sistemelor de învăţare automată, prezentând eficacitate şi o precizie remarcabilă [55].

Informaţiile de mai sus oferă o taxonomie cuprinzătoare a acestor cadre conceptuale, inteligenţa artificială cuprinzând o gamă variată de algoritmi şi tehnici dedicate emulaţiei inteligenţei umane. În cadrul acestui domeniu amplu, *Machine Learning* constituie o abordare specifică, iar *Deep Learning* este una dintre tehnicile care intră în sfera de aplicare a *Machine Learning*.

Este imperativ să fie făcută diferenţa între reprezentările din *mass-media*, exemplificate de filme precum *Her*, *Chappie, Terminator* şi multe altele care propun subiectul în diferite realizări artisitice ale marilor case de producţie. Astfel de reprezentări, în care maşinile au un comportament asemănător cu cel uman, se încadrează ferm în domeniul *SF (Science-Fiction)* şi nu reflectă starea actuală a inteligenţei artificiale.

Inteligenţa Artificială – ca domeniu specializat în cadrul ştiinţei informatice, cuprinde o serie de metodologii şi tehnici specifice studiului său, iar *Deep Learning* a apărut ca fiind cea mai promiţătoare şi mai productivă abordare din ultimele decenii, având ca scop facilitarea dezvoltării de maşini capabile să reproducă comportamentul uman.

Machine Learning are aplicaţii omniprezente în diverse aspecte ale vieţii de zi cu zi, ceea ce subliniază importanţa sa pragmatică. Printre exemplele notabile se

numără optimizarea titlurilor atractive de pe *BuzzFeed* [56] prin utilizarea tehnicilor de *Deep Learning*. Mai mult, pentru persoanele care își pun la dispoziție spațiile de cazare/locuire prin *Airbnb*, generarea prețurilor recomandate pentru anunțuri se bazează de asemenea pe metodologii *Deep Learning* [57]. Aplicația foto a *Android* utilizează algoritmi de recunoaștere facială, care valorifică *Deep Learning*, pentru a organiza fotografiile în grupuri pe baza persoanelor [58]. În plus, *Deep Learning* alimentează funcționalitățile de căutare vizuală de pe *Pinterest*, permițând potrivirea preferințelor utilizatorilor [59]. În cazul *ChatGPT*, o parte substanțială a procesării limbajului natural, esențială pentru generarea de răspunsuri coerente, se bazează pe *Deep Learning* [60]. Prin urmare, fiecare dintre noi utilizează deja tehnici *ML* și *DL* în diverse situații, ca parte integrantă a rutinei noastre zilnice.

Având în vedere progresele înregistrate în domeniu, apar tot mai multe întrebări cu privire la amploarea potențialului său și la fezabilitatea realizării unei inteligențe umane așa cum o știm noi. Pentru a răspunde acestor întrebări, este prudent să revizuim obiectivele inițiale de proiectare a inteligenței artificiale.

Deep Learning, așa cum am menționat, a demonstrat deja progrese remarcabile în domeniul raționamentului uman în comparație cu toate tehnicile anterioare. *Mass-media* a evidențiat realizări precum victoria lui *AlphaGo* asupra unui mare maestru uman în jocul de *Go* [61]. Deși acest joc poate părea simplu la o primă vedere, fiind doar un joc de societate, complexitatea lui nu trebuie subestimată. Jocul de *Go*, pe o tablă standard (19x19), oferă mai multe mutări potențiale (10^{170} [62]) decât numărul de atomi din univers – estimat în mod obișnuit la 10^{82} [63]. *Go* este astfel semnificativ mai complex decât șahul – deja bine cunoscut atunci când se vorbește despre complexitate (și care are 10^{120} de mutări posibile [64], un număr cunoscut în lumea șahului și a matematicii sub numele de „numărul Shannon" – același Shannon care a participat la prima conferință de inteligență artificială de la *Dartmouth*, pe care am menționat-o la începutul articolului). Tehnicile tradiționale de inteligență artificială, cum ar fi căutarea prin *brute force* a tuturor posibilităților, devin inutile din cauza acestei enorme complexități, având în vedere că puterea de calcul disponibilă este, cel puțin deocamdată, absolut insuficientă pentru a explora toate mutările potențiale.

Prin urmare, aplicarea tehnicilor *Deep Learning* devine esențială pentru a determina ce ramuri ale arborelui de căutare trebuie investigate. În acest context, *DL* servește drept organizator principal al multiplelor tehnici utilizate pentru a stabili ce mutări ar trebui evaluate în cadrul jocului.

Transmisia în direct a jocurilor de *Go* cu *AlphaGo* a reaprins pasiunea pentru acest joc în rândul jucătorilor profesioniști și amatori din întreaga lume. Reacțiile la mutările neconvenționale efectuate de computer au fost de surpriză și intrigă, deoarece inteligența artificială a demonstrat strategii și tactici cu totul diferite de cele ale jucătorilor umani. Percepute inițial ca fiind decizii proaste, aceste mutări s-au dovedit în cele din urmă avantajoase, ducând la victoria lui *AlphaGo* cu scorul de 4 la 1 [65].

Acest fenomen a declanșat un *feedback* interesant în interacțiunea dintre oameni și mașini. Observarea inteligenței artificiale, în acest caz *AlphaGo*, rezolvând probleme asociate unui joc atât de complex precum cel de *Go,* influențează prin prezentarea de noi perspective și strategii. Acest lucru este exemplificat de

comentariile făcute de marele maestru Lee Sedol – cel care s-a confruntat cu înfrângerea suferită în faţa lui *AlphaGo*. El a recunoscut că interacţiunea sa cu *AI* i-a îmbunătăţit semnificativ înţelegerea jocului, inspirându-i noi idei şi strategii [66]. Această observaţie subliniază dinamica potenţială a interacţiunii dintre om şi *AI* în contexte mai largi, sugerând o relaţie simbiotică în care ambele entităţi învaţă şi evoluează una de la cealaltă.

În plus, influenţa profundă a lui *AlphaZero*, un motor de şah extrem de puternic creat de *Google DeepMind* [67], a lăsat o impresie de durată în lumea şahului. Merită subliniat aici faptul că Magnus Carlsen, fost campion mondial la şah şi cunoscut ca fiind cel mai bun jucător de şah al prezentului [68], a recunoscut impactul transformator pe care acest motor revoluţionar l-a exercitat asupra abordării sale strategice şi asupra competenţei sale ca jucător. Atunci când se analizează realizările remarcabile ale lui Carlsen pe parcursul ultimilor ani, rolul indispensabil jucat de *AlphaZero* în susţinerea succeselor lui, devine un factor de netăgăduit şi care necesită recunoaştere adecvată [69].

O altă maşină remarcabilă, cu rezultate pe măsură în materie de rezonare, este *GPT-4*, un model avansat de inteligenţă artificială dezvoltat de *OpenAI*, menţionat anterior. Acesta a fost aclamat pentru realizările sale remarcabile într-o gamă diversă de examinări care acoperă mai multe domenii. Printre realizările notabile se numără o performanţă excepţională în cadrul secţiunii de citire şi scriere a testului de aptitudini şcolare din Statele Unite (*Scholastic Aptitude Test – SAT*) – echivalentul examenului de bacalaureat, unde *GPT-4* a obţinut un scor impresionant de 710 puncte dintr-un total de 800, situându-se în cadrul celui mai apreciat palier de scoruri. În mod similar, la secţiunea de matematică, *GPT-4* şi-a demonstrat aptitudinile prin obţinerea unui scor lăudabil de 700 de puncte din 800. Testul din semifinalele Olimpiadei de biologie din SUA a fost martorul competenţei excepţionale a *GPT-4*, care a obţinut un scor extraordinar, cuprins între percentilele 99 şi 100. În plus, *GPT-4* a demonstrat o competenţă remarcabilă la o gamă largă de examene *Advanced Placement* (*AP*), inclusiv la materii precum *AP Art History*, *AP Biology* şi *AP Environmental Science*, printre altele, obţinând note foarte bune la aceste evaluări riguroase. În plus, *GPT-4* a demonstrat performanţe lăudabile la examenul de licenţă medicală din Statele Unite (*United States Medical Licensing Examination – USMLE*), depăşind în mod constant pragurile de trecere stipulate la toate cele trei componente ale examenului [70]. Este important de remarcat faptul că, deşi *GPT-4* a demonstrat competenţă, performanţa sa a variat în cadrul diferitelor examene, indicând multe zone potenţiale de perfecţionare şi îmbunătăţire ulterioară care însă nu vor rămâne neacoperite prea mult timp de dezvoltatorii de la *OpenAI,* ceea ce indică evoluţia dar şi interesul tot mai crescut al tehnologiilor *AI*.

3. Direcţii emergente în *AI*

3.1. Raţionament

Mass-media, hrănită câteodată de efervescenţa reţelelor de socializare, publică articole ce sugerează că inteligenţa artificială va face ca oamenii să fie înlocuiţi de maşini. Cu toate acestea, articolele ştiinţifice, precum cele citate în acest eseu dar şi

multe altele [71, 72, 73], susţin că aceasta nu îi va înlocui pe oameni, ci le va spori abilităţile, augmentându-le – un fenomen deja observabil în domeniul jocului de *Go* şi de şah, după cum am menţionat anterior.

Prin utilizarea acestor tehnici s-a reuşit depăşirea performanţelor umane în diverse sarcini complexe ce necesitau, în mod tradiţional, o înţelegere a naturii lucrurilor din jur – a lumii (!!). Aceste sarcini se extind de la diagnosticarea medicală, cum ar fi identificarea bolilor, interpretarea razelor X pentru detectarea tumorilor, până la determinarea prezenţei celulelor canceroase în probele de sânge [74] sau chiar la detectarea infecţiilor asimptomatice Covid-19 prin intermediul tusei înregistrate de telefonul mobil [75]. Aceste sarcini erau de obicei îndeplinite de profesionişti cu o înaltă pregătire.

Punctul forte al tehnologiilor *Deep Learning* constă în capacitatea acestora de a procesa cantităţi mari de date, permiţând astfel identificarea şi clasificarea diferitelor elemente – de exemplu, determinarea dacă o probă de sânge conţine sau nu celule canceroase. Acest progres este o ilustrare clară a modului în care *DL* poate obţine performanţe superioare în comparaţie cu eforturile umane în anumite domenii.

Anticipăm că un număr din ce în ce mai mare de *startup*-uri vor valorifica aceste capacităţi, obţinând performanţe mai bune decât cele umane în domenii despre care odată se credea că ţin de competenţa exclusivă a persoanelor cu o pregătire superioară. Astfel, mai degrabă decât să înlocuiască oamenii, inteligenţa artificială, şi în special tehnologiile *Deep Learning*, vor spori abilităţile şi performanţele umane [76].

3.2. Planificare şi navigare

Având în vedere subiectul planificării şi navigaţiei, este demn de remarcat aici povestea lui George Hotz, *CEO* al companiei *COMMA.AI*. În mod remarcabil, Hotz a reuşit să construiască de unul singur o maşină care se conduce singură [77, 78].

Pentru a pune reuşita lui în context, trebuie menţionat că primul *Grand Challenge* în domeniul *self-driving cars*, a avut loc în anul 2004 în deşertul *Mojave* din California [79] şi a fost sponsorizat de *DARPA (Defense Advanced Research Projects Agency)* din Statele Unite. Competiţia a atras douăzeci de participanţi de la universităţi şi *startup*-uri de top, toţi concurând pentru a parcurge un traseu de 241 de kilometri (150 mile) în deşert. Cea mai bună performanţă a fost obţinută de *Sandstorm*, o maşină cu conducere autonomă construită de echipa a universităţii *Carnegie Mellon* din *Pittsburgh, Pennsylvania*, care a reuşit să parcurgă mai puţin de 12 kilometri (7,32 mile) din traseul total.

Trei ani mai târziu, în 2007, *DARPA* a sponsorizat *Urban Challenge* [80], un traseu urban de 96 de kilometri (60 mile) stabilit la baza aeriană *George Air Force Base* din California. În cadrul acestei provocări, automobilele mai multor universităţi au reuşit să termine traseul, *Carnegie Mellon* şi *Stanford* ocupând primele locuri. Această evoluţie, de la incapacitatea de a parcurge mai mult de 12 kilometri în deşert, la finalizarea unui traseu urban de aproape 100 de kilometri, a declanşat o cursă spre dezvoltarea aplicaţiilor *self-driving cars* [81].

În prezent, toți marii producători de automobile finanțează masiv dezvoltarea din domeniul conducerii autonome. Printre aceste companii se numără giganți precum *General Motors, Ford, Tesla, Google, Toyota, Lyft, Uber, Bosh, Volkswagen* și multe altele [82, 83].

În acest context, reușita lui Hotz de a construi o mașină care se conduce singură, complet funcțională, folosind tehnici *Deep Learning* și bazându-se exclusiv pe resurse *open-source*, este cu adevărat uimitoare. Acest caz evidențiază potențialul extraordinar al tehnologiilor *DL*. Sofisticarea acestor algoritmi *open-source* a ajuns la un punct în care o persoană poate construi o mașină care se conduce singură, o sarcină care, în mod tradițional, necesita eforturile a mii de ingineri din centrele de cercetare și dezvoltare ale companiilor. Putem anticipa din nou un interes în dezvoltarea *startup*-urilor ce vizează folosirea tehnologiilor *DL*, de data asta în vederea dezvoltării aplicațiilor pentr mașini autonome.

Astăzi, *Waymo*, compania de vehicule autonome deținută de *Alphabet* (compania-mamă a *Google*), a început să ofere servicii de taxi fără șofer în *San Francisco* [84]. Nu sunt singurii! *Cruise* – marcă a *General Motors*, sunt de asemenea prezenți pe piață [85], ceea ce a făcut ca autoritățile să aprobe de curând – 10 august 2023, operarea 24/7 a taxiurilor fără șofer în *San Francisco* [86, 87].

3.3. Procesarea limbajului natural

După cum am menționat încă de la începutul prezentului articol, domeniul înțelegerii limbajului natural (*Natural Language Processing – NLP*) este unul dintre primele domenii de explorare în inteligența artificială. Cu toate astea, progrese semnificative realizate de la acele experimente inițiale, abia au început să apară, *NLP* rămânând o problemă extrem de complexă. Combinația dintre *Deep Learning* și uriașa cantitate de date disponibile în prezent pe *web*, cum ar fi fluxurile *Twitter*, postările pe *Facebook* alături de cele de pe *Wikipedia* și blogurile nenumăraților utilizatori de Internet, oferă o sursă solidă pentru a alimenta aceste sisteme în încercarea de a efectua sarcini complexe din zona de cercetare/dezvoltare a *NLP*.

Un exemplu, poate extrem, al complexității limbajului vorbit este propoziția *‚Buffalo buffalo Buffalo buffalo buffalo buffalo Buffalo buffalo.’* care, evident, reprezintă o provocare în ceea ce privește înțelegerea contextului și a părților de vorbire. Poate merită menționat aici că această propoziție, în particular, are chiar și o pagină proprie pe *Wikipedia* [88] ea fiind una perfect valabilă în limba engleză din punct de vedere gramatical.

Învățarea profundă contribuie în mod semnificativ la abordarea acestor provocări. *Google*, de exemplu, a lansat un proiect *open-source* care vizează identificarea părților unei propoziții, împărțind-o în substantive, verbe, atribute, complemente și așa mai departe. Acest proiect, cunoscut sub numele de *robots.txt parser*, ilustrează și mai mult progresele făcute în domeniul *NLP* [89].

GPT-4 de la *OpenAI* atrage deja multă atenție, *Bard*, a celor de la *Google* este și ea o aplicație deosebit de puternică din zona *NLP* ce folosește *Large Language Models (LLMs)* ca bază de lucru pentru tehnologii *Deep Learning* ce au rolul de a procesa cantități uriașe de text culese de pe Internet... iar competiția se află abia la

început. Mai merită menționată aici aplicația *LLaMA* a celor de la *Meta/Facebook* și *Claude* dezvoltată de *Anthropic* (un *startup*), și acestea cu abilități de înțelegere și generare a textului aproape umane după cum spune Blake Lemoine, un fost inginer *Google* care a mers chiar mai departe cu afirmația zicând că „*LaMDA* [un alt *software NLP* dezvoltat de *Google*] prezintă semne de conștiință" [90]. Gigantul *Microsoft* a testat la rândul său *GPT-4* ajungând la concluzia că, în unele situații, aplicația celor de la *OpenAI* excede abilitățile umane de a înțelege și genera text [91, 92]).

3.4. Percepție

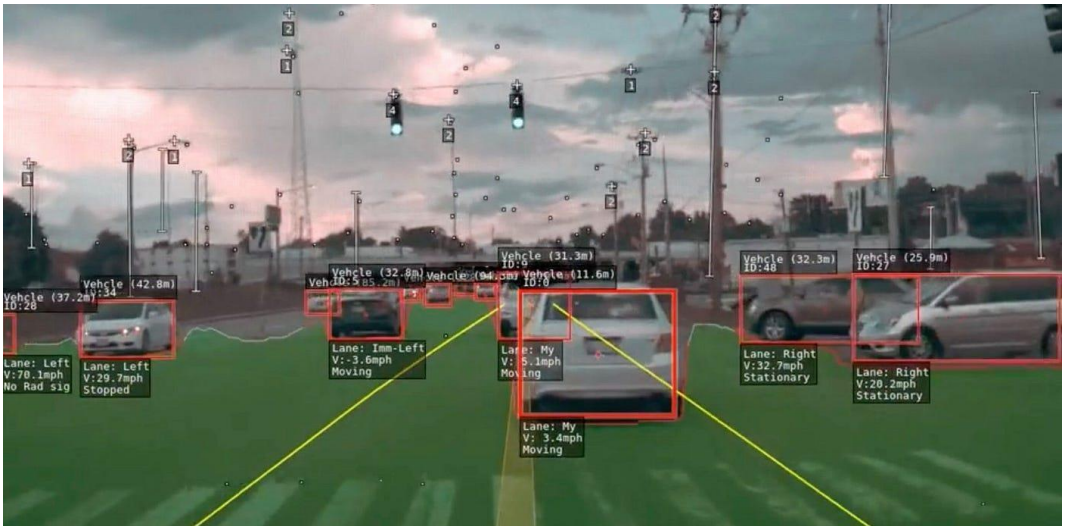

Fig. 4. Viziune computerizată pentru mașinile care se conduc singure
Source: https://enercopower.com/

În domeniul percepției se fac de asemenea progrese semnificative datorate în mare parte tehnologiilor *Deep Learning*. Dacă ar fi continuăm cu exemplul unui vehicul autonom, așa cum am vorbit în una din secțiunile precedente, și abilitatea acestuia de a analiza o scenă stradală ca cea din figura 4, acesta trebuie să identifice diverse elemente precum: un sedan în față (care se deplasează cu aproximativ 5,4 km/h), pe partea dreaptă alte două (staționare), în stângă un automobil în mișcare ce se deplasează cu viteza de 3,6 km/h precum și obiecte staționare, cum ar fi stâlpi și semafoare. Sistemul trebuie să fie capabil să clasifice toate aceste obiecte în timp real, să facă predicții cu privire la pozițiile lor viitoare și să planifice în consecință un traseu sigur și eficient. Tehnologiile *DL* joacă un rol esențial în dezvoltarea abilităților vehiculelor autonome de a interpreta și analiza astfel de scene.

Tot despre percepție este și experiemntul *cat finder* a profesorului Andrew Ng de la *Standford,* despre care am vorbit mai sus.

Impactul acestor tehnologii se extinde și în lumea afacerilor, după cum o demonstrează creșterea și succesul recent al *Nvidia* – merită menționat aici faptul că *Nvidia* este astăzi a VI-a cea mai mare companie de pe planetă cu o capitalizare bursieră de 1,125 trilioane de de dolari [93]. Această companie a atribuit o parte

semnificativă a progresului său noii sale linii de afaceri, care oferă sisteme *DL* pentru vehicule autonome. *CEO*-ul şi cofondatorul *Nvidia*, Jensen Huang, a declarat cu ocazia conferinţei *GTC Developer Conference* din martie 2023 – eveniment ce a marcat cei treizeci de ani de existenţă a companiei, că „accelerarea creşterii afacerii noastre este reprezentată de *Deep Learning*, un nou model de calcul care utilizează puterea de calcul masivă a *GPU*-urilor pentru a instrui algoritmii de inteligenţă artificială. Adoptarea sa se răspândeşte din industrie în industrie, stimulând cererea pentru *GPU*-urile noastre" [94]. După cum reiese din această declaraţie, influenţa *Deep Learning* este deosebit de vastă, având un impact puternic asupra diferitelor aspecte ale sectorului tehnologic, de la cipurile de siliciu utilizate în construcţia componentelor *hardware* la aplicaţiile *software* destinate să lucreze pe acestea.

3.5. AGI – Artificial General Intelligence

Perspectiva interesantă pe care o au tehnologiile *Deep Learning* este că acestea ne propulsează spre realizarea unor progrese semnificative în toate obiectivele fundamentale ale inteligenţei artificiale, mai exact cele care au în vedere emularea diverselor aspecte ale comportamentului uman. Acest lucru ar putea semnala, potenţial, calea către *AGI*, care să cuprindă faţete precum inteligenţa emoţională, creativitate şi intuiţie. Într-adevăr, un domeniu în plină expansiune al cercetării în domeniul *AI,* şi cu precadere *DL,* se concentrează pe creativitate, cu proiecte precum *Deep Jazz* – care poate produce compoziţii de jazz inedite (interesant este faptul că acest proiect a fost construit în 36 de ore în cadrul unui *hackathon*) [95], *Dall-e* – excelent pentru generarea de imagini [96] şi multe altele pe care le lăsăm cititorilor să le descopere.

Acest lucru ar putea fi perceput ca fiind începutul unui progres transformator în cercetarea în domeniul inteligenţei artificiale. Perspectiva dominantă este că orice aplicaţie serioasă necesită de acum înainte încorporarea tehnologiilor *AI*, la fel cum cipurile *Intel* au fost cruciale pentru toate sistemele de calcul serioase, fapt subliniat de campania de marketing *Intel Inside* a *Intel* [97]. La fel se poate preconiza că *Deep Learning* va fi parte integrantă a sistemelor viitoare, sporindu-le viteza, capacitatea de reacţie şi uşurinţa de utilizare permiţându-ne astfel să anticipăm că aceste tehnologii vor fi o caracteristică de bază a tuturor aplicaţiilor care vor fi dezvoltate în viitor.

4. Concluzie

În prezent, ne aflăm într-o primăvară a inteligenţei artificiale şi numai timpul ne va arăta dacă aceasta va duce la realizarea unei inteligenţe generalizate (*AGI*). Cu toate acestea, ceea ce este în general acceptat şi de necontestat este faptul că *Deep Learning* reprezintă cel mai important progres în cercetarea în domeniul inteligenţei artificiale de la începutul acesteia din vara anului 1956. Această tehnologie va spori eficienţa, inteligenţa şi capacitatea de reacţie a fiecărei aplicaţii, iar mişcările mediului de *business* din jurul *startup*-urilor din domeniul *IT/AI* par a fi vârful de lance al tuturor acestor iniţiative. Prin urmare putem spune că am păşit într-o eră

entuziasmantă fiind îndreptățiți să credem că că *AI* și *Deep Learning* ar putea reprezenta schimbări tehnologice precum cele aduse de tehnologiile mobile și *cloud* în ultimii cinci, zece ani.

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Using a modern honeypot model to defend smart cities and provide early detection to APT and ransomware attacks

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Abstract

Ransomware and advanced persistent threat (APT) attacks are proliferating on critical infrastructure in cities and nation-states. Holding a whole smart city for ransom using a combined cyberattack would, just a few years ago, have been the stuff of science fiction movies. Yet today sophisticated hacking techniques, the ease of use and availability of RaaS (Ransomware as a Service) and the vast vulnerabilities of computer systems, web applications, databases and various IoT-connected devices exposed in the wild are all creating a significant challenge for security teams. Such a movie may become reality. Some security teams in various sectors use active defense technology and deception security to deceive, trick bait, and lure hackers towards fake assets. Regardless of vulnerabilities in the wild, it helps detect the breach at an early stage and allows faster threat remediation before it is too late. In this study, we use a descriptive literature review to explore various real-life breach cases which occurred in smart cities. We use content analysis to detect similarities, patterns, significant correlations, and relationships between keywords. A synthesis analysis is conducted and the modern honeypot triangle model is suggested to reduce the risk of future similar breaches by deceiving cybercriminals and providing security teams with extensive early warning detection capabilities and intelligence about the attackers' techniques and tactics. Finally, we provide recommendations for further analysis.

Keywords: *Ransomware, Deception Technology, Cybersecurity, IoT.*

1. Introduction

This paper explores real-life breach cases on smart cities reported in the media over recent years. Learning from real cases is essential, especially in understanding the impact of significant attacks on smart cities and how to detect such cyberattacks quickly and remediate the threats and risks.

Recently, the EU published the "Network and Information Security Directive" NIS2 and defined many new essential and important sectors that will be added to

the original NIS directive. Reporting obligations and incident reporting are given special attention in the directive. Affected organizations will need to report any cyber incident within 72 hours. NIS2 will be applicable by 2024 after EU member states execute the legislation [1], [2].

Early warning systems and active defense techniques are necessary to detect attackers and remediate the threat as early as possible, to reduce the potential damage from a breach. The effectiveness of deception security has been researched in previous studies. For example, Ferguson-Walte [3], [4] concluded that the presence of deception, combined with knowledge of its existence, has the greatest effect on cyber attackers. A honeypot is a method to bait, deceive, and trick an attacker by placing fake computing assets in production or non-production networks. It looks real to attackers and provides alerts and intelligence as soon as the attacker communicates with the honeypot . The term honeypot for trapping attackers was used in the 1960s and 1970s when Clifford Stoll, an American astronomer, author, and teacher, set up a honeypot and tracked down a hacker who was later identified as KGB recruit Markus Hess [5]. Over the last decade, a new technology industry has arisen, which Gartner also referred to as deception technology industry [6].

Security operations centers use many tools for early warning of threats. However, not all of these tools utilize active defense technology, deception technology, or the modern honeypots that are discussed in this article. By implementing decoys and lures to deceive cybercriminals and distract them with fake assets, modern honeypots have the potential to reduce risk and improve service level agreements for early warning detection. This allows security teams to effectively remediate risks while the attackers are occupied and their efforts are wasted. The probability of harming real assets is reduced as soon as more decoys are added across the network and coverage is expanded or lures are used to divert the attackers to these decoys. This paper explores real-life breach cases on cities that have occurred already, synthesizing and suggesting a modern honeypot model as a deception strategy for smart cities.

This paper aims to equip the cyber community that defends smart cities with a toolset of deception ideas and best practices for leveraging existing active defense technologies to improve their early warning detection capabilities and meet necessary upcoming regulations such as NIS2 [1], [2].

Moreover, this paper identifies trends, relations, and common findings between various real-life breach cases that occurred and were reported in the news. The paper suggests insights and recommendations of how a suggested modern honeypot triangle model can help to defend smart cities and provide early detection to Advanced Persistent Threat (APT) and ransomware attacks. Finally, we also discuss suggestions for future research.

2. Methods

For this paper a descriptive literature review was conducted using three search engines: Google, Bing and Yahoo. The search engines were used to search for news reports of breach cases on cities.

The following search terms were used: "attack on cities", "attack on smart cities", "published attacks", "published breaches", "attack on government", "government breach", "attacks on IoT in cities", "attack on smart devices", "attack on connected devices", "attack on smart homes", " ransomware attack on cities", "APT attack on cities", "attack on emergency alarms", "attack on CCTV", "attack on transportation.", and "breaches in cities and government".

The criteria for inclusion in the literature review were: a published breach involving an official city or government office and a significant impact on the entity. This impact could take various forms, such as affecting many users, compromising safety or national security, interrupting online payment services or services offered to citizens, or impacting a large number of students. Additionally, significant operational disruptions in transportation, healthcare, finance, or other areas within a city or government were also considered.

The entry point, the impact of each breach, the type, and the sector were classified into categories. An in-depth review of all published cases was conducted, and the content of cases was compared between the various sources. In cases of ransomware, a search on which variants were used was also conducted.

Categories of business use case impact and technical use case impact were defined, and each case's business and technical impact were classified accordingly. Then analysis of key similarities and differences between these published breaches was conducted using content analysis, keyword frequency analysis, and Spearman correlation to search for significant correlations between certain keywords within the reported articles. The findings were then summarized for discussion in this paper; how we can minimize, reduce, and remediate the impact of similar cases in the future by using the modern honeypot model suggested in this paper to provide cities with outstanding early warning capabilities.

2. Results

2.1. Descriptive Literature Review and Synthetic Analysis

Following the articles search over three search engines, the initial query yielded eighty-six articles. Of these articles, twenty-one real-life breach cases met the criteria for inclusion in the literature review. These cases are outlined in Table 1. Even though all of the breach cases have already occurred and have been reported in the news, the researcher has chosen not to disclose the names of the affected organizations. Instead, the focus is on the impacted sectors and the nature of the breaches, as well as suggesting a future model to defend against similar incidents in the future.

When looking for similarities among the breach cases it was discovered that over 65% of the cases were in the government sector. Based on the published reports, ransomware attacks and data breaches were the main type of attacks. The ransomware variants used in the attacks were Ryuk, WannaCry, Trickbot, and Lockbit. When searching for common entry points, the following categories were defined: Computer systems were 44% of the cases, web applications were 33% of the cases, databases were 12% of cases, and IoT were 11% of cases.

Based on the published cases, most breaches resulted from weak or stolen credentials, unpatched or outdated software, a lack of authentication or authentication methods, and an insecure configuration or management interface. Based on the analysis conducted, the main weaknesses used were divided into the following categories: 44% were unpatched servers, 33% were vulnerable web applications, 12% were exposed databases, and 11% were misconfigured firewalls.

Trellix reported similar findings [7] in Q3 2022, within the same time frame of these cases. Lockbit was one of the top ransomware families used in 2022. Additionally, they reported that Cobalt Strike and Mimikatz were the most malicious hacking tools used and attackers continue to leverage most Operating System (OS) binaries such as Command Prompt (CMD), PowerShell, Scheduled Tasks (Schtasks), and Windows Management Instrumentation (WMI) as well as third-party tools like remote access tools, red team tools, and file transfer tools.

The higher percentage of computer systems and web applications entry points in comparison to IoT and databases is related to the fact that computer systems and web applications have more potential entry points. For example, computer systems may have vulnerabilities in their operating system or open ports that attackers can exploit. Web applications may contain code or server vulnerabilities that allow malicious actors to inject malware or access sensitive information. By comparison, IoT systems and databases may have fewer entry points that can be targeted.

The attackers' main goal was to create as significant an impact as possible to increase the probability of getting their ransom request paid. In many cases, it was not reported whether the ransom was eventually paid or not.

Sophos's report also mentioned that in both state and governments, there were higher ransomware encryption rates 72% in 2022 [8].

Table 1. Examples for cyberattacks on cities which were reported in the news

Sector	Entry point category	Impact based on the source
Education	Computer Systems	Hundreds of thousands of students were affected.
Government	Computer Systems	A significant percentage of recorded storage devices
Government	Computer Systems	Hundreds of outside sirens activated.
Education	Computer Systems	School's data encrypted
Transportation	Web Applications	Online tickets, web and signals
Education	Web Applications	Tens of thousands of students were affected.
Education	Web Applications	Thousands of students were affected.
Government	Databases	Delayed rent payments

Legal	Web Applications	Tens of servers and workstations
Government	Web Applications	Servers/network and important city data were stolen.
Education	Computer Systems	Shut down of phone lines, locked and encrypted school system data.
Government	Web applications	Online payment utilities, traffic tickets and law enforcement operations.
Healthcare	Web applications	Health insurance/medical information.
Utilities	IoT	The hacker tried to poison the water supply.
Government	Computer Systems	Thousands of government computers The office moved to work with paper.
Government	Computer Systems	Email servers, fingerprinting and background checking system.
Government	Web applications	Hundreds of online computers during the holiday.
Government	Computer Systems	The city took all servers down as a precaution following the detection of the cyberattack.
Government	Web applications	Hundreds of computers were infected and all the city's files were locked.
Government	Databases	Telephones, online payments
Government	Computer Systems	911 and online payments were down and took weeks to recover as part of a simultaneous attack on many cities.

Sources: [11],[12],[13],[14],[15],[16],[17],[18],[19],[20],[21],[22],[23],[24],[25]

All twenty-one published breach case articles were analyzed using content analysis, keyword frequency analysis, and the Spearman correlation test between keywords using Voyant software [9]. When analyzing keyword frequency, the top fifty-five keywords met the expectation for this study (Fig. 3.) in which "ransomware" and "breach" appear among the top ten keywords which were: "city", "attack", "security"," incident"," government,"" data", "ransomware", "breach", "access", and "information" (Fig. 4.)

Fig. 3. Top 55 keywords frequency from published attacks

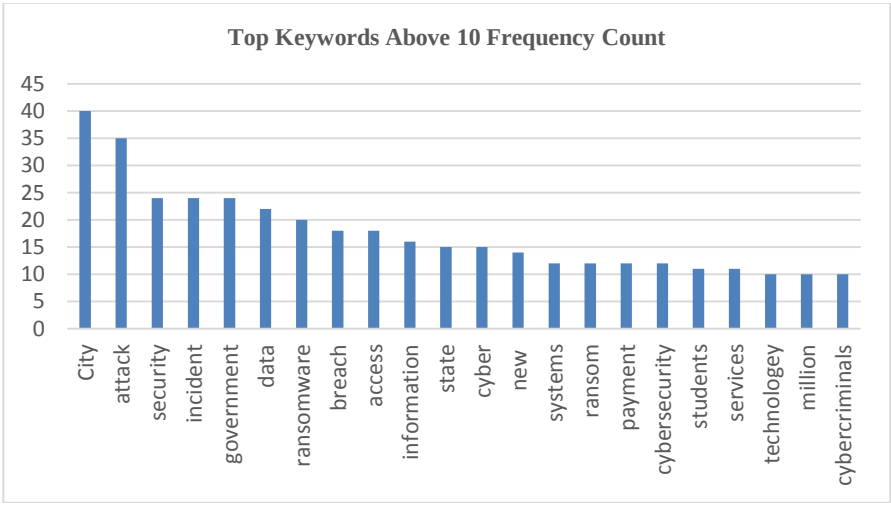
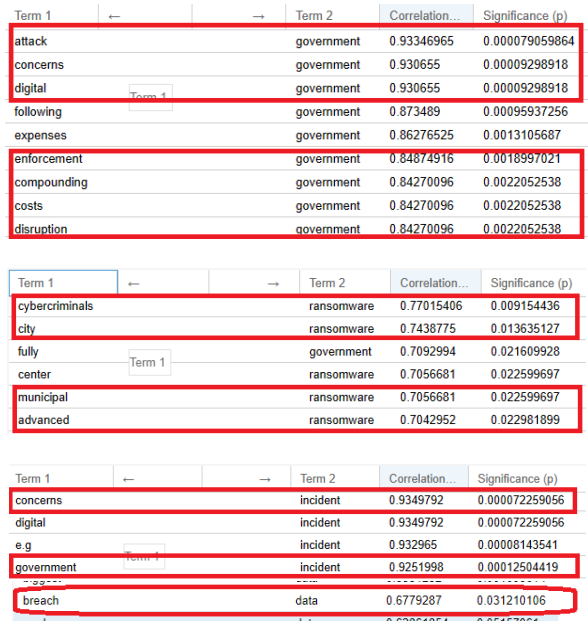


Fig. 4. Top Keywords Above 10 Frequency Count

When checking for Spearman correlations between keywords, interesting and significant findings were detected (Fig. 5.):

- Between the keywords "attack", "concerns", "digital", "enforcement", "compufunding", "costs", and "disruption", and the keyword "government".
- Between the keywords "cybercriminals", "city", "municipal", and "advanced", and the keyword: "ransomware".
- Between the keywords: "concern" and "government", and the keyword "incident".
- Between the keyword: "breach" and the keyword "data".



Term 1	Term 2	Correlation...	Significance (p)
attack	government	0.93346965	0.000079059864
concerns	government	0.930655	0.00009298918
digital	government	0.930655	0.00009298918
following	government	0.873489	0.00095937256
expenses	government	0.86276525	0.0013105687
enforcement	government	0.84874916	0.0018997021
compounding	government	0.84270096	0.0022052538
costs	government	0.84270096	0.0022052538
disruption	government	0.84270096	0.0022052538

Term 1	Term 2	Correlation...	Significance (p)
cybercriminals	ransomware	0.77015406	0.009154436
city	ransomware	0.7438775	0.013635127
fully	government	0.7092994	0.021609928
center	ransomware	0.7056681	0.022599697
municipal	ransomware	0.7056681	0.022599697
advanced	ransomware	0.7042952	0.022981899

Term 1	Term 2	Correlation...	Significance (p)
concerns	incident	0.9349792	0.000072259056
digital	incident	0.9349792	0.000072259056
e.g	incident	0.932965	0.00008143541
government	incident	0.9251998	0.00012504419
breach	data	0.6779287	0.031210106

Fig. 5. Significant keywords Correlations in published reports

The visual linkage between keywords clearly emphasizes that ransomware received a high level of attention in the breach cases reported in the news.

The relationship between the keywords: "attack" and "government"; "ransomware" and "government"; "attack" and "ransomware"; "ransomware", "access" and "data" were found to be significant, and this visual linkage is presented in Fig. 6.

These keywords' correlation seems obvious and makes sense. Most importantly, this ensures the reliability of the specific cases that are included in the literature review and allows a focused analysis of these cases for the purposes of this study in order to draw meaningful deductions regarding future potential implications and suggestions.

Since this paper recommends the use of active defense technology and modern honeypots for improving early warning capabilities, a keyword analysis was also conducted to assess whether deception technology, modern honeypots, or other keywords related to those topics exist in the articles. An interesting finding was that "active defense technology", "deception technology", "decoy", "lures", "honeypot", or "active defense" keywords did not appear in any of these published reports. There could be a few reasons for this. First, many published breaches do not mention which security tools the organization used and had in place during the attack. Second, if the attack or breach succeeds, the security tools in place are no longer an interesting topic to write about. However, if the breach was made on a fake asset or decoys containing fake content and the fake data was leaked, stolen, or published by the attacker, then we would expect that a successful deception of an attacker at such a level would get published. A case of this sort was not found in the literature within this study, which may imply a gap in knowledge on this topic and highlights the potential importance and contribution of this paper to the cybersecurity community.

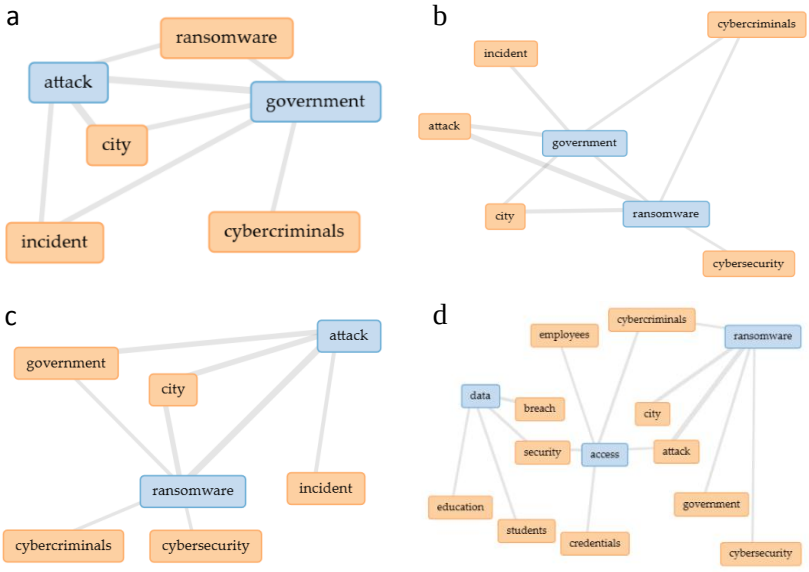


Fig. 6. (a) relationship between "attack" and "government" keywords; (b) relationship between "ransomware" and "government" keywords; (c) relationship between "ransomware" and "attack" keywords; (d) relationship between "ransomware", "access" and data keywords.

2.2. The Modern honeypot model for smart cities

Following the synthesis analysis of twenty-one published breach cases on smart cities, both business use case impact and technical use case impact were categorized for all these cases accordingly. The business use case categories that were defined were:

- Financial losses - expenses related to infrastructure damages and recovery costs;
- Loss of reputation - damage to public image and trust in businesses and government;
- Legal challenges - liability issues, regulations, and enforcement;
- Interruption of services - disruption to services and operations;
- Data loss - exposure or loss of confidential and sensitive data.

The technical impact use cases categories that were defined were:

- Encryption and access controls - includes items like locked files and encryption of computer systems;
- Network security - includes controlling and/or halting of IoT-CCTV, recording storage devices, VOIP, network devices, smart connected devices, and emergency alarms;
- Data loss - includes stolen data and controlling and/or halting of information systems;

- Online services - includes controlling and/or halting of online payment services, email server breaches, and signals;
- Critical infrastructure - includes controlling and/or halting of critical infrastructure and medical devices.

Deception technology includes high-level interaction decoys, medium-level interaction decoys, and low-level interaction lures. These can be purchased by business organizations and can be designed and customized as required [6].

Following the defined technical use case impact categories, we suggest the modern honeypot triangle model for smart cities by using deception technology and customization of decoys for any sector.

We define the full modern honeypot model as a unified main triangle consisting of four sub-triangles that must include the following components:

- The first component, a Full Operating System (OS) Windows decoy, which is a golden image of any version of Windows server decoy. Any software can be run on it, and it can monitor services such as Remote Desktop (RDP), Windows Management Instrumentation (WMI), Web, Microsoft SQL Server(MSSQL), Active Directory (AD), Domain Name Systems (DNS) and more. A Full OS of Linux is also an advantage to mimicking a Linux server and should contain high-interaction services such as Secure Shell (SSH) , Web service, MySQL service, and more;
- The second component is an emulated decoy that can easily be changed to any OS and can be adjusted to run multiple emulated services. It can be customized to look like a real server or workstation and can be deployed at scale across multiple VLANS;
- The third component is the lures, which are like bread crumbs distributed to endpoints. They deceive and bait attackers and refer them to the emulated decoys or the Full OS decoys;
- The fourth component of the full modern honeypot model is the remediation of the threat actor as soon as communication with one of the decoys occurs. There are various remediation measures that can be executed, such as blocking communication using a firewall, conducting network containment using endpoint protection and network access control systems, restoring an endpoint or server using backup systems, sending alerts to Security orchestration, automation and response (SOAR) or central management on the cloud, sending new signatures of zero-day to anti-virus, sending alerts through SMS and notifications, using the Security Information and Event Management (SIEM) or SOAR to perform advanced actions on endpoints, such as removal of files, and sending binaries to sandboxes for further analysis.

In Fig. 7 we associate the technical impact use case categories with the relevant component of the suggested modern honeypot model and in Fig. 8 we show a suggested example for implementing the model in the government sector.

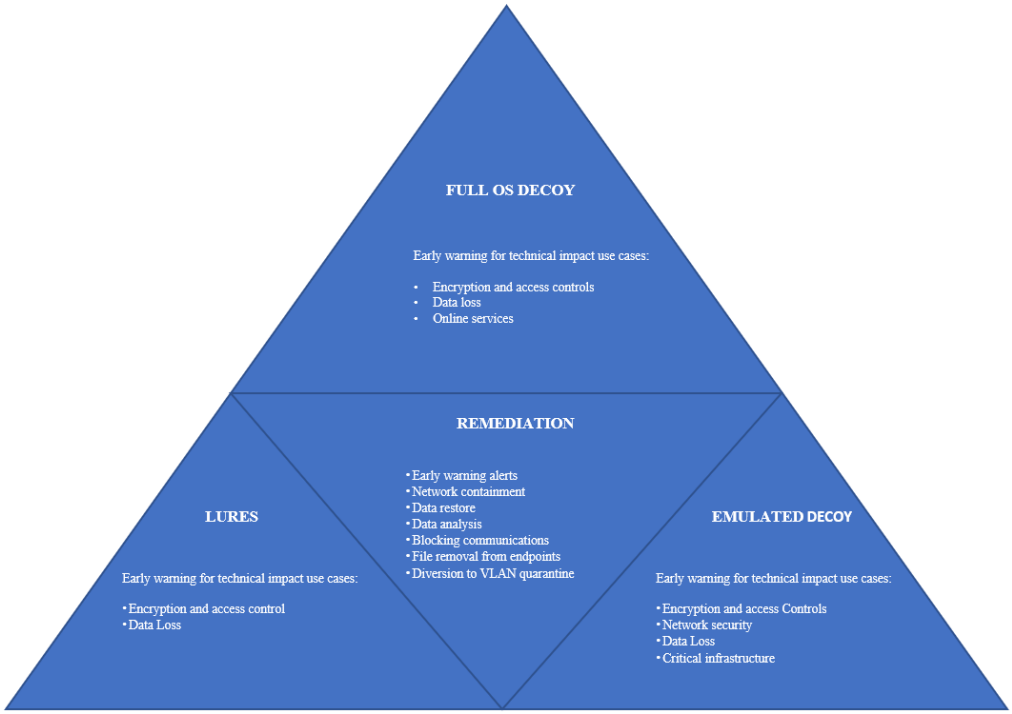


Fig. 7. The suggested modern honeypot triangle model for smart cities

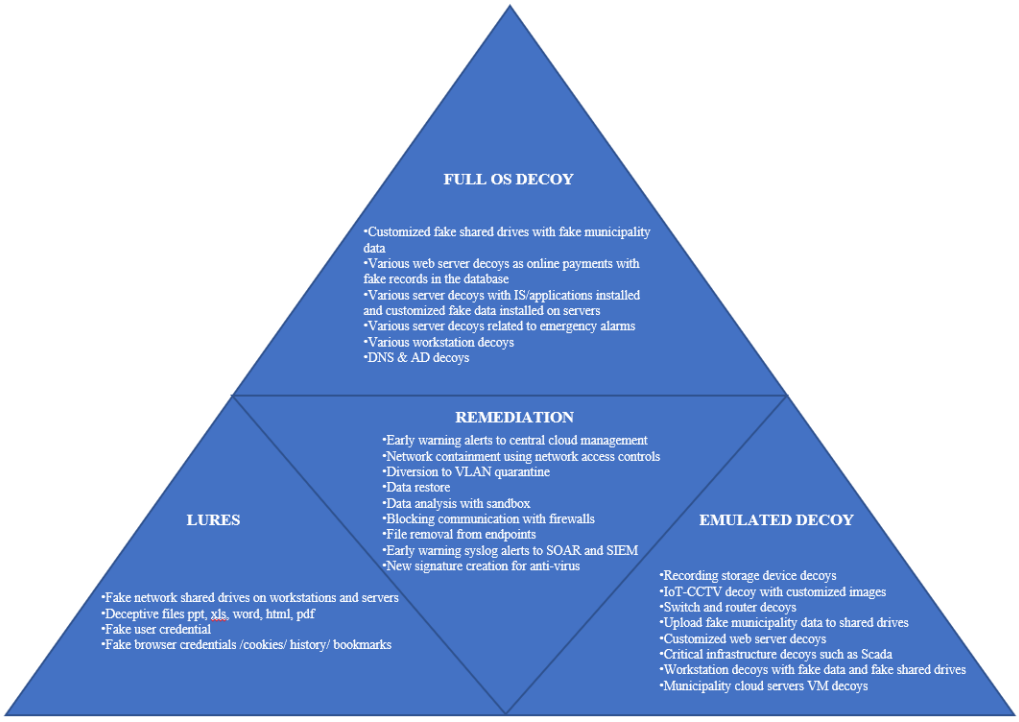


Fig. 8. Example of a modern honeypot triangle model implementation for a municipality

3. Discussion

This study used a descriptive literature review to explore various real-life attack cases on cities that occurred in recent years and were reported in the news. A synthesis analysis was conducted using content analysis, which revealed that significant keywords within the content of the published articles focused on and discussed ransomware and data breaches in cities and the government sector. This ensures that the selected cases share content that reflects the aim and purpose of this paper.

Although many vulnerabilities exist on IoT smart-connected devices which are distributed in smart cities, most of the attacks carried out over recent years and which are explored in this paper used ransomware variants, mainly targeting computer systems and web applications rather than IoT smart-connected devices. Computer systems and web applications have a large number of exposed vulnerabilities that are leveraged daily by attackers. These can be exploited even by unsophisticated technical hackers who use Ransomware as a Service (RaaS) [10]. Based on the cases reviewed in this paper, attackers' motivations were mostly financial. Their objective was to cause a significant financial loss, which would result in a high ransom payment and increase the likelihood of payment. This would create a heavy reliance on the attackers for system release. Whether or not the ransom was paid was not published for the selected cases. However, in 2022, Sophos published a survey of 965 respondents which revealed that the average global ransomware payment in 2021 was almost five times greater than in 2020. In their report for the state and local government sector, they reported an increase in the volume of cyberattacks of 59%, an increase in the complexity of cyberattacks of 59% and an increase in the impact of cyberattacks of 56% [8].

Smart cities should get prepared for the worst. A future combined cyberattack on a city could involve multiple groups of attackers encrypting key data such as financial and other critical infrastructure in cities, halting various essential services including healthcare, utilities, education, governmental, communication, transportation, and other systems by making them inaccessible. They may then threaten to release the stolen data publicly or keep it encrypted until the ransom amount is paid. To increase the chances of success, other attacks may be launched in tandem with ransomware attacks, such as distributed denial-of-service (DDoS) attacks to disrupt services and phishing campaigns to gain access to user credentials. A combined attack of this sort is a huge national security risk. It could disrupt essential online services, risk people's safety in hospitals or on roads, and affect the stock exchange, raw material prices, and essential food, gas and energy supply.

What do we learn from this study? We should not only ask how to prevent breaches from occurring in cities because the reality is that in today's digital world, it has become an impossible mission. The volume of attacks is increasing, and a future possible combined cyberattack on cities is becoming a huge risk. We should ask how we can delay attackers, get an early warning on breaches to minimize the effect, and how we can deceive the attackers and keep them busy while we remediate the threat. One day it will be interesting to see attackers publish fake data that they have stolen, believing that the locked shared drives and files were all authentic. Such a phenomenon will symbolize a different approach to fighting cybercriminals and would potentially be a small win for organizations in their

endless battle with attackers. We suggest the modern honeypot triangle model for smart cities. Deception technology as an early warning detection solution can be commercially achieved by any city, implemented and customized to fit its needs. The modern honeypot triangle model for smart cities will allow security operations to deceive, bait and trick attackers, reduce the time for detection, reduce risk, and improve remediation capabilities.

Future in-depth research on similar topics in smart cities is recommended to be done on breach cases where organizations used deception technology to research if the breach impact was minimized and at what level the attacker was deceived. Other future research is recommended on the effect of deception technology on attackers targeting IoT-connected devices in cities.

4. Disclosure and conflict of interest

The author of this article is a doctoral student researcher at "Alexandru Ioan Cuza" University of Iasi and was the former COO of TrapX Security (a global leader in deception security technology), which Commvault (a global data protection leader) acquired. Today he works at Commvault as Director, Business Operations-Metallic ThreatWise. Metallic ThreatWise solution offered by Commvault is an early warning cloud data protection solution based on TrapX deception technology. The author worked in the high-tech industry for 25 years and has 10 years of experience in deception technology solutions. The author has tried to remain unbiased in writing this research.

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Guarding the Digital Health Data as Front Gate: Strengthening Healthcare Data Security in Indonesian Smart Cities

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Abstract

In this modern world, data has become an important part of our daily lives, permeating every aspect of society. It serves as a gateway to knowledge, giving us access to important information that shapes our understanding of the world. Objectives In the healthcare field, data is becoming increasingly important as it empowers medical professionals to provide optimal care and improve patient outcomes. Prior Work However, Indonesia's fragmented digital health landscape presents many challenges, with a myriad of diverse and abundant health applications and databases. The proliferation of these systems creates vulnerabilities, leaving patient information vulnerable to attacks and cyber breaches. Approach To solve this problem, this research paper proposes implementing a centralized health data security system. Under this system, each hospital will have a designated data door, combining various data sources into a unified platform. This consolidation allows the establishment of robust, multi-layered security measures that can effectively protect patient information from unauthorized access and breach. Result This paper presents a comprehensive framework for implementing these centralized data systems, addressing the potential benefits and challenges associated with their adoption. Implications By adopting a centralized data system, smart cities in Indonesia can significantly improve the confidentiality, integrity, and availability of digital health data. This proactive approach not only strengthens data security but also increases the efficiency and effectiveness of managing data security protocols. Implementation

of such a system is an important step towards ensuring the protection of sensitive healthcare information, fostering trust among patients, healthcare providers and stakeholders. Value The successful implementation of a centralized health data security system has the potential to revolutionize healthcare delivery in Indonesian smart cities. It enables better patient care, increased data privacy, and improved healthcare outcomes. By strengthening data security and promoting trust, this initiative acts as a front gate to guard the digital health data, ensuring its integrity and protecting patient privacy in Indonesian smart cities.

***Keywords**: Centralized Systems, Data Protection Measures, Security Protection, Data Security Framework.*

1. Introduction

In today's digital age, data plays an increasingly vital role in our lives, particularly in the healthcare industry. As healthcare providers rely on digital platforms to store, process, and manage patient information, ensuring the security and privacy of healthcare data has become a critical concern. This issue is particularly relevant in Indonesian smart cities, where the proliferation of diverse digital health applications and databases presents challenges to safeguarding the confidentiality and integrity of patient data.

Numerous studies have underscored the urgent need to strengthen healthcare data security in Indonesian smart cities. For example, some study [1] found that the fragmented digital health landscape in Indonesia creates vulnerabilities that leave patient information vulnerable to attacks and cyber breaches.

To address these challenges and fortify the security of digital health data in Indonesian smart cities, this research paper advocates the implementation of a centralized health data security system. The proposed approach aligns with the widely recognized National Institute of Standards and Technology (NIST) Cybersecurity Framework, which provides a comprehensive framework for managing and mitigating cybersecurity risks.

The NIST Framework offers a systematic and structured methodology for organizations to assess and enhance their cybersecurity [2]. By leveraging this framework, the proposed centralized health data security system seeks to consolidate disparate data sources from multiple hospitals into a unified platform. This consolidation enables the establishment of robust, multi-layered security measures that address the vulnerabilities stemming from fragmented systems, safeguarding patient information from unauthorized access and breaches.

However, implementing a centralized approach to healthcare data security also presents challenges. Ensuring data integration, interoperability, scalability, and stakeholder collaboration are crucial aspects that require careful consideration and resolution.

By strengthening healthcare data security in Indonesian smart cities, the proposed centralized health data security system can significantly enhance the confidentiality, integrity, and availability of digital health data. This will foster trust among patients, healthcare providers, and stakeholders, ultimately contributing to improved healthcare delivery and outcomes.

Building upon the existing research, this paper proposes a centralized health data security system, like the concept of Satu Sehat. This system envisions each hospital having one data door, consolidating various data sources into a single platform. The paper presents a framework for implementing the centralized data system, highlighting its design and functionality. Additionally, the potential benefits and challenges associated with this approach are discussed. By adopting a centralized data system, Indonesian smart cities can achieve not only improved data security but also greater efficiency and effectiveness in managing healthcare data.

2. Literature Review

2.1. Introduction to Healthcare Data Security

Healthcare data security has become an important concern because large amounts of sensitive information are stored and transmitted electronically. The protection and integrity of healthcare data is critical due to the increasing reliance on digital platforms and technology in the healthcare industry [3]. Healthcare data security refers to measures and practices implemented to protect patient information, electronic health records (EHR), and other sensitive data from unauthorized access, breach, and misuse.

The significance of healthcare data security cannot be overstated. Patient data contains highly sensitive information, including personal details, medical history, diagnosis, treatment plan and financial data. Any unauthorized access to or breach of this information can result in severe consequences such as identity theft, fraud, damage to reputation and impaired patient care. Ensuring strong safety measures is critical to maintaining trust between patients and healthcare. Patients should be assured that their personal information will be treated in the strictest confidence and that their right to privacy will be respected.

Compliance with legal and regulatory requirements is another important aspect of healthcare data security. Many countries have enacted data protection laws and regulations, such as the Health Insurance Portability and Accountability Act (HIPAA) in the United States, to protect patient information and maintain privacy standards. Complying with these regulations is very important for healthcare organizations to avoid legal repercussions and financial penalties [4].

In addition, healthcare data security has a direct impact on the overall quality of patient care. Access to accurate and secure patient data enables healthcare professionals to make informed decisions, collaborate effectively, and provide personalized and timely care. This facilitates the smooth exchange of information among different healthcare entities, resulting in better care coordination, reduced medical errors and better patient outcomes.

In summary, healthcare data security plays a critical role in protecting sensitive information, building trust between patients and healthcare providers, complying with legal requirements, and ultimately enhancing the delivery of high-quality, patient-centric care. Strong security measures, guided by industry standards and best practices, are critical to protecting healthcare data from unauthorized access and breach.

2.2. Key Challenges in Healthcare Data Security

Healthcare data security in Indonesia's smart cities faces several major challenges. First, the fragmented digital healthcare landscape prevalent in these cities contributes to interoperability issues and a lack of standard systems [5], [6]. This fragmentation makes it difficult to seamlessly integrate and share data, hindering the establishment of comprehensive security measures. Second, privacy and security risks raise significant concerns in managing healthcare data [7]. Patient privacy must be protected, and the risks of unauthorized access and breach need to be effectively mitigated. Healthcare data is vulnerable to cybersecurity threats and attacks, which have the potential to have severe consequences [8], [9]. Cyber-attacks targeting healthcare data have increased, emphasizing the need for strong security measures to secure sensitive information. Another challenge is the Effective control and robust data protection are critical challenges that must be carefully addressed during the guarding of data [10].

To address this challenge and strengthen health data security in Indonesia's smart cities, it is imperative to establish strong measures to safeguard digital health data as the front gate. Implementing a centralized health data security system can be a good solution. By consolidating multiple data sources into one unified platform, this approach enables the establishment of effective and efficient multi-layered security measures that protect patient information from unauthorized access and data breaches. A centralized system offers advantages such as increased data confidentiality, increased data integrity, and increased availability [11]. This can streamline data management processes, facilitate standardized security protocols, and encourage collaboration between healthcare providers and stakeholders. Implementing such a system is an important step towards ensuring the protection of sensitive healthcare information and building trust in the healthcare ecosystem.

2.3. Cybersecurity Threats and Attacks

The healthcare industry is increasingly becoming the target of multiple cybersecurity threats and attacks, which pose significant risks to the confidentiality, integrity, and availability of patient and hospital data and care systems. Malware and ransomware attacks have become prevalent, exploiting vulnerabilities in healthcare systems and wreaking havoc on patient records. For example, the increasing threat of ransomware in the Internet of Things (IoT) domain, including healthcare devices and systems [12]. They discussed the challenges of ransomware attacks, which can encrypt critical healthcare data and demanded a ransom for its rollout. The importance of detecting malware using deep learning techniques, such as long short-term memory, to improve the security of healthcare systems [13].

Insider threats pose another important challenge to healthcare data security. the risks associated with insiders having authorized access to sensitive healthcare information [14]. These people may intentionally or unintentionally engage in activities that compromise data security. In addition, data breaches due to unauthorized access and incidents of data leakage are the main concerns that must be watched out for. Additional damage that deep learning-based malware detection systems can cause to adversary attacks [15]. Their research highlights the need for

strong defenses to minimize the impact of insider threats on the security of healthcare data.

Social engineering and phishing attacks continue to be a significant threat to healthcare cybersecurity. The detection of spear-phishing emails using transformer-based text classification [16]. Social engineering techniques, including phishing attacks, exploit human vulnerabilities to trick individuals into divulging sensitive information or granting unauthorized access. The importance of addressing security, privacy, and trust in the Internet of Things (IoT) domain [17]. Their work highlights the need for comprehensive action, including employee awareness programs and robust security protocols, to counter social engineering attacks and protect healthcare data.

To ensure the security of healthcare data in Indonesia's smart cities, it is imperative to develop an effective strategy to mitigate this cybersecurity threat. Organizations or governments should invest in advanced threat detection and prevention systems, conduct regular training and awareness programs for employees to recognize and respond to potential threats, and implement robust access control mechanisms to limit unauthorized access. Additionally, collaboration between hospitals, healthcare institutions, government agencies and cybersecurity experts are needed to share best practices and respond effectively to emerging threats.

By understanding and addressing the challenges posed by malware and ransomware attacks, insider threats, as well as social engineering and phishing attacks, smart cities in Indonesia can strengthen their healthcare data security infrastructure, increase patient confidence, and ensure the confidentiality and integrity of health care information. sensitive.

3. Methodology

The methodology used in this research comes from the National Institute of Standards and Technology Cybersecurity Framework (NIST Framework). The NIST Framework serves as the basic structure to guide the development and implementation of research methodologies. It provides a systematic and comprehensive approach to managing cybersecurity risks, specifically adapted to the context of healthcare data security in Indonesia's smart cities.

Fig. 1. NIST Framework

Adapting to the NIST Framework, the methodology covers the core functions of Identify, Protect, Detect, Respond, and Recover. The Identification Phase involves identifying specific healthcare data security risks and vulnerabilities that exist within the fragmented digital health landscape of Indonesia's smart cities. The Protect phase focuses on implementing appropriate security measures to protect patient information and ensure data confidentiality, integrity, and availability. The Detect phase emphasizes establishing mechanisms for proactive monitoring and detection of potential cyber threats and breaches. The Response phase requires the development of a response strategy and incident management protocol to address and mitigate cybersecurity incidents promptly. Finally, the Recovery phase focuses on establishing data recovery procedures and plans in the event of a breach or breach of security.

By leveraging the NIST Framework, this study ensures a structured and comprehensive methodology that addresses the unique challenges and requirements of healthcare data security in smart cities in Indonesia. This provides a solid foundation for systematically managing cybersecurity risks, protecting patient information, and improving the overall data security posture in Indonesia's healthcare system.

4. Results and Analysis

4.1. Important to Guard the Data

Confidentiality and privacy protection are critical in the healthcare sector, where the security of patient data is paramount. Unauthorized access or breach can lead to severe consequences, including compromised patient privacy and potential misuse of sensitive information. To overcome this problem, researchers have proposed various solutions. For example, a privacy-protecting data collection framework for the medical Internet of Things (IoT) in smart healthcare, using techniques such as encryption to protect patient data [18]. Transmission can use blockchain and homomorphic encryption to maintain the privacy of healthcare data, ensuring secure and confidential storage the data [19]. This approach contributes to maintaining patient confidentiality, protecting against unauthorized access, and instilling trust in the healthcare system.

Mitigating data breaches and cybersecurity threats is critical to protecting healthcare data. The integration of advanced technologies, such as blockchain and smart contracts, has shown promise in increasing the security of healthcare systems. A framework utilizing blockchain and smart contracts to guarantee the security and integrity of e-healthcare systems while prioritizing trustworthiness and privacy [20]. By leveraging a combination of cryptography and blockchain techniques, electronic medical records can be safeguarded, mitigating the potential risks linked to unauthorized alterations or destruction [21]. This approach not only mitigates cybersecurity threats but also provides a secure and immutable environment for healthcare data, enhancing overall data protection and system integrity.

Ensuring the integrity and availability of data is very important for the health care system in patients, because accurate and accessible data is essential for making good decisions so that patient care is very effective. A comprehensive survey was conducted to explore data integrity and security concerns in cloud-based healthcare, addressing the issues surrounding the topic [22]. They highlight the challenges associated with maintaining data integrity in cloud environments and discuss strategies for mitigating these risks. Dynamic data replication techniques were proposed to guarantee data availability in healthcare cloud systems, thereby decreasing the potential for data loss or unavailability [23]. Furthermore, a review was carried out to examine data storage and security in cloud healthcare systems, exploring various approaches and technologies for the effective protection and management of healthcare data [24]. This contributes to maintaining the accuracy, accessibility, and availability of data, thus facilitating efficient health service delivery and decision-making processes so that the steps taken can be appropriate, effective, and efficient.

Implementing an effective data security system is essential to safeguard healthcare data in Indonesia's smart cities. The concept of a centralized health data security system, often referred to as a "one-stop-shop", offers a promising approach. This system, as envisioned by the Satu Sehat concept, consolidates multiple data sources into a single platform, enabling the implementation of strong security measures. By adopting a unified platform, healthcare providers can create layered security protocols, combining encryption, access control, and authentication mechanisms to protect patient data.

One-stop systems address some of the key challenges in healthcare data security. It maps out the risks associated with a fragmented digital health landscape, ensuring standardized security measures across healthcare institutions. In addition, it strengthens privacy and confidentiality protection by mitigating vulnerabilities stemming from diverse and abundant health applications and databases. Consolidating data sources into a unified platform improves data integrity, minimizing the risk of data tampering or unauthorized modification.

The implementation of a centralized health data security system not only strengthens data security but also makes data management processes more precise, leading to increased efficiency and effectiveness. The system facilitates seamless data integration, enabling healthcare professionals to securely access comprehensive patient information, resulting in better healthcare services and outcomes. Additionally, it fosters trust among patients, healthcare providers, and stakeholders, promoting the confident exchange of sensitive healthcare information.

Safeguarding health service data in smart cities in Indonesia is very important to protect patient privacy, prevent unauthorized access, and mitigate cyber security threats so that safe, effective, and efficient data is created. The concept of a centralized health data security system, exemplified by a one-stop system, offers a more comprehensive approach to addressing these challenges. By adopting this system, healthcare institutions can improve data security, ensure data integrity and availability, and improve overall healthcare delivery. Effective healthcare data security through the implementation of a one-stop system is a significant step towards a safe and efficient healthcare system in smart cities in Indonesia.

4.2. NIST Framework Implementation and the Effectiveness of Centralized System

4.2.1. Identification

By implementing a one-stop-shop system, which combines multiple data sources into a unified platform, healthcare organizations can identify and understand their data landscape in a timely, efficient, and effective manner. The centralized nature of the one-stop system aids in the identification process by providing a comprehensive view of the healthcare data ecosystem, enabling healthcare organizations to prioritize security measures and allocate resources more efficiently and effectively.

4.2.2. Protect

This protection function focuses on implementing measures to protect healthcare data from unauthorized access, data breaches, and cyber threats. One-stop systems enhance healthcare data protection by implementing strong access controls, strict encryption mechanisms, and authentication protocols. By consolidating data sources into a unified platform, the one-stop system enables healthcare organizations to establish standard security measures across institutions. This approach ensures consistent protection of sensitive patient data and reduces the potential vulnerabilities associated with diverse and fragmented data sources.

4.2.3. Detect

We analyze the application of the NIST Framework's “Detect” functionality in healthcare organizations and the role of one-stop systems in enhancing detection capabilities. This function involves continuous monitoring, intrusion detection mechanisms, and real-time alerts to identify potential cybersecurity incidents or breaches. The one-stop system facilitates centralized monitoring and detection by providing a comprehensive view of data activity across multiple healthcare sources. This centralized approach enhances the ability to detect anomalies, unauthorized access attempts, or suspicious behavior, enabling healthcare organizations to respond quickly in case of erroneous data, and mitigate potential security threats to patient and hospital data.

4.2.4. Respond

In this section, we discuss the “Respond” function of the NIST Framework and the role of a one-stop shop in responding to healthcare data security incidents. This function focuses on creating an incident response process to address and mitigate the impact of a data breach or unauthorized access. One-stop systems streamline incident response by consolidating data sources, facilitating efficient coordination among stakeholders, and enabling fast action. With a unified platform, healthcare organizations can respond effectively to security incidents, minimize the potential for data loss, and ensure a coordinated and timely incident management process.

4.2.5. Restore

We evaluate the adoption of the NIST Framework's "Restore" function and the one-stop-shop system's contribution to data recovery and system recovery. This

function involves establishing strategies and procedures for recovering healthcare data and recovering systems after a cybersecurity incident. One-stop systems help data recovery by centralizing backup and disaster recovery mechanisms. By combining data sources, a one-stop system ensures the availability and integrity of healthcare data, facilitating a faster recovery process. This centralized approach minimizes disruption to patient care and can ensure patients have precise and accurate data.

4.3. Implementation of the One-Door System in Indonesian Smart Cities

Implementing a one-stop system in smart cities in Indonesia has proven to be an effective way to protect health data and improve data security. The "One Health Plan" initiated by the Indonesian government is an important example of the successful implementation of the "One School System". By consolidating healthcare data from multiple institutions into a centralized platform, the one-stop system ensures standardized security measures and mitigates vulnerabilities associated with fragmented digital health applications and databases. This approach, aligned with the NIST framework, incorporates key elements of the "response" phase by implementing strong security protocols such as encryption, access control, and authentication mechanisms. With a one-stop system, healthcare providers can effectively respond to potential breaches and unauthorized access, protecting patient data from malicious threats. The implementation of the one-stop system not only improves data security, but also facilitates the seamless integration of data, making the data management process more accurate and efficient. This in turn improves the overall efficiency of healthcare delivery and supports data-driven decision-making in smart cities in Indonesia.

4.3.1. One-Door System and Initiation from Indonesian Government

The Initiation of the One Stop System in managing health data is a significant step to improve data security and streamline data access in smart cities in Indonesia. The concept of a centralized data system, often referred to as a “one-stop shop”, emerged in response to the challenges posed by the country's fragmented digital health landscape. The Indonesian government recognizes the need to address the vulnerabilities associated with diverse and abundant health applications and databases, which place patient information at risk of unauthorized access and breach. To address this challenge, the government is introducing a "Satu Sehat" as part of a larger effort to strengthen health data security and improve the overall quality of health services. This aims to consolidate multiple data sources from different healthcare institutions into a unified platform, creating a single entry point or "one door" for accessing and managing healthcare data. By establishing this centralized system, governments are trying to standardize security measures, improve data protection, and ensure better interoperability between healthcare providers, ultimately benefiting both patients and healthcare professionals.

4.3.2. Benefits and Outcomes

The implementation of the One Stop System in Indonesia's smart cities brings many benefits and positive outcomes for both patients and hospitals. One of the main goals of this is to prioritize patient well-being and satisfaction. By combining

healthcare data into a single platform, the One Stop System enables healthcare providers to quickly access comprehensive and up-to-date patient information. This leads to better coordination of care, as healthcare professionals have a thorough view of a patient's medical history, medications, allergies, and treatment plan. As a result, patient outcomes are improved, with reduced medical errors, greater treatment accuracy and better decision making.

In addition, the One Stop System facilitates efficient data exchange and interoperability between hospitals so as to create a secure system. The centralized platform eliminates the need for complex data transfers between different institutions, saving time and resources. This efficient sharing of data promotes collaboration and improves communication among healthcare providers, leading to a more coordinated and integrated care delivery.

For hospitals, the One Stop System provides a real advantage. It simplifies data management and reduces administrative burden by providing a unified interface for data access, retrieval, and storage. This increases operational efficiency, enabling hospitals to allocate resources more effectively and focus on delivering high-quality care. In addition, the centralized system improves data security and privacy through standard security measures, reducing the risk of data breaches and unauthorized access. This instills confidence in patients and helps hospitals comply with regulatory requirements, maintain their reputation and ensure compliance with data protection laws.

Overall, the One Stop System resulted in significant benefits for both patients and hospitals. By promoting seamless data exchange, improving care coordination, and improving data security, this centralized approach improves healthcare quality, optimizes resource utilization, and ultimately contributes to better patient outcomes and satisfaction.

4.3.3. Challenges and Lessons Learned

The implementation of the One Stop System in Indonesia's smart cities is not without its challenges. One of the main challenges faced is the integration of various data sources and systems from various health institutions. The process of consolidating and standardizing complex data formats, structures and protocols requires extensive coordination and collaboration among stakeholders. Additionally, ensuring interoperability between disparate electronic health record (EHR) systems and legacy applications creates technical complexities that need to be addressed.

Another challenge is the need to address concerns about data privacy and security. By consolidating healthcare data into a single platform, ensuring adequate protection against unauthorized access, data breaches and cyberthreats is paramount. Strong security measures, including encryption, access control, and authentication mechanisms, must be implemented to protect patient information and maintain compliance with data protection regulations.

Lessons from implementing the One Stop System provide valuable insights for future projects. First, effective stakeholder engagement and collaboration is critical to success. Engaging with all relevant parties, including healthcare providers, IT professionals, policy makers and patients, fosters a sense of ownership, encourages knowledge sharing and facilitates the alignment of goals and objectives.

Second, training and continuing education are essential for healthcare professionals and staff. Introduction of centralized systems requires familiarity with new technologies, processes, and security protocols. Investing in training programs and workshops ensures that personnel are equipped with the necessary skills to navigate and use the One Stop System effectively.

Finally, continuous monitoring and evaluation is essential to identify and address any system gaps or vulnerabilities. Regular assessments of data quality, system performance and security measures help identify areas for improvement and prompt and timely corrective action. Additionally, seeking feedback from end users, such as patients and healthcare providers, provides valuable insights to refine and enhance the functionality and user experience of One Stop System.

By addressing these challenges and applying lessons learned, the One Stop System can continue to grow and adapt to the changing needs of the healthcare landscape in Indonesia's smart cities, ensuring sustainable benefits for patients, healthcare providers, and the healthcare ecosystem.

4.4. Future Works

The implementation of the One Stop System has become a solid foundation for maintaining health data in Indonesia's smart cities. However, there are still potential areas for further development and improvement. First, expanding the scope of the One Stop System to include other healthcare stakeholders, such as pharmacies, diagnostic centers and insurance providers, can contribute to a more comprehensive and interconnected healthcare ecosystem. This will facilitate complex data exchange and improve continuity of care across multiple healthcare settings.

In addition, taking advantage of new technologies can enhance the capabilities of the One Stop System. Exploring the integration of artificial intelligence (AI) and machine learning algorithms can help identify patterns, detect anomalies and provide predictive insights to improve patient care and early disease detection. Additionally, the use of blockchain technology can increase the security and transparency of healthcare data by enabling tamper-resistant and auditable records.

To ensure the long-term sustainability and effectiveness of the One Stop System, it is important to establish a strong governance and regulatory framework. Clear guidelines and policies should be developed to address data privacy, security and ethical considerations. Collaboration with regulatory agencies and relevant stakeholders can facilitate the development of standardized protocols and guidelines for data sharing, privacy protection and interoperability.

In addition, ongoing research and development efforts should focus on improving the usability and user experience of the One Stop System. User-centric design principles must be applied to ensure that the system is intuitive, easy to navigate, and accessible to all users, including healthcare professionals and patients with varying levels of digital literacy.

Finally, cultivating a culture of data-driven decision-making and innovation is critical. Encouraging data sharing for research purposes while ensuring privacy

protection can lead to valuable insights and advances in healthcare. Collaboration with academic institutions and research organizations can drive further innovation and promote evidence-based practice in healthcare delivery.

By focusing on potential areas for further development and implementing the recommendations mentioned above, the One Stop System can continue to develop as a strong and secure platform for maintaining health service data in smart cities in Indonesia. This will ultimately contribute to improving patient outcomes, enhancing healthcare delivery, and advancing the healthcare ecosystem.

5. Conclusions

The increasing reliance on data in our modern world makes healthcare data security a priority, especially in the context of smart cities in Indonesia. Indonesia's fragmented digital healthcare landscape poses significant challenges, exposing patient information to cyber vulnerabilities and threats. To overcome this problem, the implementation of a centralized health data security system is proposed as an effective and efficient solution.

The concept of a centralized data system, exemplified by the "one door" approach, offers many advantages. By consolidating multiple data sources into a unified platform, robust and layered security measures can be created to protect patient information from unauthorized access and breach. This comprehensive framework ensures the confidentiality, integrity, and availability of digital health data.

Adopting a centralized data system in Indonesia's smart cities not only improves data security, but also improves the efficiency and effectiveness of managing data security protocols. This enables standardized security measures across healthcare institutions, reduces vulnerabilities arising from diverse healthcare applications and databases, and fosters trust among patients, healthcare providers, and stakeholders.

The successful implementation of a centralized health data security system has broad implications. This is revolutionizing healthcare delivery in Indonesia's smart cities, resulting in better patient care, increased data privacy, and better healthcare outcomes. This proactive approach acts as a front gate, safeguarding digital health data and ensuring its integrity while protecting patient privacy.

However, challenges and lessons must be considered in the process. Diverse system integration, stakeholder collaboration, and addressing privacy issues are important factors that must be addressed. Future work should focus on further developing one-stop systems and exploring potential upgrades to strengthen healthcare data security in Indonesia's smart cities.

In short, effective guarding of health data in Indonesia's smart cities requires the implementation of a centralized health data security system. This proactive approach not only protects patient information but also enhances data privacy, increases trust, and paves the way for a safe and efficient healthcare system. By prioritizing data security, smart cities in Indonesia can ensure the protection of sensitive healthcare information, leading to better healthcare outcomes and overall healthcare improvements.

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Protecting Sensitive Data in LoRa-Based Smart City Networks: Challenges and Best Practices

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Abstract

The widespread adoption of smart city technologies has brought significant benefits to urban areas, including increased efficiency, sustainability, and livability. These technologies also bring new data security and privacy challenges, particularly when it comes to protecting sensitive data that is collected and transmitted by connected devices. Objectives LoRa-based networks, which offer low-cost, low-power, long-range connectivity, are increasingly being used in smart city applications, but they also present unique security challenges that must be addressed in order to ensure the privacy and security of sensitive data. Prior Work This paper explores the challenges and best practices associated with protecting sensitive data in LoRa-based smart city networks with We discuss the unique features of LoRa networks that make them well-suited for smart city applications, as well as the security challenges that arise from the use of low-power, long-range wireless technologies. Approach This research adopts a qualitative approach to explore a deep understanding of complex phenomena. Qualitative methods are used in data collection and analysis to explore perspectives, interpretations of meaning, and relevant contexts. Result The outline is a set of best practices for securing sensitive data in LoRa-based networks, including the use of end-to-end encryption, secure key management, and

multi-level access control. Implication We also discuss the importance of collaboration between stakeholders in the smart city ecosystem, including government, industry, and citizens, in order to ensure that security and privacy concerns are addressed in a comprehensive and effective manner. Value Finally, we present case studies of successful implementations of LoRa-based smart city networks for protecting sensitive data and discuss the lessons learned from these experiences. Overall, this paper provides valuable insights into the challenges and best practices associated with securing sensitive data in LoRa-based smart city networks and offers practical guidance for cities looking to deploy these networks in a secure and responsible manner.

Keywords: *Data Security, LoRa Networks, Smart City, Sustainability, Urban Areas.*

1. Introduction

Smart city networks powered by Low Power Wide Area Network (LPWAN) technologies such as LoRa (Long Range) offer numerous benefits in terms of connectivity and data transmission for various urban applications. However, with the proliferation of IoT devices and the collection of sensitive data in these networks, ensuring the protection and security of this data has become a critical concern. This journal article aims to explore the challenges associated with protecting sensitive data in LoRa-based smart city networks and proposes best practices to mitigate these risks.

LoRa technology provides long-range, low-power communication capabilities, making it suitable for large-scale deployments in smart cities. These networks facilitate the collection of diverse data from sensors, devices, and infrastructure, enabling the implementation of smart services such as environmental monitoring, traffic management, and public safety. However, this wealth of data includes personally identifiable information (PII), financial data, health records, and other sensitive information that must be safeguarded to ensure privacy and prevent unauthorized access.

The unique characteristics of LoRa-based networks pose specific challenges when it comes to securing sensitive data. First, the wide coverage area and low power consumption of LoRa devices make them susceptible to physical attacks and eavesdropping attempts. Additionally, the limited processing capabilities and constrained resources of these devices pose constraints on implementing robust encryption and authentication mechanisms. Furthermore, the decentralized nature of smart city networks, with numerous devices and gateways spread across the city, introduces complexities in managing and securing the network infrastructure.

To address these challenges, it is essential to establish best practices for protecting sensitive data in LoRa-based smart city networks. This article will examine various aspects of data protection, including encryption algorithms, secure key management, access control mechanisms, and secure data transmission protocols. It will also explore strategies for secure device provisioning, network monitoring, and incident response to detect and mitigate potential security breaches.

By understanding the challenges associated with protecting sensitive data in LoRa-based smart city networks and implementing best practices, stakeholders, including city administrators, network operators, and IoT device manufacturers, can ensure the privacy and security of the collected data. This, in turn, fosters trust among citizens and encourages the continued growth and adoption of smart city technologies.

This journal article aims to contribute to the existing body of knowledge by shedding light on the challenges and best practices for protecting sensitive data in LoRa-based smart city networks. The insights and recommendations provided will serve as valuable guidance for researchers, practitioners, and policymakers involved in the design, deployment, and operation of secure smart city infrastructures.

2. Literature

2.1. Smart City

The smart city refers to the concept of urban development that integrates information and communication technology (ICT) to enhance the quality of life, operational efficiency, and sustainability of a city. It involves using data and digital technologies to improve various aspects of urban life, such as transportation, energy management, infrastructure, public services, and citizen engagement.

A smart city is a dynamic urban environment that harnesses cutting-edge technologies and data-driven solutions to enhance the well-being of its residents. By integrating advanced information and communication technologies, such as Internet of Things (IoT) sensors and data analytics, smart cities optimize the efficiency of various sectors, including transportation, energy, and public services. This enables intelligent resource management, improved mobility systems, and enhanced delivery of essential services. With a strong focus on sustainability, smart cities strive to minimize environmental impact by promoting energy efficiency, waste reduction, and eco-friendly practices. Moreover, citizen engagement and participation play a vital role in smart cities, as they foster a sense of community and empower residents to actively contribute to decision-making processes. Through their innovative approaches, smart cities aim to create urban spaces that are livable, connected, and responsive to the needs of their inhabitants, ultimately enhancing the overall quality of life.

2.2. LoRa (Long Range)

LoRa (Long Range) is a wireless communication technology designed for long-range, low-power communication between devices in the Internet of Things (IoT) ecosystem. LoRa enables devices to transmit data over long distances while consuming minimal power, making it well-suited for IoT applications that require low-cost, energy-efficient, and wide-area coverage. LoRa (Long Range) is a wireless communication technology that offers long-range, low-power connectivity for Internet of Things (IoT) devices. It provides a reliable and efficient solution for

transmitting data over extended distances while consuming minimal energy. LoRa operates in the unlicensed Industrial, Scientific, and Medical (ISM) frequency bands, allowing for cost-effective deployment and widespread adoption.

LoRa technology utilizes a chirp spread spectrum modulation technique, which enables devices to communicate at low data rates while maintaining robust connectivity even in challenging environments. This makes it suitable for a wide range of IoT applications, such as smart cities, industrial automation, agriculture monitoring, and asset tracking. One of the key advantages of LoRa is its exceptional range capability, which can extend up to several kilometers in open areas. This long-range coverage enables the deployment of IoT devices in remote or hard-to-reach locations, eliminating the need for extensive infrastructure investments. Additionally, LoRa devices consume minimal power, enabling battery-operated devices to operate for years without requiring frequent replacements or recharging.

LoRaWAN, the networking protocol built on top of LoRa technology, provides a standardized framework for managing the communication between LoRa devices and network gateways. LoRaWAN enables scalable deployments by supporting large numbers of devices, efficient use of network resources, and secure end-to-end communication. Numerous studies and literature have been conducted to explore the capabilities and applications of LoRa technology. The mentioned article, "LoRaWAN for IoT: Energy Consumption Models, QoS Analysis, and Deployment," offers valuable insights into LoRaWAN, including energy consumption models, quality of service analysis, and deployment considerations. LoRa technology offers a versatile and cost-effective solution for long-range, low-power communication in the IoT landscape. Its ability to provide wide-area coverage, low energy consumption, and support for large-scale deployments makes it a compelling choice for various IoT applications, contributing to the advancement of smart and connected environments.

2.3. Data Security

Data security refers to the protection of sensitive information from unauthorized access, use, disclosure, disruption, modification, or destruction. In today's digital age, where data is a valuable asset, ensuring its security is crucial to maintain privacy, prevent breaches, and safeguard against potential threats. Data security is a critical aspect of modern information systems, as it encompasses measures and practices designed to protect sensitive data from unauthorized access, breaches, or misuse. With the proliferation of digital platforms, cyber threats have become more sophisticated, necessitating robust security mechanisms.

Data security involves implementing a comprehensive framework that encompasses encryption, access controls, authentication protocols, and monitoring systems to safeguard data from unauthorized disclosure or tampering. Encryption transforms data into an unreadable format, ensuring that even if it is intercepted, it remains unintelligible without the proper decryption key. Access controls restrict data access to authorized individuals or entities, preventing unauthorized parties from obtaining sensitive information. Authentication mechanisms, such as

passwords, biometrics, or multi-factor authentication, validate the identity of users and protect against unauthorized access attempts.

Organizations must continually stay informed about emerging threats, adhere to industry best practices, and maintain compliance with relevant data protection regulations to ensure effective data security. Literature references, such as the article "Data Security in the World of Cloud Computing: An Overview," [1] provide valuable insights into the challenges and strategies associated with data security, aiding in the development of robust security measures for the protection of sensitive data. By implementing comprehensive data security measures, organizations can maintain the confidentiality, integrity, and availability of their data, fostering trust, and mitigating potential risks.

3. Methodology

In this study, qualitative methods were used as a form of approach and reconciliation between Smart City [2], [3], and LoRa itself [4], [5], [6], [7], [8], [9]. which will later have implications for data security in smart cities and their future development processes. Qualitative research involves gathering and analyzing non-numerical data to gain a deep understanding of the topic under investigation. This qualitative analysis of existing literature would provide a comprehensive overview of the current state of knowledge in the field. These interviews and discussions would provide valuable insights into the specific challenges faced in securing sensitive data within LoRa-based Smart City networks. The authors may explore the experiences, perspectives, and recommendations of these experts to develop a comprehensive understanding of the topic.

4. Result and Discussion

4.1. Advantage of the Application of LoRa Technology

There are several things that are advantages of Lora technology if applied or implemented in data security including:

1. Data Encryption: LoRaWAN, the commonly used protocol in LoRa networks, provides end-to-end data encryption. This means that data transmitted through the LoRa network is encrypted before being sent from the endpoint devices (such as sensors) and decrypted only by the intended receiver. Encryption helps protect the integrity and confidentiality of the data transmitted in the Smart City network.
2. Embedded Network: LoRa networks enable direct communication between endpoint devices and LoRa gateways, without relying on the public internet infrastructure. This helps reduce potential attacks that could occur through conventional internet networks.
3. Access Management: LoRaWAN uses an access management mechanism called ALOHA, which regulates device access to the network. In LoRaWAN

mode, endpoint devices can only transmit data after obtaining access permission from the gateway. This helps prevent attacks such as Distributed Denial of Service (DDoS) or unauthorized network access.

4. Monitoring and Threat Detection: Well-implemented Smart Cities should include continuous monitoring and threat detection systems that constantly monitor the connected network and systems. This allows for early identification of attacks or suspicious anomalies in real time, enabling prompt countermeasures to be taken.

4.2. LoRa Linkages with Smart Cities

The utilization of LoRa (Long Range) technology plays a vital role in the advancement of smart cities. LoRa, a low-power, wide-area network (LPWAN) technology, offers extensive coverage and long-range communication capabilities, making it well-suited for the complex requirements of smart city deployments. By leveraging LoRa, cities can establish a robust and scalable infrastructure to support a wide range of IoT devices and sensors.

One of the key advantages of LoRa in the context of smart cities is its ability to provide long-range wireless connectivity. LoRa networks can cover large areas with fewer base stations compared to traditional cellular networks, resulting in cost-effective deployments. This extended coverage enables seamless communication and data exchange among various devices, allowing cities to gather real-time information and make informed decisions for efficient resource management, environmental monitoring, and infrastructure optimization.

Table 1. Cities That Have Already Implemented LoRa Technology

Cities	Implementation
Amsterdam, Netherlands	Amsterdam has implemented a city-wide LoRaWAN network, known as The Things Network, to support various smart city applications. It is used for monitoring air and water quality, waste management, parking systems, and smart lighting.
San Diego, United States	The City of San Diego has deployed a LoRa-based IoT network called "Smart City Solutions" to improve parking management, track waste bin levels, monitor streetlights, and enhance public safety.
Wellington, New Zealand	Wellington has implemented a LoRaWAN network for a range of smart city applications. It is utilized for monitoring environmental conditions, tracking public transportation, managing parking, and improving energy efficiency.
Moscow, Rusia	Moscow has established a LoRaWAN network to support its smart city initiatives. The network is used for monitoring air and water quality, optimizing waste management, tracking public transportation, and improving energy consumption in buildings.
Dubai, United Emirates Arab	Dubai has deployed LoRaWAN technology as part of its Smart Dubai initiative. The network is utilized for various applications, including smart parking, smart lighting, waste management, and environmental monitoring.

Source: Author own work

These are just a few examples of cities that have adopted LoRa technology in their smart city projects. It's important to note that the adoption of LoRa and other technologies may vary across different cities, and new deployments are continuously emerging as smart city initiatives evolve worldwide. These devices can be deployed in diverse applications such as smart parking, waste management, air quality monitoring, and smart lighting, enabling cities to monitor and manage resources effectively while minimizing energy consumption. Moreover, LoRa's support for bi-directional communication enables cities to not only collect data from sensors but also control and manage devices remotely. This capability facilitates intelligent control systems for street lighting, irrigation systems, traffic management, and other urban infrastructure, contributing to enhanced efficiency, reduced costs, and improved sustainability.

Several studies and research papers have explored the application of LoRa in smart city contexts. For instance, the research paper "LoRaWAN for Smart Cities: A Survey" by T. Watteyne et al. provides a comprehensive overview of LoRaWAN's role in smart cities, discussing its benefits, challenges, and potential use cases. Another study, "Smart Cities Deployment: A Comparative Study on LPWAN Technologies," by S. Chatterjee and S. Das, compares different LPWAN technologies, including LoRa, in terms of their suitability for smart city deployments. In conclusion, the utilization of LoRa technology in smart cities enables extensive coverage, low-power consumption, and bi-directional communication, making it a valuable enabler for IoT deployments. By leveraging LoRa, cities can enhance their connectivity, gather real-time data, and optimize resource management, ultimately leading to more sustainable, efficient, and livable urban environments.

4.2. Effectiveness of Using LoRa in Smart Cities on Data Security

The utilization of LoRa (Long Range) technology in smart cities has a significant impact on data security. The implementation of strong data encryption techniques ensures that the information transmitted between devices and the LoRa network remains secure and protected from unauthorized access or data breaches. By using LoRaWAN, which operates on a separate and dedicated wireless network, the smart city can isolate and safeguard data communication from potential threats or disruptions on the public internet. This separation enhances the overall security posture of the data transmitted within the smart city environment.

Furthermore, maintaining robust security measures for the sensors connected through the LoRa network is crucial. Employing stringent security protocols, access controls, and data protection mechanisms for these sensors safeguards the integrity of the collected and transmitted data. Implementing unique and encrypted access keys for each device and network prevents identity spoofing and unauthorized access, enhancing the overall data security of the LoRa network. Effective network monitoring systems play a vital role in ensuring data security in LoRa-enabled smart cities. By continuously monitoring the network, potential security threats can be detected in real-time, allowing for proactive response measures.

The utilization of LoRa technology in smart cities offers extensive connectivity benefits, but it also necessitates robust data security measures. By implementing strong encryption, maintaining a separate network, securing sensors, managing access keys, and monitoring the network for security threats, smart cities can enhance the overall data security and integrity of their LoRa-based systems. These measures are crucial for maintaining trust, protecting sensitive information, and ensuring the privacy of individuals within the smart city ecosystem.

5. Conclusion

This paper highlights the potential repercussions of data breaches on privacy, public safety, and infrastructure integrity, underscoring the need for robust security measures. Specifically addresses the unique challenges posed by LoRa technology, shedding light on the importance of addressing these challenges to ensure the security of sensitive data transmitted and stored within Smart City networks. By identifying and understanding these challenges, the journal provides valuable insights and best practices to mitigate risks and enhance the security posture of LoRa-based Smart City networks. It serves as a resource for stakeholders involved in the design, implementation, and operation of secure Smart City infrastructures.

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Some considerations regarding the trilemma of technological civilization: between tradition, conservatism and revolution or about Traditional Education vs. Digital education

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Abstract

Traditional learning combined with digital learning is becoming more and more attractive. Thus, there is no sudden transition from traditional to digital, both bring added value if combined, and the change and transition to digital education only is easier to assimilate, especially by teachers, who have been educated and "trained" many years in the classic, traditional way. And the sudden transition to the digital environment can give rise to frustration, but especially to resistance to change. The blended approach of online and conventional education also provides human interaction with teachers being able to provide real-time feedback. Thus, time is saved and other costs are reduced, even eliminated. Now that options exist, it's up to students and teachers to decide which option to choose. In addition, the process of digitization of education is long-lasting. The only certainty being that we are only heading there, towards technology in all fields, this being the natural course of evolution, the only certainty of life remaining, of course, change. How is the educational system changing in the digital age? This is the theme of the present scientific research endeavor being inspired by the times in which we live.

Keywords*: education, technological civilization, tradition, conservatism, digitization, social impact, digital age.*

1. Argumentum and foreword

For our society, the year 2020 brought an unprecedented situation in a pandemic context never seen before by contemporaries. The theme of this scientific research endeavor is inspired by the time we live in, by the perception we have of the changes brought to society by man and the role that technology has in this context. Since the notion of "technology" plays an important role in this study, I will make a few clarifications. In the Little Academic Dictionary, edited by the Linguistics Institute of the Romanian Academy in 2010, there are four definitions for technology. Of these, the second definition covers the meaning we will consider next, namely: "Technology is the set of processes, methods, procedures, operations, etc. used for the purpose of obtaining a certain product" [1].And right in the title I made a summary of what citizens read, hear and see who get information from the mainstream media, i.e. the mass media under the control of propaganda. You don't even need more to understand that people are treated like patients in a hospice who, after taking their dose of medicine, are deceived and lied to ensure the peace of the establishment. Here's why I believe the day Einstein feared has arrived. "I fear the day when technology will be more important than human interaction. The world will have a generation of idiots". Modernity has undermined the prestige and objective status of virtues and morals, creating what C.S. Lewis calls "chestless men," men without the symbolic abode of courage, honor, and responsibility. To prove that reference to an absolute and moral norm constitutes objective, defining and universal facts for man, C.S. Lewis invokes great names of Greek, Roman, Jewish and Christian thought, such as Plato, Aristotle, Augustine, Thomas Aquinas, along with masters of Eastern thought, Confucius or Hindu sages. The assertion ranks among the most clairvoyant criticisms of postmodern man. Accustomed to consider truth and justice as subjective, interpretable matters, today's man has lost the essential criterion that can give him resistance in the face of tyranny and totalitarianism [2].

With this preamble, we can consider that the inhuman technicalization of life proposes benchmarks that highlight and analyze the way in which the current technological system rigorously and totalitarianly organizes the spirit of the world, targeting us in an attachment to the worldly, in a dispersion towards the external, favoring absolutization the insignificant and transient ones. Overwhelmed by information flows, plugged in front of the screen, instrumentalizing different applications and numerical techniques, man lives a screened, mediated, artificial existence. Integrated into the technological gear, man diminishes his ability to be awake, his inner settlement in a state of wakefulness that would allow him to unify his soul powers. Gradually, the spirit of the technology system invades the human soul, technical logic is internalized, generating a certain state of mind, materialized through thought and behavioral patterns. As society becomes more and more technical, man, in order to survive, will have to become more and more like the machine. When man will live more in the artificial environment of technology than in the reality given by God, he will resemble the technological environment that configures his existence.

Dehumanization intensifies as man is valued and evaluated by technical criteria. Man's life, thinking, action, evaluated according to technical criteria, presuppose the encouragement of man to think, to work, to live like a machine. Thus, living thought, empathy, love, everything that gives specificity to the existence of concrete man is subjected to a deep process of alienation. In the technical society, the deep needs of man, what concerns his soul, his intrapersonal and interpersonal life are considered irrelevant. And yet, despite some shortcomings, I must highlight the positive role that the development of technology has had in the evolution of human society, considering here the relations between nature and man and between man and nature, about how man became a "zoon technologiko" , about civilization and technology, about the future of technological civilization. It is possible that, contrary to what some anti-technology currents want, man will continue to strengthen his control over the surrounding nature with the help of technology. Until where? As for me, 20 years ago, when I first started writing on the computer, I was excited by the possibility of moving a passage, a sentence, a paragraph, or even a single word from one place to another. Working on the text thus became faster, because if I decided that that content looked better elsewhere in the document, I didn't have to rewrite everything from the beginning: I simply moved the passage to another place. I often had to adjust the text a bit because all the references and conclusions no longer matched, but the relevant passage was now in the right place – and in less time than it would take to write the passage again. Today copy-paste, copying and pasting a text, are self-evident activities and we can no longer imagine how letters or books were written in the old days without having these editing possibilities available. This is precisely why millions of people who create and process text work on the computer: it takes over part of our work! More recently, artificial intelligence has taken over even too much, it can create works of art, from literary texts to musical scores! How far will the massive transformation "progress"? For answer choices, we try the trilemma of technological civilization.

2. The trilemma of technological civilization: between tradition, conservationism and revolution

The techno-editorial space does not allow me to review, in detail, the answer given to this question, but a brief excursion into the history of humanity in various places and times, would be useful to recall some stages of the evolution of the human species. This will allow us to highlight those characteristics of the species, which determined the evolution towards the current human society. The species was originally an "ordinary" one, that is, it evolved for a long time according to the laws of natural selection, from Australopithecus, to Homo Habilus, to Homo Erectus, to Cromagnon man and to Homo Sapiens. However, after the end of the last glaciation, about 11,700 years ago, something essential happened. In the Near East, a few people, probably women, discovered that it was possible to grow plants to secure food supplies. Humans found that they had the option of growing plants and then raising animals, instead of the natural options of gathering and hunting them respectively. It was the first step in the next period of development based on

knowledge and technology, whereby we began to differentiate ourselves from natural biological systems. Our evolution has moved further and further away from the law of natural selection and has been driven more and more by technologies. Anticipating, the exit from the dominance of natural selection corresponds to the stage of the emergence of modern science and the industrial revolution. Once this first step was taken, man continued to demand from nature more than she naturally provided. The consequence was that, in order to satisfy his needs and desires, man began to modify the environment, both environmental and social. The process started with the first step continued without interruption, but slowly, until about 500 years ago. Then several processes of great importance took place in a small region of the globe, Europe: the Renaissance, the Enlightenment, the Scientific Revolution, the Industrial Revolution. On the scale of history, these processes unfolded rapidly, so that at the end of the 19th century Europe was so different from that of the Middle Ages that it was obvious that the change was fundamental [3]. The completion of the stages started with the first step was a great success for the human species: humanity no longer evolves according to the laws of natural selection: epidemics can be fought or even avoided; the effects of calamities can be predicted and countered. Unlike ordinary species, which develop those abilities that enable adaptation to the environment, the human species defines its needs and then modifies the environment to satisfy them. This is a fundamental characteristic of our species, existing permanently after the first step is taken. It is evident that a fundamental characteristic of man is the dissatisfaction with having only what can be obtained naturally from nature. We have always wanted to improve our everyday living. We didn't like living in caves; we have built homes, which have permanently changed their functionality, becoming now skyscrapers and smart buildings. We didn't like to continuously migrate, gathering and hunting, we created agriculture and raised cattle. Viruses and microbes have plagued us and decimated us, we created medicine and fought them. We have been managing local ecological systems for millennia and regional systems for decades. Water management systems have reached huge dimensions, comparable to the size of some states (the Amu and Sâr-Daria basins, the Danube basin, the Great Lakes in North America). We ended up triggering certain atmospheric processes and lessening the effects of storms. In general, as far as technology allows, we have tried to modify nature for our benefit. And nowadays the level reached by technology has reached a stage where we have the possibility to manage the entire planet. Regarding the stage of the period we are living in, according to the opinion of Mr. Academician Mihail-Viorel Bădescu, there are several points of view, but two may be relevant for our object of scientific research. Thus, the first point of view belongs to The International Union of Geological Sciences and The International Commission on Stratigraphy. In July 2018, these scientific bodies presented the structure of the International Stratigraphic Chart. From the point of view of geologists we live in Meghalayan. This new geological age covers the last 4,200 years of Earth's history and is one of three new subdivisions of the Holocene epoch (which begins 11,700 years ago, at the end of the last ice age). The members of the Stratigraphy Commission appreciated the concordance and convergence between the stratigraphic data and the cultural

evolution of humanity as extraordinary and sufficiently argued [4]. A second point of view considers that we are currently living in the Anthropocene [5], a recent period of time in which human activities have profoundly, and rather adversely, altered the Earth's environment and processes, including climate, and technology is seen as the main tool of these unwanted changes. The term has been appropriated by the conservation movement and the media. It is obvious that there is a significant difference between the two points of view. The first point of view captures the influence of changes in nature on the evolution of humanity, and the second point of view considers that only the negative influence of man on nature deserves to be highlighted. According to most historians of civilizations, we live in a time when technology has become a fundamental attribute of human society. We have entered the era of "technological civilization" and some researchers already believe that the first thing to be said about this civilization is its Kardashev index, the other aspects being secondary [6].

From the perspective of "technological civilization", each historical stage emphasized some ideas, the so-called values or categories, which were added to other values from previous historical eras, together constituting hard-to-shake bases, transmitted through tradition. Each category had its promoters and partisans, of whom some, a few, were creators and others were keepers of the idea, transmitting it from generation to generation. Thus, Greek Antiquity emphasized the categories of Good, True and Beautiful and philosophers, scientists and artists were, respectively, their keepers. Late Roman antiquity emphasized the category of law, defended by jurists, who turned customs into codes of law and enforced them for hundreds of years throughout the Empire. The much-disapproved Middle Ages emphasized the category of honor, with the system of oaths of faith, and this category was defended by a numerically reduced and enfeoffed aristocracy, practicing the judicial duel. What has the modern age brought new in terms of values? The modern era, in various interpretations, is defined in relation to the evolution of Western civilization, following the Middle Ages. Modernity is characterized by a series of changes of a new type, manifested in the acceleration of progress in all areas: politics, society, economy, trade, transport, communications, science, medicine, technology and culture. An original and unique characteristic of modernity is the industrial revolution that began in the 18th century in England and the emergence of those technologies that later led to a mechanized and automated industry that gradually replaced manual labor. The industrial revolution emphasized the useful category, which is the good of the Stoics, with innovators as promoters and engineers and technologists being, in practice, its keepers. Industrial society, based on technology, was so successful that within a single century it spread to the East and now dominates the entire globe. The useful has joined the other traditional values, which it sometimes seems to subordinate, the old hierarchy between "episteme" and "techne", that is, between knowledge and interested knowledge, for the control of things, often reversing itself. The useful is at this moment the motto and objective of the activity of much larger groups of people than the traditional keepers [7].

From the point of view of disadvantages, technology has been trumpeted with extraordinary advantages that have always proved to be deceptive, i.e. with growth, progress, but also slippages to loss (see the paper economy promised by the promotion of computers or the compact disc when it replaced the vinyl disc and magnetic tape, etc.), in reality being dictated and interested only in profit and not in the benefit of all. Globalization and technology bring the news that nations will disappear and with them the borders and cultural differences. Let me remind here that before the existence of the states, there was globalization and disbandment on the earth, and when the states were invented, these were also the nations that invented and created democracy, not technology [8]. Technological advancement takes the credit that thanks to it we will win and that we will no longer have the problems created by the national state without realizing that we won all the rights of democracy in the last one hundred and fifty years of struggles and social upheavals. If we are not careful, some specialists warn us that with globalization we will also lose the piece of democracy that we still have since the appearance of corporations. We have to think that the vast majority of us do not earn our living from technology. Three quarters of the world's population does not live on technology. There are few who get rich from it and in their greed, those who do will trigger riots, revolutions and even a global war with the poor through this huge difference in earnings. The new global economy based on modern technology may be the end of us, even through the social impact caused by technology.

3. The social impact of technologies

The first industrial revolution caused that, starting in 1825, in England the value of industrial production exceeded that of agriculture. At the same time, there is a radical change in the structure of the population's expenses in England: if at the beginning of the 19th century food expenses represented 90% of the total consumption expenses, in the middle of the century they represented only two thirds. In the same period, clothing expenses doubled. The structure of the population's expenses changed in favor of comfort goods [9]. Throughout history, some professions have disappeared or transformed into others. The trend will be accentuated in the next period as the speed of implementation of inventions and new technologies increases in everyday life. This should not scare us. We just have to predict, as early and as realistically as possible, these changes and prepare to face them by training the workforce in the school, but also by retraining it. Anyway, the professions that require creativity, cognitive skills, will be a human prerogative for a long time to come. The main technologies that will produce mutations in the structure of jobs will be robots and artificial intelligence, and the most significant jobs where the new technologies will be found are those where demanding or repetitive physical work is performed, respectively data collection/processing . The first category includes jobs in the field of machine construction, metallurgy, mining, accommodation and food services, agriculture, product handling and distribution, transport, care and rehabilitation of the sick, etc. The second category includes jobs

in the field of secretarial and archiving, accounting, banking and insurance, translation, text editing, etc.

In this sense, the evolution of the number of jobs in several professions in the period 1986-2016 in France is suggestive, where it is worth noting the increase in the number of motor vehicle drivers, considered until about 10 years ago the most difficult profession to automate and replace with a robot [10]. Now autonomous driving has become a reality, and in a short time the evolution of this profession will be similar to those presented previously. It has already entered our everyday life and we have become accustomed to ATMs, ticket machines at train stations or bus stations, vending machines for drinks or cigarettes, automatic check-in or passport control devices at airports, etc. Moreover, we started to get used to conversations with "robots" that respond to our request to obtain information from the field of banking, mobile telephony, transport services, etc. All these "machines" have taken over the activity of some people, performing it, many times, under more efficient conditions and parameters than the human factor. Artificial intelligence systems are capable of defeating champions of general culture contests or strategy games (chess or Go), or taking over the doctor's tasks in diagnosing diseases [11]. Moreover, they are able to understand not only human language, but also the emotional state and character of the interlocutor and formulate the appropriate answers. The implications of these systems will be observable in the next few decades in all fields of activity: philology (automatic translations, analysis and writing of texts, etc.), history (analysis, correlation and synthesis of information from archives, analysis of artifacts), art (analysis through imaging of paintings, digital art, music composition), psychology/psychiatry (diagnosis and treatment of phobias or mental illnesses through virtual reality techniques), etc. Three examples are suggestive: one from the field of arts and two from the field of literature. Both the music field and the literature field are fields with a very high degree of creativity. The EMI program (Experiments in Musical Intelligence), and more recently Annie, created by David Cope from the University of California, compose classical music, and not only, of such perfection that even the discerning public cannot notice the difference between a composition created by a computer and of a Bach chorale or a Beethoven symphony.

The second example refers to the forecasts regarding the evolution of artificial intelligence programs in the field of composing literary works: it is estimated that by the year 2024 the programs for automatic translation of texts will be functional; until 2026, essay writing programs for didactic purposes, usable by pupils and students, will be available; after 2050, artificial intelligence programs will write novels [12].

In 2018, a novel composed by an artificial intelligence program came close to winning a literary prize in Japan [13]. The third example is from the field of electronic devices for reading books. The Amazon company is going to equip its Kindle device with biometric and facial recognition sensors, as well as with an artificial intelligence program, which will allow the evaluation of the impact of each phrase or passage of the book on the reader and the evaluation of its degree of satisfaction. As a result, the artificial intelligence system will suggest books that it

knows will give you satisfaction or interest. The impact of technologies on the exact sciences will be direct, through the development of more and more complex and performing computing or experimental equipment. But the most spectacular and the most accessible field, because it affects us all from the point of view of the quality of life, is that of medicine. New fields of engineering have developed, such as medical engineering, which trains engineers to design, manufacture and maintain medical equipment. They have designed and manufactured increasingly high-performing equipment, based on new physical principles, the most relevant being those in the field of imaging and surgical robotics. New imaging equipment has completely changed the way of investigating the human body in the last decades, significantly improving the rate and time of detection of serious diseases. Dental implants, currently used today, would be impossible to achieve without the assistance of imaging. Equally spectacular are the applications of robots in surgery, which have gone through the phases from concept to research, realization and current use, at a rate of several decades. In 1984, the first surgical intervention by a robot was performed. Today, da Vinci-type robots are already currently used in multiple types of operations. Materials engineering researchers have developed new biocompatible materials, which made it possible to create bone implants, tissues or even artificial organs [14].

The fascinating achievements of modern technology and their social implications made great thinkers focus their attention on this phenomenon, a new direction of research in philosophy being developed: the philosophy of technology. Famous philosophers and sociologists such as Ortega Y Gasset, Martin Heidegger, Jacques Ellul, Hannah Arendt focused on the anthropological, ethical, taxonometric aspects of technology, as well as on the processes of innovation and evolution of technologies. An important role was played by the analysis of the social impact of the development of new technologies and the mutations it produces in the collective mind. We will mention here only three of the famous studies that addressed this subject: Heidegger's Die Frage nach der Technik (The Question Regarding Technique), published in 1954 [15]; Arendt's The Human Condition, published in 1958 [16]. and Ellul's The Technological Society, published in English translation in 1964 [17]. Ellul points out that the technological system proliferates, restricting human freedom, not necessarily as a result of a Machiavellian plan. He speaks of the spontaneous convergence of numerous techniques, of man's adherence to them, so that the integration of technical models into a comprehensive technological system converts life into a technicized existence. This technicized way does not admit the reference to the transcendent, the man being contained in a technological flow, squentialized in himself, in multiple sequences from which the system integrates what is convenient. Ellul meets deeply with the approach of Ioan Petru Culianu who notes that "technology represents a democratized magic." Ell, like Mircea Eliade, shows that "in the technical society myths are hijacked." The myths of the traditional world are replaced by the new myths of the technological society [18].

Later, especially in the last 20 years, the number of publications in this field increased significantly. Relevant in this sense are: Thinking about technology, by Pitt, published in 2000 [19]. and Philosophy of Technology and Engineering

Sciences, a voluminous treatise edited by Meijers and published in 2009, representing the 9th volume of the famous Handbook of Philosophy of Science.[20] The launch at the Paris Motor Show on October 5, 1955 of the avant-garde car model DS 19 by the Citroën company fascinated the French thinker Roland Barthes to such an extent that he dedicated to it an essay entitled "La nouvelle Citroën", included in the volume of essays Mythologies. It is one of the most beautiful essays dedicated to an achievement of modern technology. Suggestive, in this sense, is the opening sentence: "In my opinion, today, the automobile is the fairly exact equivalent of the great Gothic cathedrals: that is, a great creation of the era, conceived with passion by some unknown artists, consumed as an image by a whole people, who, through it, bring a completely magical object closer to themselves."

The changes produced by the development of digital technologies have made psychologists, sociologists and educators seek to explain how the new generations differ from those educated and trained before the appearance of these technologies. Thus, Mark Prensky introduced in 2001, in his famous article Digital Natives, Digital Immigrants [21], the term "Digital native". He defined digital natives as young people born in the last 20-30 years and who grew up with computers, mobile phones and the Internet. Those who were born before this period, but who adapted these new technologies, Pensky called "Digital immigrants". Later [22], he introduced a new concept "Digital wisdom" which represents the ability of a person to use new technologies in order to improve his cognitive performance, not only to understand them. Just as electricity changed our lives 100 years ago, the same will happen in a few years with artificial intelligence. A large part of the decisions in everyday and professional life will be made by systems that incorporate artificial intelligence. Is it good, is it bad? The future will give us the answer to this question.

The other side of the development of technologies is their negative effects. We will mention some of them: a human dependence on technology (mobile phone, computer, Artificial Intelligence programs, etc.), which leads to the loss of social skills; their destructive use (for example of military technologies by terrorists); the use of advanced technologies to manipulate public opinion (for example, the vaccination manipulation campaign or the manipulation campaigns in India, which led to lynching, etc.); the impact on the environment (global warming, increase in CO_2 content, technological waste - radioactive or polluting); an upheaval on the labor market, etc [23]. Anyway, the development of technologies has two faces: one angelic and the other evil. One that will lead us to the condition of Gods and the other that will lead us to Hell. Man will have to choose the path he will follow. From this point of view, we must be optimistic that he will choose the right path whose evolution we are deciphering.

4. Developments and trends in the field of technologies

Next we will refer to the role that technology will play in the coming times. We will see that there are different views on this and present the main options that human society may have for the future. First, some preparatory comments. Throughout its history humanity has lived under the threat of disasters. Any major

natural event (flood, earthquake, fire, epidemics) decimates the population. For mankind, nature did not appear as a friendly environment to be preserved, as long as it was also a source of disasters. Only when nature began to be controlled did the disastrous effects diminish or cease. In recent decades, humanity has brought changes to the environment on a large surface of the globe. Will this increase in humanity's impact on nature continue? To give an answer, it is not enough to call on science. We must also appeal to morals and ethics. In contemporary society, several ethical principles of behavior in relation to the environment have been proposed, and some of them will be briefly recalled. An ethical principle could be the traditional one, namely: in the actions concerning the environment, we must consider the benefit of humanity. Other principles often taken into account in the public space are: conservation of biodiversity, protection of endangered species and nature conservation. There are, of course, other principles, but it is obvious that not all principles are independent or compatible with each other. How humanity chooses between these principles, however, depends on ideologies, which also contain sentimental, non-rational or transgression-based aspects. We will briefly present the most significant ideologies that refer to technology.

One of the ideologies, which can be classified as anti-technological, believes that by using technologies we have moved away from the way of life of the past, and therefore the call to technology must be reduced in order to return to that way of life. An eminent proponent of renunciation of technology was Martin Heidegger, considered to be one of the most influential philosophers of the 20th century. In a 1954 essay, "The Question of Technology" he condemned the view that nature is a mere resource for human consumption saying that the air is not made for nitrogen to be extracted from it, the earth is not made to be a source of deposits. He condemned hydroelectric dams for storing energy that would otherwise circulate freely. Also, referring to anthropometric measurements, which show that in the Holocene the cranial capacity of the species decreased compared to the Pleistocene, by about 10% in men and 20% in women, important researchers believe that the human species has regressed and, as a result, advocates a return to the ancestral way of life, characterized by living in groups of hunters and gatherers, having a maximum of 9-12 individuals. For this, aggressive anticipatory policies of technologization, population reduction and deliberate return of agricultural land to the undeveloped environmental fund are suggested. This ideology, in fact, proposes a fundamental change in the attitude of humanity for millennia, which has constantly tried to get out from under the tutelage of nature, characterized by indifference towards man and supplier of unpleasant surprises and disasters: hurricanes, floods, volcanism, plagues, earthquakes. Indeed, our ancestors did not adopt the principle of "Let nature take its course", because if they had adopted it few of us would still be alive today [24].

A second ideology, part of the moderate stream of conservationism, aims to maintain the relationship between humanity and nature as it is today. Adherents of this ideology do not exclude technology. The papal encyclical Laudato si, published in May 2015 and considered to be the first papal ecological manifesto in history, is part of the expressions of this ideology. The following passage is edifying: "If it is

true that sometimes we Christians have interpreted the Scriptures only badly, we must today strongly reject that, from the fact of being created in the image of God and with the mission to dominate the earth, it follows for us an absolute dominion over other creatures. We thus appreciate that the Bible does not give place to a despotic anthropocentrism that would be disinterested in other creatures" (Laudato si, §67-68). The passage is considered by some as a major change in attitude of the Catholic Church, because it proposes a profoundly different understanding from the traditional one of the founding divine commandment: "Let us make man in Our image and likeness, that they may rule over the fish of the sea, the birds of the air , the domestic animals, all the creatures that creep on the earth and all the earth" (Genesis, I, 26).

A third ideology is a continuation of the tradition, believing that humanity's problems can be solved by increasing control over nature. The difference from previous stages is that in these times, due to the level of technology reached, the scale of the projects and implicitly the control of nature begin to extend to the planetary level. Adherents of this ideology believe that, regardless of the principle adopted, technologies will be used to achieve the proposed objectives, and what will result at the global level will be a division of the Earth into areas where there will be mixtures of varying degrees, between things called "human ” and things called “natural”. Which way will humanity go in the future? This depends on how these three ideologies, or any other, will stand the practical test, and, in a predominantly democratic society, will be accepted and appropriated by the majority of the population, including the accession of women. Politicians, those who are responsible for the management of states and interstate bodies, are not strangers to these ideological currents and belong to the category of people with well-defined personal opinions, which is mandatory for the activity they carry out. However, when a politician has to decide on some practical issues, his freedom of choice is limited and the force of circumstances may lead him to choose options that are not in agreement with his preferred ideology [25].

The practical application of principles, whatever they may be, encounters difficulties, regardless of ideology. At this stage of humanity's evolution, major difficulties are caused directly or indirectly by the numerical growth of the population. It is known that the impact of a society on the environment is proportional to the size of the population, the demand for resources per person and the technological factor (ie the technical means and energy resources available to the society). The current situation is characterized by the increase in the exploitation of resources of all types (water and classic fuels, mainly), and these resources being limited, by the expansion of prospecting and exploitation in new areas. Also, population growth, which continues although at a lower rate, requires the increase, at certain time intervals, under the conditions of the same available land area, of the capacities to provide food, water, housing stock, transport, of waste disposal and storage facilities, energy production facilities and associated infrastructures. The need for continued environmental modification therefore appears as one of the inevitable consequences of population growth and the search for new resources. The far-reaching problems humanity will face in the future,

characterized by increasingly severe constraints, will also require far-reaching technological solutions. The multitude of such projects, leading to the modification of the terrestrial environment on a regional, continental or global scale, received the generic name of geoengineering. The current technological capacity of mankind allows the approach of such projects and under the current conditions and constraints avoiding the option based on geoengineering seems impossible.

Recently, several trends can be highlighted in the field of technologies. And we will insist only on three areas: autonomous vehicles; advanced robots; processing technologies by adding material. If a few years ago the field of autonomous vehicles was still a vanguard field in research (Google announced the creation of the first autonomous car in 2010), they have become a reality before our eyes. Self-driving cars are already on public roads, in testing mode, both in the United States and in Germany. By developing and increasing the robustness of M2M (Machine-to-Machine) communication systems between physical entities, applications in the industrial field of autonomous vehicles have become more and more present, having an important role in logistics from processing and assembly halls, from warehouses parts etc. The transition to a new level of communication between the human subject and the physical entity of H2M (Human-to-Machine) or more recently B2V (Brain-to-Vehicle) has already made it possible to realize a dream of to man, which until a few years ago was still in the realm of science-fiction literature: the driving of the automobile by the power of thought! The Nissan company presented this year the new concept car, IMx, driven by commands given directly by the brain to the car's driving system. A source of pride for us, as Romanians, is the fact that the director coordinating the mentioned project is a young Romanian, with a not-so-Romanian name: Gheorghe. The medical applications of this way of Brain-Machine communication, through the creation of bionic limbs, have a particularly great impact for the social integration of disabled people with paralysis or limb amputations.

Advanced robots, equipped with artificial intelligence systems and high-performance sensors, are able to communicate with each other, but also with the human operator or with other equipment in the production process, to perform complex tasks, to adapt to unforeseen situations, to understand the environment in which they act. The names of some humanoid robots, such as ASIMO built by Honda, Sophia built by Hanson Robotics or Robina built by Toyota, are familiar to us.[26] They have the ability to dialogue with man, to understand his gestures and emotions. The robots used in the industry are capable of performing fast, complex and precise actions, such as those of assembling some car components in areas that are hard to reach for the human operator. Or, more, to cooperate with each other in order to achieve new, unscheduled tasks [27]. A new field of robotics, called Cobotics, was thus developed. The BMW company in Munich is already testing such robotic manufacturing cells, used in the welding technology of automobile structures. It is possible to collaborate between the robots of the cell in the sense of the possibility of self-reconfiguration of work sequences, so that they automatically adapt to a new configuration of the car structure, without the need to reprogram each individual robot.

Among the advanced technologies, developed in recent years, that of processing technologies by adding material (Additive Manufacturing) is the one that best meets the requirements of the fourth industrial revolution. Additive Manufacturing technologies represent a series of technologies characterized by the fact that they use a virtual 3D model of the part, which they transform into a physical model through material addition processes. They appeared worldwide in the mid-80s, under the name of Rapid Prototyping technologies and have developed extremely quickly in the last three decades, bringing added value and complementarity to classic technologies. They revolutionized the field of manufacturing technologies and led to the introduction, at the beginning of the 2010s, of a new paradigm in this field, namely Cloud Manufacturing (by analogy with Cloud Computing). Additive Manufacturing technologies have applications in the automotive, aerospace, medical, jewelry, footwear, architecture, construction, etc. industries. One of the recent applications of additive manufacturing technologies is the manufacture of a car at the International Manufacturing Technology Show in Detroit, MI, USA. Workers at Local Motors in Phoenix, Texas, took 44 hours to 3D print the car's components, one day for mechanical finishing and two days to assemble other components such as the engine, gearbox, electronics and wheels [28].

What will the future look like? What will be the next step? When and what will the next revolution consist of? "It's difficult to make predictions, especially about the future." So goes an old Danish proverb. But that doesn't stop people from always trying - maybe, just maybe, the adage will be proven wrong in the end. In my articles I have discussed various predictions. Each time, I hoped that article explained well enough why it is difficult to make predictions, especially about the future of the tech world. But, it seems, some people like to build and others to constantly read all kinds of scenarios: alarmist, pessimistic, optimistic, apocalyptic, but the future also includes unpredictable, unforeseen, unanticipated aspects. It is good to leave room for the indeterminate, the unknown, the miracle. Perhaps this is also the existential beauty, the discovery, our moving forward. It does not bring the year what the clock brings. Absolute, mechanical predictability would turn us into non-humans, and the world would become a planned engineering, a monotonous, flat machine. Not all predictions come true and not all are beneficial. Let's not forget that the Delphic oracle also predicted or induced things inconsistent with the natural course of the world. We don't need such "predictors". Education would also have the task of preparing us to take on new challenges and experiences, unimagined, surprising. Not everything that appears on the news is to be rejected. Chronological continuity – individual, human – also happens due to the permanence, depth, unfathomability of unknown faces brought by the future. And yet, according to the opinion of Mr. Academician Dorel Banabic, the next industrial revolution will take place when the machines (tools) will reproduce (multiply) themselves: they will think, design and realize by themselves the means they need to fulfill the tasks given by the human subject. How far away is this moment? Hard to say. Foreshadowings in this sense are already made: there are already computer programs that "write" programs in turn. Taking into account the fact that the speed of implementing a new invention in

everyday life is ever greater, the moment of the appearance of the next revolution can be estimated at several decades. If we look at the history of technologies from the point of view of their adaptation to the consumer's requirements, we can periodize it in the following four stages, which generally overlap the four industrial revolutions.

The period before the first industrial revolution (that of artisanal production) is characterized by the fact that each product was designed and made for a specific customer (shoes, clothes, etc.). The industrial revolution of the 18th and 19th centuries led to an increase in productivity and the volume of production by product variant, which caused, at the beginning of the 20th century, to move to another paradigm, that of mass production (introduced by Ford in the manufacture of the Ford T automobile model). At this stage, a limited number of products are manufactured, these being made in a very large number, assuming that there will be enough buyers for them. The year 1955 is considered to be characteristic for mass production, being the year with the highest volume of production for a certain product variant. Starting this year, at the turning point, the variety of products increases, and the number of products per variant begins to decrease. The year 1969 is the year of the transition to a new stage, that of mass customization, in which the customer selects the desired product, from a list of options, before its realization (a classic example is the choice of the car configuration by the customer based on a list of variants and then launching it into production). The fourth technological stage is that of personalized production, which begins in the first decade of the 21st century. During this period, the product options are chosen by the customer, bought from the manufacturer and then made with advanced processing systems. From the above it follows that technologies have gone through a cyclical development, from personalized artisanal production (oriented to the individual), to mass production (oriented to the product), then to the personalized mass production (oriented to consumer groups) and returning to personalized production (oriented to the individual consumer). From this point of view, the next industrial revolution will appear when each consumer will produce the goods he needs by himself, in a reasonable time, using Additive Manufacturing type technologies and the necessary programs for this, downloaded from the Internet (Cloud). In this way, the cycle is completely closed, returning to the type of production in the primitive commune, in which each individual produced his own necessary goods [29]. Until then, let's analyze a new situation often encountered in today's society, the "vulnerability syndrome" of the "happy slaves" that hides unsuspected dangers.

5. "The Vulnerability Syndrome of Happy Slaves" or about "Digital Dementia"

At the beginning of the 21st century, the Westerner feels more and more "vulnerable". Panic, insecurity, social apathy, risk avoidance, accompanied by drastic security measures have replaced the daring and heroic spirit, political activism, the desire to experiment and overcome the limits. A new cultural paradigm around the concept of "vulnerability" is being born before our eyes. Everything has become

subordinate to the notion of "safety", safety in a narrow, purely technical sense. The perception of reality through the glasses of vulnerability is a cultural phenomenon, closely related to the status of the individual in the era of hyperglobalization and institutionalized postmodernity.[30] Delighted with himself and his aseptic world, postmodern man remains a slave to a comfort mentality. The search at any cost for the "comfortable life" has turned into an undisputed personal and collective ideal; comfort is the new religion, promoted by technologism, globalism and mass consumerism. Lacking the comfort, the mysticism and the social imaginary that it implies, the postmodern man would be gripped by a terrible panic; face to face with reality and his own conscience, he would feel empty and helpless. A source of immediate satisfaction, comfort dispels his fears, protects him from unpleasant confrontations. It turns him into a happy slave. The title was inspired by Huxley, the great British writer and intellectual, who in the 30s understood that the manipulation of the human being is not only done through the instrument of fear, but also through that of comfort. The communist bracket is over, but there is a vast chapter ahead in which people will imagine that they are free without being. Ovidiu Hurduzeu proves to us that there is no freedom where man has forgotten his divine inner tension. A lucid opinion, against manipulation [31] . But much more serious is the harmful effect of technology on the human brain, causing "digital dementia" as Manfred Spitzer researched and called it in his well-known work [32].

“Dementia is a mental decline. Like any descent, it takes longer if you start from a higher height. In turn, this height or functional capacity of the mind depends, as with muscles, on training. Mental training – learning – happens automatically, like muscles, with mental and physical effort. We make mental effort when we actively interact with the world.” During learning, the synapses, i.e. the connections between nerve cells, change, and the brain's efficiency increases. Moreover, in the hippocampus, responsible for data storage, new nerve cells are formed, which remain alive only if they are intensely requested. Learning uses not only the neural hardware already in place, but also new neurons, which it keeps alive. One thing is clear: our mental capacity depends on how much mental effort we put in especially in the case of young people in their formative period. In the unanimous opinion of doctors, education is the most important factor for a person's health. This is true for both mental and physical health. And because mental health also depends on physical health, education has a double effect. Even more: education frees us from many constraints, because those who are educated can take a critical position towards themselves and the environment, without living at the will of others and chance. All this reduces stress, which destroys nerve cells. Today there is a lot of talk about continuous, lifelong learning. But it is often overlooked that its foundations are laid by good education in childhood and youth, as will be seen a little later. "Is Google fooling us?" - this is the title of a media criticism essay by the American internet expert and publicist Nicholas Carr [33]. When dealing with digital environments and the potential dangers they present, we must turn our attention not only to Google; nor can it simply be stupidity. Modern brain research shows that the widespread use of digital media is a serious cause for concern. Our brains are in a continuous process of change, from which it necessarily follows that the daily use

of digital media cannot fail to have effects on us, the users. Digital media – computers, smart phones, game consoles and last but not least the television – are changing our lives [34]. In this context, more than alarming, even gloomy, the paradigm "traditional education vs. digital education" [35].

6. Traditional education vs. Digital education or School: copy-paste instead of writing and reading?

6.1. European and national context

As of March 2020, the COVID-19 crisis has caused education and training institutions in Europe to close their doors and quickly switch to distance/online learning. In a matter of weeks, the educational landscape in Europe and around the world has fundamentally changed. Teachers, students and their families quickly adapted and continued to learn, showing determination and perseverance. The COVID-19 pandemic has raised awareness of significant gaps and deficiencies in digital skills, connectivity and the use of technology in education. Furthermore, according to the latest Digital Economy and Society Index, 42% of Europeans lack basic digital skills and the European labor market faces a significant shortage of digital experts. Moreover, the COVID-19 crisis has drawn attention to both the opportunities and risks of online life and the need for a better and safer digital environment for all, especially young people under the age of 18. The adaptation of education and training systems to the digital age has become a topic of major interest on the European agenda, an aspect reflected in the following initiatives: the launch on July 1, 2020, by the European Commission of the new European Competence Agenda for competitiveness, social equity and resilience, which includes the following objectives:

- Strengthening sustainable competitiveness and ensuring social equity;
- Increasing social resilience and promoting lifelong learning;
- Training skills for a job and resilience of the economy.

At its core, this initiative focuses on skills and vocational education, proposing a set of 12 EU actions, which sets ambitious EU-wide quantitative targets and outlines how the EU will support investment in skills. Thus, a Recommendation of the Council on education and vocational training for competitiveness, social equity and resilience that emphasizes the training of skills to achieve ecological and digital transitions, while ensuring inclusion and a set of indicators for adult learning until 2025 when 230 million of adults in the EU population should have at least basic digital skills.

The launch, on 30 September 2020, by the European Commission of the new Digital Education Action Plan, called "Resetting Education and Training for the Digital Age (2021-2027)" contained and complemented the first Digital Education Action Plan, which it was adopted in January 2018, the revised form forming part of the European Education Area vision. First, between June and September 2020, the

European Commission carried out an extensive public consultation process for the revision of the action plan for digital education. In essence, the new Digital Education Action Plan is a call for closer cooperation between EU Member States so that education and training systems become fit for the digital age, given the impact of digital transformation on societies, the labor market and of its future, as well as on education and training systems. From this perspective, the digital transformation in education is driven by advances in connectivity, the widespread use of digital devices and applications, the need for individual flexibility and the growing demand for digital skills. At the same time, it is a call to action for closer cooperation at the European level, to draw conclusions following the crisis caused by the COVID-19 pandemic, a crisis during which technology is used at the highest level in the field of education and training, respectively for adapting education and training systems to the digital age. From a structural perspective, the new Action Plan for Digital Education includes the recommendations formulated on the basis of extensive consultations with stakeholders and includes two strategic priorities: the development of a high-quality digital educational ecosystem and the strengthening of digital skills.

The initiative aims to strengthen education and training systems following the crisis caused by the coronavirus, simultaneously with the EU's recovery efforts, based on the transition to a green and digital Europe. In essence, the creation of the European Education Space falls within the scope of the objectives set by the new European Competence Agenda for sustainable competitiveness, social equity and resilience and completes the panorama of actions following the strategic priorities in the new Digital Education Action Plan, as it aims at the following directions of action : basic and transversal skills training, gender inclusion and equality, ecological and digital transitions, teacher training, higher education, strengthening international cooperation in education and training, including by unlocking the potential for cooperation in the vocational and technical education sector. Similar to the member states, and in Romania, starting from March 2020, the "COVID-19" crisis has reconfigured educational practices from "face-to-face" interaction to the online environment. This challenge highlighted the role of digital education as a key objective for quality, accessible and inclusive teaching-learning-assessment, as well as the need for a strategic approach to lifelong digital skills acquisition for all actors involved. During this period, "teaching-learning" moved predominantly to the online environment, and the challenges faced by schools in Romania were related to the lack of predictability in a heterogeneous school network, with a strong digital gap between educational units combined with insufficiently developed digital skills for the effective organization of the didactic process in the online environment due to limited access to technology and low internet connectivity. At the same time, the reduced possibilities of families to support the beneficiaries of education, the children, for participating in online lessons also had a negative influence.

In an increasingly turbulent and divided world, concerns about children's education have intensified. Both in Romania and in other countries, the question is being asked more and more often: "for what future are we educating our children?" For contemporaries, the answer to this question should be clearer from a balanced

perspective on technology seen in the context of our days, but also highlighting its risks. Let us, therefore, avoid technophobia, stepping with patience and courage towards tomorrow in the light of our Lazarist and Haretian traditions. Thus, we can raise education to the level of art, later gaining gratitude from the children, but also intercession for our nation's own future, combining digital with traditional education. Now that most of the opinions found on educational sites suggest that digital education is gaining more and more ground and, in a way, the traditional school is starting to lose ground. We can even read predictions of educational centers that, in their current form, will disappear and give way to online education. But let's debate this topic a little more starting from the question of digital die-hards: "Is traditional education enough?" Rarely do we come across someone who keeps their kids out of school and turns to online education only. Anyone who does so is now considered insane and will receive plenty of free advice and counter-arguments. At this point, most people believe that traditional schools are the best. But is it enough? Do children still learn with the same love and interest as 10 years ago, for example? Today's generation is much more active, more curious and more eager for fast and on-topic information, and the traditional school is no longer enough. And this is where technology and its advantages come into play, including in the field of education. In the continuation of this option, it is stated that online education has its charm, giving as arguments the fact that it is more advanced from a technological point of view, therefore it has a special charm. Online education is ideal for making your children thrive in their field of interest and prepare for the jobs they will have when they finish school, always being updated with the latest advances in science, technology, medicine, art, culture , travel, transportation and other fields. Digital education goes beyond classical teaching methods, which no longer keep up with the needs of today's students. It is more flexible and suits the specific requirements that children have. Why? Because children always want to know more, always something new to further stimulate their creativity and critical thinking.

Today's children want to know how to do practical things, and not everything can be explained by current textbooks. Of course, apart from online courses, we can look to improve our knowledge through Google, Wikipedia and YouTube – which contain the latest information about science, people, technological advances and discoveries. Most online sites are updated regularly and offer new insights. Something that classic textbooks cannot do so actively. Then, is digital education good for our children? How do we figure it out? Here are some factors to consider:

1. Flexibility. Digital education is very flexible. For example, if you have to stay home because you're sick, you don't miss school, you do your homework online, and this means you don't have to catch up on what your classmates did in class. But if you want to become more organized, then you need to study according to a well-established schedule and give up a lot of free time. In this case, studying at school is the most suitable.
2. Costs. Traditional education often has additional costs, including dorm or rent fees, food, and textbooks. In the case of digital education, the courses are done online, and those who create these courses use professional

software equipment, which you have access to at no or very low cost. Online courses also come in video form, with picture and sound quality as good as the real thing. These video lessons are accessible anytime, anywhere. However, traditional education, although expensive in many cases, also has its advantages, such as access to vast libraries and direct contact with teachers and peers.

3. Social interaction. If we want children who can build relationships, meet people, enjoy student life, participate in trips and cultural programs – we can choose the conventional school. Online education is mostly about video-based learning and online mentoring – where personal contact and face-to-face interactions are missing and if you are more than just a geek, love gadgets and keep up with trends in technology – learning digital is the right option. If you want to have an edge over other students and improve your skills for a successful career in the future, then digital education can be an option. If you want to learn in a slower, conservative way, sometimes without a solid foundation for the real world beyond school, and have a slow path to your development, then traditional education is another option. Between these two - traditional and digital - the most suitable approach? Our answer is combined education because if we look at the works of great artists, be they painters, sculptors, architects or photographers, we notice that many of them are based on the golden rule.

According to it, "for a whole divided into unequal parts to appear beautiful, there must be the same ratio between the small part and the large part as between the large part and the whole." According to Rudolf Arnheim, “this ratio is considered particularly satisfying because of the way it combines unity with dynamic variety. The whole and the parts are perfectly proportioned, so that the whole prevails without being threatened by a split, and the parts at the same time retain a certain autonomy". The golden ratio is an irrational number, 1.618033..., which can be defined in different ways, the most important mathematical concept associated with the golden rule being the Fibonacci sequence, a sequence of numbers in which each is obtained from the sum of the two before it: 0,1,1,2,3,5,8,13,21,34,55 etc. Dividing any number by its predecessor roughly yields the golden number. These values have less practical importance, no one can measure exactly when creating a work of art, but they show that there is a close connection between mathematics and art. The first to use it were the Egyptians, most of the pyramids being built with the golden number in mind. The Greeks were the ones who named it as such, using it both in architecture and painting, sculpture. Moreover, he is also noted with the Greek letter "fi", from the Greek sculptor Phidias who built the Parthenon starting from the golden ratio. In painting it was used mostly in the Renaissance, probably the most discussed use of this concept being in Leonardo da Vinci's painting, "Mona Lisa". The golden number is not only present in art, but especially in nature. The human face is based on this principle.

So traditional learning combined with digital learning is becoming more and more attractive. Thus, there is no sudden transition from traditional to digital, both

bring added value if combined, and the change and transition to digital education only is easier to assimilate, especially by teachers, who have been educated and "trained" many years in the classic, traditional way. And the sudden transition to the digital environment can give rise to frustration, but especially to resistance to change. The blended approach of online and conventional education provides, say, human interaction is done a little once a week, and assignments and projects are usually online. Also, if you're working on a project involving multiple people, all participants can work from home at their own pace on the same document, with each person having access to the changes made by others, and teachers being able to provide real-time feedback. Thus, a lot of time is saved and other costs are reduced. Now that options exist, it's up to students and teachers to decide which option to choose. In addition, the process of digitization of education is long-lasting. The only certainty being that we are only heading there, towards technology in all fields, this being the natural course of evolution, the only certainty of life remaining change. How is the educational system changing in the digital age? Education experts see the potential behind the electronic devices that most people are addicted to today. If in recent years electronic books have gained ground in front of classic ones, education can reach a higher level, adapted to the requirements and habits of the generation raised in the digital age. The problem that can arise in this direction is that teachers are used to classical teaching methods and, even if they use a laptop, a tablet or a mobile phone, they cannot so easily get rid of the style they have become accustomed to. Today's societies in Europe and around the world are strongly shaped by widespread access to the Internet, which makes it possible for citizens not only to have access to an overwhelming and sometimes confusing volume of information, but also to connect and combine it, with institutions public and civil society stakeholders in different ways in a digital world. Digital transformation is a reality for the whole society, but it comes with a series of challenging situations for all environments. Undoubtedly, it is the students who have taken up and integrated technology as a way of life.

Moreover, the evolution of the teaching tools used in schools experienced a spectacular leap during this period. Although still new to teachers, they are familiar and often used by students. Of course, classic learning methods should not be eliminated from the learning process, but students and teachers need modern learning tools, like those used in free time. Modern technology can be seen as a complement to education and not as a negative factor. Digital equipment has already proven its effectiveness as teaching and learning methods. Working with modern digital equipment is a challenge for teachers. However, many of them access and use modern teaching methods in class, adapting their classic lessons for the digital environment. With regard to electronic documents in the digital age, the learning unit is oriented towards solving some work tasks, mainly using the method of learning and training skills by solving a wide range of practical applications and emphasizing the achievement of projects. The digital revolution is a phenomenon that also has implications in education. The instrumental aspect is important, because the instrument can also have an influence on the content, reconstructing it or redefining it. For example, when delineating the learning content, we must also

consider the extensions that emerge in the virtual space and that can be brought, in one form or another, into the classroom and connected to the traditional curriculum. That is, teaching literature or philosophy, the teacher always refers to the curriculum, which prescribes a certain ideational content. But he can expand and tell students that they will find additional or more in-depth things by going to a particular web page. Therefore, the teacher must know, master and tame this means, appropriate it, connect it to the classical methodological tools.

Education is not only limited to teaching-learning activity. There is also an administrative dimension, which can be perfected by resorting to these platforms. Also, communication between school and family can be improved using new technologies - for example, the digital catalog, through which the parent is promptly informed about the child's school situation. Technological progress is a reality that cannot be stopped and must be accepted and addressed as part of everyday life, and can be seen as a challenge for education. For children and young people, the internet and social media are an essential part of their lives. According to international studies, a very high proportion of teenagers have used some form of social media and have a profile on a social networking site. Despite the common vision of two different worlds, a real world and a digital world, often seen as being in opposition, young people actually live in one world, comprising online and offline realities. If education becomes more effective and meaningful when it considers real life and elements of reality that are familiar to learners, it means that education should also consider online reality. If the educational process is perceived to be centered on something other than the accumulation of predetermined knowledge, but on developing skills and supporting learners to construct their own understanding of the world, it should refer explicitly to their life experiences. Thus, educators must bring the learning process closer to the real life of children and young people, thus incorporating aspects related to their experiences in the digital world.

The educational process should appreciate and use the competences acquired by children and young people through informal online learning or participation in ICT-related non-formal educational activities. Young people are more and more used to learning by exploring a new tool or using different online tutorials. This is actually evidence of autonomous learning skills and should be recognized and encouraged in the school context, along with critical thinking skills to develop the ability to identify reliable and valid sources of learning. Teachers need to feel confident in a position where they do not necessarily know more than the learners. As "digital natives", it is normal for young people to learn very quickly how to use different new ICT tools. It is of course very good for teachers to continuously develop their ICT skills, but it is not necessarily necessary to keep up with the students in this regard. Even without being ICT competent themselves, teachers can find ways to bring young people's ICT competences into the learning process as resources. New educational strategies, inspired by non-formal education, can be developed based on the use of the Internet and mobile devices that students already have. Also, many of the educational activities that teachers are used to can be adapted by taking the digital world into account. Teachers should be supported to accept that students can be viable partners for mutually enriching dialogue based on respect and trust. By accepting

the role of facilitator of learning, teachers help students develop independent learning skills and critical understanding.

New methods of communication between schools and parents are an important element of day-to-day school management. The use of the Internet is at the basis of these transformations. The way we live, the way we do business, the way we work, the way we study, the communication between people and even the way we spend our free time are influenced by the Internet. The important factors for the transition to the Information Society are the communication infrastructure and IT applications. Thus, from a political point of view, the Information Society must remain a democratic society, from an economic point of view, it must increase its development possibilities, and from a cultural point of view, it must become a knowledge-based society. The amount of information at our disposal is growing exponentially and, for this reason, a system of coordinating it is necessary, as well as appropriate selection services, based on the ability of specialists to analyze and evaluate the information, with the aim of helping him the beneficiary to obtain quality, up-to-date and fast information. As such, for the development of the information society, along with the information transmission technologies, a decisive role is also played by the content of the transmitted information, which, together with computer programs and music, constitute virtual goods, goods of a digitized world, which can be downloaded directly from the network. The new digital era determines a new type of approach to the educational phenomenon through new communication and information technologies. The analysis of virtual, online educations leads us to the conclusion that there is a new perspective of approaching the educational process under the conditions of postmodern societies. Currently, the system developed in the technology learning process is characteristic of the informal education formula. The advantage in the case of new technologies is the high degree of receptivity of young people, consumers of new media. Global culture dominated by technology is producing mass media literacy and shaping a new model of learning. The learning process is accessible and interactive, depending on the requirements of accepted social models. Online, virtual education provides useful skills for young people who are in the middle of the schooling process. Tools developed by application programs, marked by specialized design. The differences in value and content in relation to traditional education give a non-standardized, informal education model of connection in terms of the use of knowledge, information and learning formulas. The use of multimedia systems indicates a social barometer of trend orientation including in the plan of educational life. Interactive learning involves a new approach to accessing information and textual content, and education in the digital age involves developments, challenges and trends.

6.2. Education in the Digital Age: developments, challenges and trends in the relationship between education and technology

Children represent the hope for immortality of a nation and the parents who gave them life, the hope that they will live in their souls, as long as the memory of the good deeds done during life will be alive in the consciousness of the descendants. One of the highest deeds that parents can do for children, beyond watching over their physical growth, is to educate them in the spirit of moral values.

For such reasons, the Holy Fathers left us some of the most beautiful and profound words regarding the value of the act of education. This is a true art and has soteriological value, in the sense that, depending on the education provided to their children, parents receive reward from God when it has positive moral effects, or condemnation when it was not done responsibly and in the spirit of high spiritual values. Saint Porphyry the Kavsocalivit is profoundly right when he says that those parents who did not give their children the proper education are "losers", that they "failed" not only in educating their children, but in general. St. John the Golden Mouth considers that the act of training children has soteriological value, through the care shown towards it, they have the chance of forgiveness of sins and the acquisition of salvation. In the same spirit and with the same spiritual charm, Saint Paisius the Aghios believed that when they offer a "good" education, parents and educators, if they have no sins, sanctify themselves, and if there are imperfections in their lives, in proportion to their love and responsibility shown, they are forgiven from these. Over the years, the styles of education have undergone numerous transformations, tending more and more towards providing more and more rich knowledge from a theoretical point of view, but with a diminished moral and spiritual finality. From the creation of strong and tall characters, she focused on providing the most varied information, in the most efficient way [36].

Recently, the Covid 19 pandemic constituted a challenge not only for health systems, but also for education systems. The physical, "face-to-face" format, in which the educator communicated directly with the learner, was replaced by an online, screen-mediated communication. The effects of these realities, forced by objective events, will be observed over time. With or without a pandemic, digital technology has penetrated and continues to insert itself more and more into our lives. Specialists believe that we will soon end up not being able to distinguish too clearly between online and offline, that we will be increasingly surrounded by artificial intelligence, in increasingly varied forms, through its intrusion into our space, including the private one , and by our enthusiastic immersion in it. However, there are also specialists who warn of the risks posed by the "digitalization" of activities, their extreme form being "cyber-addictions". And children and teenagers seem to be the most vulnerable categories. Not having enough discernment and lacking parental and digital education, they can become slaves or slaves of cold technology, but with a special capacity for seduction and addiction. The present study does not claim to be exhaustive or to have maximum originality. He collects several materials in an attempt to answer some current questions and challenges, showing the importance and role of parents, and then of educators, teachers and teachers, in the growth and formation of children, students. Those who love high and deep meaning in life and are responsible for the intellectual training and moral development of the children with whom God has blessed their lives in our words clear advice and practical exhortations, which will facilitate their special work and give it a spiritual meaning .

Second, I have inserted some moral reflections on the presence, role and relationship with digital technology, with reference to the act of education. The fundamental idea, specific to Judeo-Christian spirituality, is that everything is good if it is used with discernment and for a high purpose. Thus, the Christian faith is not

technophobic in the sense that it would condemn technology and its various forms. The evil is not in matter, but in the wrong use we can give to it. The world is not bad, but depending on our attitude towards the things that make it up, it can become the way to Heaven or the way to hell. Similarly, when used according to rules or balanced conduct, for purposes and with high instructive and moral purpose, technology is a benefit. In such circumstances it eases, beautifies and ennobles life. On the contrary, in the absence of proper conduct, it has an addictive potential, which a still incompletely matured soul can hardly resist. The following pages highlight some of its risks, in the absence of moral discernment, with the hope of identifying them and acquiring an optimal digital behavior, which supports and strengthens the act of education, giving it formative value and moral finality.

I express a thought of high appreciation and sincere gratitude to the National University of Political Studies and Public Administration, the Faculty of Public Administration for organizing the Securing Smart Cities International Conferences, and to its patrons. Highly valued, because over the years they have given readers works of a chosen scientific outfit and of real practical value. These, along with the light of knowledge, bring rich meaning and peace to souls. I owe them, likewise, sincere gratitude for the honor of having accepted the publication of the conference volumes, among so many and valuable works published to date. I hope, at the same time, that in their pages all who will take the trouble and patience of reading will find current scientific truths and moral exhortations useful to the soul, regarding the principles of an education in virtue and morality. And thus, children, parents and educators may fulfill their vocation and discover the joy of a good deed, done for the glory of God, for soul fulfillment in this world and life and for a better future of the generations to come.

To the question "When should children's education begin?", we could answer, without making too much of a mistake, that since their conception, from the intrauterine period. We could even say that even earlier, from the "friendship" of their future parents, because, from those moments, they propose to themselves, as potential husbands, their ideals, aspirations, expectations, wishes and hopes, the most much of it related to the future family he might start. Nothing is more beautiful and uplifting for parents than the quality of bringing new creatures into the world, their children. But, in particular, this quality is enjoyed by the future mother. The pregnant woman is in a blessed and gracious period of her life. The period of pregnancy, beyond its weight and difficulties, is, for her, a privileged one, an optimal time for deep meditation on the meaning of her own life, a meaning that cannot be thought outside of the family and in the absence of the gift of childbirth. It is also a suitable time to reflect on the past, but especially on the future, the achievements up to that moment and, in particular, on the future achievements, inaugurated by the very act of the child's birth. A time of inner dialogue, with oneself, but also with the other members of the family, and especially with her husband and the father of their children, regarding the atmosphere in their home and, in particular, on the principles of raising and educating the future child. For these reasons and understanding the special situation in which the expectant mother finds herself, the whole family has the responsibility to surround her with affection, creating a climate

of harmony and understanding, so that she can "rest" mentally and prepare for the expectation of the child. Any restlessness must be removed from her soul. "If the mother in her womb becomes angry and sad, then the fetus is also disturbed in her. That is why the woman, when she is pregnant, must not cause anxiety to herself, but others must also try not to make her sad. By doing so, the child will be born peacefully, and the parents will not have problems with him either when he is small or when he grows up [37]."

The lifestyle of the mother decisively influences the character of the child During pregnancy, the expectant mother must change her entire lifestyle in order to give birth to a healthy child, who will later bring joy and comfort to her family. The main concern of the pregnant woman is to prepare for the birth of the future child, and then for its growth and education. After the birth of the child, the life of the whole family changes, it is called to show love and care, concern and responsibility towards the education of the new offspring. Regarding breastfeeding, through breastfeeding, children not only suck milk, but also love, affection, comfort, safety, thus acquiring a strong character. It is known that, thanks to campaigns aimed at the emancipation of women, today most wives and mothers are employed, sometimes performing professions incompatible with their delicate nature. Many of the "successful wives" are even busier than their husbands, have a higher income, and what has been observed in recent years, against the background of their increasing social and economic independence, most divorce applications are filed by such women, who want to live life to the fullest, to enjoy its pleasures, often with people other than the father or even the "fathers" of their children. But more and more of today's women and mothers find the high price of this emancipation, namely the betrayal of the conjugal home and the denial of their own vocation - as wives, but especially as mothers. The time spent at work is taken away from the time that used to be dedicated, almost exclusively, to the family. However, it is known that, unlike a man, who can fulfill himself in life through work, outside or in the absence of the family, a woman never feels truly spiritually fulfilled except in the bosom of the home, next to her husband and, above all , through her children. The mother's service is demanded by the increasing desires of today's family, in a never-ending spiral of expectations and in a constant social comparison with others, out of a desire to surpass them. And in this case, he recommends simplifying life, establishing rational and reasonable goals, decency in material things and cultivating spiritual values, among which the fundamental priority is the beautiful education of children, for life. Children's education is a particularly high responsibility of parents. For this reason, all other family debts must be subordinated to it [38]. Returning to the object of our approach, what would be the "lessons", more or less explicit, from which we could learn, regardless of levels, roles, responsibilities, from the online experience of exercising education? We bring to your attention a series of coordinates, the list remains open:

a) Establishing and guaranteeing an openness, flexibility or self-regulation of the entire education system in relation to unpredictable dynamics of the world in which we live; an education system - as structure, functionality, resources, skills, forecasting exercise, etc. – it must be accommodating,

adaptable, flexible, being prepared for any macro/extra level evolution that exceeds its own responsibility or functionality (natural, social, medical cataclysms, etc.); an education system must assume a "realistic coefficient of vulnerability", to preserve, permanently, alternatives or lines of maintaining and exercising specific functions and in the most unexpected or gloomy scenarios (social, historical, natural, etc.) [39];

b) Capitalizing, integrating and "pedagogizing" new discoveries in the field of communication and information at the level of training practices; from a procedural-instrumental perspective, the educational process is required to be more attentive and "interested" in relation to the implementation of new acquisitions in the field of technologies in the specific territory (especially, in relation to innovations aimed at communication); any techno-cultural discovery or institution, in the course of history (the printing press, the museum, radio-television, the Internet, etc.), also had educational implications; the first question that could be asked, when something new appears in this field, would be this: to what extent can we exploit the new technical means from a didactic, instructive, formative point of view (of course, by subsequent adaptations and by "taming" the framework technical in relation to the objectives, possibilities and needs of the person's training);
c) Rethinking the school curriculum and their concrete correspondences (curriculums, programs, textbooks, didactic aids, etc.) and in relation to the opportunities for generation and transfer of some virtual, digital contents, which emphasize activism, involvement and self- learning, etc.; of course, digital can come with some constraints - if we consider the relational aspect - but also with many opportunities that must be exploited; in the future, it is expected that certain sequences of the school programs (assigned tasks or activities) will be designed, right from the start, in the perspective of online learning;
d) The sequential, progressive – intelligent and inspired – connection of the culture offered by the school to that made available virtually; cyber-culture can become a referential of learning through effective, profitable didactic integrations, valorizations and meanings; the virtual space can house a vast material that can also become relevant from a didactic point of view, if it is haloed/integrated from the perspective of learning objectives; the school curriculum can also include open, even indeterminate sequences that propagate in virtual space (by the way, more and more classic cultural structures are building their virtual "doubles": the digital book, the virtual museum, the online conference, the distance school, the open university etc.);
e) Finding technical and didactic solutions to supplement or alleviate the lack of empathy, contact and socialization carried by IT staff used in training; the "humanization" and "spiritualization" of communicative artifacts with a formative purpose, through the relational "naturalization" of the virtual environment, by diminishing the psycho-social distance between the protagonists trained in the educational activity;

f) Revealing a new division between in-person and online education, including through relocation and asynchrony (the one in the classroom remaining predominant), by freeing up additional time for didactic activities and moving some peri-didactic activities online, solving tasks, working in virtual groups, carrying out projects, additional learning, counseling and psychological support, for consultations and meditations, for administrative routines, for communication with parents, etc.
g) Updating and adapting the evaluation framework or some of their components (tests, exams, contests, etc.) and in relation to the conditions of a distance learning situation (by rethinking the entire evaluation system, procedures, administered instruments, tasks /anticipated requirements, etc.); docimology, as a subfield of pedagogy, must also take into account "in absentia", "asynchronous", "remote" examination formulas or situations;
h) The training of teachers, both in the initial stage and during professional development, must also aim at the formation of skills for identification and pedagogical use of the virtual environment and to capitalize, in school or extra-school didactic practice, the opportunities or valences carried by new technologies; I would propose that the didactics of teaching school subjects include explicit topics regarding teaching using ICT, didactic transposition exercises from classic to online, examples of virtual interactivity, ways to ensure feed-back and online assessment, etc.;
i) Preservation and affirmation of the autonomy, dignity, importance of exercising the teaching profession through related normative, material, symbolic, deontological levers; the teaching profession, covered by verifiable skills, validated as such, must be valued and rewarded; many actors (parents, pupils, students, etc.) were able to realize, by going through/overcoming this stage, how complex and difficult the didactic performance is;
j) Accountability, support and the provision of material and educational support for less obvious actors in the training exercise: pupils/students, parents, exponents of the local community, supportive-implicative associations, non-governmental entities, etc.; these "secondary" factors can become first-line and important, regarding the completion and continuation of education, both in normal conditions and in special borderline ones; a "parents' school" is not obsolete at all, associative structures can take over the tasks of defunct state entities, and representatives of local communities must not shirk their cultural-educational responsibilities, etc.;
k) The establishment and propagation of an educational optimism, especially in crisis situations, demonstrated by the main actors - teachers, school managers, some decision-makers - who have proven responsibility, creativity, involvement, dedication, discovery of resolute solutions for the continuation and completion of educational paths, including through examination, validation, certification;
l) Guaranteeing and establishing the culture of competence at all levels - from the minister of education, the school inspector, to the level of the

school director, the teacher; trust is an important dimension that solves - managerial, practical, psychological - many problems; from the moment an important decision-maker says one thing today and another tomorrow, things can get out of control, etc.;

m) Avoiding or reducing inequalities starting from access to technologies; there is a risk that the inequalities due to the educational interventions of the immediate environment will deepen; those who already have, will be given, those who do not have (technical conditions, etc.) will remain even further behind;

n) Review of psycho-pedagogical theories about learning, forms and strategies of instruction, about the construction of knowledge, about the reception and internalization of values; the current pandemic demonstrated that the known theoretical arsenal did not cope with the complexity of the new reality; such a question remains a challenge for basic and applied research in the field of educational sciences.

7. Instead of conclusions, brief considerations about ethics and academic integrity

The school forms the people and the universities the elites. Schools in general and universities in particular represent the strongest concentrations of intellectual elites. They have the mission to ensure the moral and spiritual health of the nation through education, to prepare young people for life, thus ensuring the future of the nation. While social elites have associated and undertake coherent actions to promote and protect them in society or to impose rules that recognize their value, professional elites benefit, first of all, from recognition within professional associations, their recognition within society being conditioned by the attitude of political leaders, opinion-forming factors, by the way society is prepared to accept the role of the elites in ensuring their progress and prestige. A short tour of academic "Ethics and Integrity" is, of course, too little to cover the relevant subject matter in all fields of science and at all levels of study. It would have been ideal to have available, for university education - not excluding pre-university education - separate adaptations and developments of this text, one for each faculty and for each level of studies at which the discipline has become mandatory. The need for particularization arises from the only partial overlap of the ethical issues we routinely confront: to a significant degree, for example, they will be different if we are doing laboratory research or on living subjects, or if we are working especially with texts or in the archives. Noting this shortcoming from the outset, we still believe that we provide a useful, albeit incomplete, tool. Although some of the moral challenges will be specific, there remains a consistent core of cross-cutting themes. Ethically competent analysis and evaluation of a situation presupposes minimal familiarity with a set of basic argumentative concepts and tools; the institutional mechanisms of the university in the field of ethics management are common to all; the moral arguments against plagiarism remain largely the same, even though the "technical" citation rules may differ; bullying is just as repulsive when it happens in

a laboratory, and when it happens in an archaeological site or a library, etc. The casuistry may vary, but the structural characteristics of the situations often overlap [40]. This study mainly addresses such transversal themes, not only from the area of moral philosophy. However, we tried to use illustrations that also come from the natural sciences, social sciences or the humanities. They can, we hope, at least function as starting points of wider development. Our intention was to think of a useful text for teachers, but to write it mainly for everyone interested.

Ethics is particularly interesting when it involves different moral intuitions or values and when we face dilemmas where the decision is not obvious and disagreement is reasonable. Therefore, we have tried to avoid verdicts and mere enumeration of prohibitions as much as possible. Dilemmas and open questions generate debate and occasion reflection. Sentences, on the other hand, tend to kill discussion and rather prompt reactions of embrace or vehement rejection. If we come, in our professional communities and society, to talk more to each other and less to each other, we will probably have taken a major step in the right direction in developing a moral attitude. There are other materials that can be extremely useful for supplementing the content. With a simple click we discover significant examples so that, together, they provide a first approximation of an already very vast field of reflection and research. Without going into too many details, we propose an exercise: Imagine a box of freshly picked apples. After a while, you notice that an apple has become moldy, so you remove it so that it does not spoil the neighboring apples. The situation is repeated several times during the following days. Finally, take a closer look at the apple crate and find that the crate itself is rotten and that's why all the apples were getting moldy. But what if the apple crate is a metaphor for the university, and the apples for the members of that university's community? Which do you think is more relevant to explain perpetuated and widespread immoral actions, the rotten crate (the university environment in which the immoral behaviors occur) or the rotten apples (the individuals who behave immorally)? immoral are neither unimportant nor as difficult to evaluate as one might think. They help create an unethical organizational environment where everything seems to be allowed, which will encourage even more unethical behavior.

Take for example the case of University X, known among applicants, students and professors as a relaxed space where you "get by" without too much hassle: it's easy to get in, course requirements are minimal, seminar papers "are solve" for the correct amount, in the exams you can learn nothing because you pass anyway, and after graduating, there is no problem of stressing. Teachers "turn a blind eye" when they notice or learn about bought or plagiarized papers, and most expect various "attentions" on exam days. The new chancellor of University X, however, has a different vision of how the institution should function and wants to run a moral university, where ethics and academic integrity are valued and respected by all members. What to do? For example, the chancellor could severely sanction each individual misconduct in the hope that the wrongdoers will learn a lesson and behave ethically in the future. The solution is necessary, but is it also sufficient? The problem is that misconduct is not the exception, but rather the (unwritten) rule of behavior at University X. Everyone behaves immorally, because "that's the way it is"

here. There seems to be a group "contamination" with immoral actions. As in the case of any organization, we can also speak in the case of universities about a general and collective level of morality, located beyond the morality of each member of the respective institution. This is because a university is moral if its current practices (the university context or environment) encourage its members to adopt moral conduct [41].

Why do we need ethics and integrity in academia? Whereas, as Kaptein and Wempe argue, a moral diagnosis of University X based on an informal opinion poll shows that the main immoral behaviors are, in descending order of frequency, the following: flawed teacher-student relationship: targeting, harassment, treatment arrogant of students, plagiarism, conflict of interest, nepotism, unfair competition, issues of ethical evaluation of research projects, influence peddling, correctness of marking - corruption, violation of the right to privacy (in marking, in final grades, in statistical data, etc.), the status of small institutional gifts, etiquette problems in classes and in administrative services in turn, an environment in which a set of organizational practices develops that can be subjected to moral evaluation [42]. These organizational practices specific to each university are actually expressed through the actions of the members of the respective university and form the moral context in which ethical decisions are made, as Menzel would argue [43]. Far from being neutral or passive, the university context or environment plays an active role in the ethical decision-making process, in that it can constrain or, as the case may be, stimulate university members to act morally or immorally. This can be expressed either explicitly - through the policies and procedures in force (formally, at the level of the university structure), or implicitly - through attitudes, perpetuated traditions, assumed values (informally, at the level of the organizational culture in a university). Immoral behavior in the university has consequences, and we find it worthwhile to be so concerned about creating moral universities. It definitely seems more like an ideal than something we could translate into reality [44].

Of course, we can ignore the moral dimension of university life, but we will do so risking damages of all kinds, from those regarding job satisfaction, to those aimed at reputation and financial losses because as Spiru Haret said, "How the school looks today, so the country will show tomorrow". And vice versa: what the country looks like today, the school will look like tomorrow, and those who have had the patience to read our analysis know that the hard truth corresponds to the above descriptions, I also invite you to try predicting the future based on the assumption of this present, certainly unpleasant, but necessary, like the treatment of a disease. Today, Romania is like a madhouse, and unfortunately this comparison is not even a forced one, made only as a possible figure of speech. Unfortunately, Romanian society obviously shows shocking similarities with that of a hospice, and its citizens behave in such a way that they can easily be assimilated to doctors and guards, on the one hand, and patients, on the other. Because, a society repeatedly subjected to major traumas, as our society was at least in the last century, consecutively generates nervous diseases at the level of the individuals that compose it. After 45 years of Communism imposed with terror, in which I became aware of the prison I was living in, which came after the experience, unhappy in its second half, of an imported, selfish,

corrupt and dictatorial monarchy, followed over 30 years like this the so-called post-revolutionary period, in which hope was repeatedly killed, civility and representative democracy were practically permanently compromised, the traumas inflicted on disadvantaged social groups became chronic. This study presents the symptoms that we must watch for, of some diseases that have settled in our social environment. "Of course, the years have passed and the school is obliged to keep up with life, but not throwing overboard the real values in favor of some illusory ones. And the European, national or local education programs are very important, but we are not missing them, first of all, but the application of the existing laws, the removal of education from the status of a cinderella, the serious treatment of the school. Otherwise, we will destroy, without bombs and without pandemics, but step by step, this people." [45].

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Unele consideraţii referitoare la trilema civilizaţiei tehnologice: între tradiţie, conservaţionism şi revoluţie sau despre Educaţia tradiţională vs. Educaţia digitală

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Abstract

Învățarea tradițională combinată cu cea digitală devine din ce în ce mai atractivă. Astfel, nu se face trecerea bruscă de la tradițional, la digital, ambele aduc plus valoare dacă sunt combinate, iar schimbarea și trecerea numai la educația digitală este mai ușor de asimilat, în special de către profesori, care au fost educați și „antrenați" foarte mulți ani în maniera clasică, tradițională. Iar trecerea bruscă la mediul digital poate da naștere la frustrare, dar mai ales la rezistență la schimbare. Abordarea mixtă de educație online și convențională oferă și interacțiunea umană profesorii putând oferi feedback în timp real. Astfel, se câștigă timp, iar alte costuri sunt reduse, chiar eliminate. Acum, că opțiuni există, depinde numai de elevi și profesori să decidă ce variantă aleg. În plus, procesul de digitalizare a educației este de durată. Singura certitudine fiind aceea că doar într-acolo ne îndreptăm, către tehnologie în toate domeniile, acesta fiind parcursul firesc al evoluție, singura certitudine a vieții rămânând desigur, schimbarea. Cum se schimbă sistemul educational în era digitală? Aceasta este tema prezentului demers de cercetare științifică fiind inspirată de vremurile în care trăim.

Cuvinte cheie: *educație, civilizație tehnologică, tradiție, conservatorism, digitalizare, impact social, demeță digitală.*

1. Argumentum şi cuvânt înainte

Tema acestui demers de cercetare ştiinţifică este inspirată de vremea în care trăim, de percepţia pe care o avem despre modificările aduse societăţii de către om şi despre rolul pe care îl are tehnologia în acest context. Deoarece noţiunea „tehnologie" are un rol important în cadrul acestui studiu, voi face câteva precizări. În Micul dicţionar academic, editat de Institutul de Lingvistică al Academiei Române în 2010, există patru definiţii pentru tehnologie. Dintre acestea, a doua definiţie acoperă semnificaţia pe care o vom avea în vedere în continuare, şi anume: *„Tehnologia este ansamblul proceselor, metodelor, procedeelor, operaţiilor etc. utilizate în scopul obţinerii unui anumit produs"* [1].Şi chiar în titlu am făcut un rezumat a ceea ce citesc, aud şi văd cetăţenii care se informează din presa mainstream, adică cea de mare audienţă aflată sub controlul propagandei. Nici nu trebuie mai mult ca să pricepi că oamenii sunt trataţi asemenea pacienţilor dintr-un ospiciu care, după ce-şi iau porţia de medicamente, sunt amăgiţi şi cu minciuni ce să asigure liniştea stabilimentului. Iată de ce cred că ziua de care s-a temut Einstein a sosit. *„Îmi e teamă de ziua în care tehnologia o să fie mai importantă decât interacţiunea umană. Lumea o să aibă o generaţie de idioţi".* Modernitatea a subminat prestigiul şi statutul obiectiv al virtuţilor şi al moralei, creând ceea ce C.S. Lewis numeşte „oameni fără piept", oameni lipsiţi de sălaşul simbolic al curajului, onoarei şi responsabilităţii. Pentru a dovedi că raportarea la o normă absolută şi morală constituie fapte obiective, definitorii şi universale pentru om, C.S. Lewis invocă mari nume ale gândirii greceşti, romane, iudaice şi creştine, precum Platon, Aristotel, Augustin, Toma d'Aquino, alături de maeştri ai gândirii orientale, Confucius sau intelepţii hinduşi. Aserţiunea se înscrie în rândul celor mai clarvăzătoare critici ale omului postmodern. Obişnuit să considere adevărul şi dreptatea niste chestiuni subiective, interpretabile, omul actual şi-a pierdut criteriul esenţial care poate să-i confere rezistenţa în faţa tiraniei şi totalitarismului [2].

Cu acest preambul putem considera că tehnicizarea inumană a vieţii propune repere care evidenţiază şi analizează modul în care sistemul tehnologic actual organizează riguros şi totalitar duhul lumii, ţintuindu-ne într-o alipire de cele lumeşti, într-o dispersie spre cele exterioare, favorizând absolutizarea celor insignifiante şi trecătoare. Copleşit de fluxuri informaţionale, branşat în faţa ecranului, instrumentalizând diferite aplicaţii şi tehnici numerice, omul trăieşte o existenţă ecranată, mediată, artificială. Integrat în angrenajul tehnologic, omul îşi diminuează capacitatea de trezvie, aşezarea sa lăuntrică într-o stare de veghe care să îi permită unificarea puterilor sufleteşti. Treptat, duhul sistemului tehnologie invadează sufletul omului, logica de tip tehnic este interiorizată, generând o anumită stare de spirit, materializată prin tipare de gândire şi comportamentale. Pe măsură ce societatea va deveni tot mai tehnicizată, omul, pentru a supravieţui, va trebui să se asemene tot mai mult cu maşina. Atunci când omul va trăi mai mult în mediul artificial al tehnicii decât în realitatea dată de Dumnezeu el se va asemăna mediului tehnologic care-i configurează existenţa. Dezumanizarea se intensifică pe măsură ce omul este apreciat şi evaluat prin criterii tehnice. Viaţa, gândirea, acţiunea omului, evaluate după criterii tehnice presupun încurajarea omului de a gândi, de a munci, de a trăi precum o maşină. Astfel, gândirea vie, empatia, dragostea, tot ceea ce dă specificitate existenţei omului concret se supune unui profund proces de alienare.

În societatea tehnicizată, nevoile profunde ale omului, ceea ce vizează sufletul său, viaţa sa intrapersonală şi interpersonală sunt considerate irelevante. Şi totuşi, în pofida unor neajunsuri, trebuie să evidenţiez rolul pozitiv pe care dezvoltarea tehnologiei l-a avut în evoluţia societăţii omeneşti, având aici în vedere, relaţiile dintre natură şi om şi dintre om şi natură, despre cum a devenit omul un „zoon technologiko", despre civilizaţie şi tehnologie, despre viitorul civilizaţiei tehnologice. Este posibil că, în opoziţie cu ceea ce doresc unele curente anti-tehnologiste, omul va continua să îşi întărească controlul asupra naturii înconjurătoare cu ajutorul tehnologiei. Până unde? În ceea ce mă priveşte, în urmă cu 20 de ani, când am început să scriu texte la calculator, am fost încântat de posibilitatea de a muta un pasaj, o propoziţie, un paragraf sau chiar un singur cuvânt dintr-un loc în altul. Lucrul pe text a devenit astfel mai rapid, căci, dacă hotăram că acel conţinut arată mai bine în alt loc al documentului, nu mai trebuia să rescriu totul de la capăt: pur şi simplu deplasam pasajul în altă parte. Deseori, trebuia să mai adaptez un pic textul, pentru că nu mai concordau toate referinţele şi concluziile, dar pasajul cu pricina se afla acum la locul potrivit – şi asta în mai puţin timp decât cel necesar pentru a scrie încă o dată pasajul. Astăzi *copy–paste*, copierea şi lipirea unui text, sunt activităţi de la sine înţelese şi nu ne mai putem imagina cum se scriau pe vremuri scrisori sau cărţi fără a avea la dispoziţie aceste posibilităţi de editare. Tocmai de aceea, milioane de oameni care creează şi prelucrează texte lucrează la calculator: el preia o parte din munca noastră! Mai nou, inteligenţa artificială a preluat chiar prea mult, poate crea opere de artă, de la trexte literare la partituri muzicale! Oare până unde va „progresa" masiva transformare ? Pentru variante de răspuns, încercăm trilema civilizaţiei tehnologice.

2. Trilema civilizaţiei tehnologice: între tradiţie, conservaţionism şi revoluţie

Spaţiul tehnoredacţional nu ne permite să facem o trecere în revistă, în detaliu, a răspunsului dat la acestă întrebare, însă un succint excurs la istoria umanităţii în diverse locuri şi timpuri, ar fi util pentru a rememora unele etape ale evoluţiei speciei umane. Aceasta va permite să evidenţiem acele caracteristici ale speciei, care au determinat evoluţia către societatea umană actuală. Specia a fost iniţial una „obişnuită", adică a evoluat mult timp după legile selecţiei naturale, de la Australopitecus, la Homo Habilus, la Homo Erectus, la omul de Cromagnon şi la Homo Sapiens. Totuşi, după încheierea ultimei glaciaţiuni, acum circa 11.700 de ani, s-a petrecut ceva esenţial. În Orientul Apropiat, câteva persoane, probabil femei, au descoperit că este posibil să cultive plante pentru a-şi asigura rezerve de hrană. Oamenii au constatat că au opţiunea de a cultiva plante iar apoi de a creşte animale, în locul opţiunilor oferite de natură, de a le culege şi respectiv de a le vâna. A fost primul pas din următoarea perioadă de dezvoltare bazată pe cunoaştere şi tehnologie, prin care am început să ne diferenţiem de sistemele biologice naturale. Evoluţia noastră s-a îndepărtat din ce în ce mai mult de legea selecţiei naturale şi a fost determinată din ce în ce mai mult de tehnologii. Anticipând, ieşirea din dominaţia selecţiei naturale corespunde etapei apariţiei ştiinţei moderne şi

revoluţiei industriale. Odată ce acest prim pas a fost făcut, omul a continuat să ceară de la natură mai mult decât ea îi oferea în mod firesc. Consecinţa a fost că, pentru a-şi satisface necesităţile şi dorinţele, omul a început să modifice mediul, atât cel ambiant cât şi cel social. Procesul început cu primul pas a continuat fară întrerupere, dar lent, până acum circa 500 ani. Atunci au avut loc într-o mică regiune a globului, Europa, câteva procese de mare importanţă: Renaşterea, Iluminismul, Revoluţia Ştiinţifică, Revoluţia Industrială. La scara istoriei, aceste procese s-au desfăşurat rapid, astfel că la sfârşitul secolului XIX Europa era aşa de diferită de cea din Evul Mediu, încât era evident că schimbarea a fost fundamentală [3].

Finalizarea etapelor începute cu primul pas a fost un mare succes pentru specia umană: omenirea nu mai evoluează acum conform legilor selecţiei naturale: epidemiile pot fi combătute sau chiar evitate; efectele calamităţilor pot fi previzionate şi contracarate. Spre deosebire de speciile obişnuite, care îşi dezvoltă acele abilitaţi care permit adaptarea la mediu, specia umană îşi defineşte nevoile iar apoi modifică mediul pentru a şi le satisface. Aceasta este o caracteristică fundamentală a speciei noastre, existentă în permanenţă după efectuarea primului pas. Este evident că o caracteristică fundamentală a omului este nemulţumirea de a avea doar ceea ce se poate obţine în mod firesc de la natură. În permanenţă am dorit să ne îmbunătăţim traiul de fiecare zi. Nu ne-a plăcut să locuim în peşteri; am construit locuinţe, care şi-au modificat permanent funcţionalitatea ajungând acum zgârie nori şi clădiri inteligente. Nu ne-a plăcut să migrăm continuu, culegând şi vânând, am creat agricultura şi am crescut vite. Virusii şi microbii ne-au cauzat molime şi ne-au decimat, am creat medicina şi ne-am luptat cu ei. Am gospodărit sisteme ecologice locale de milenii iar sisteme regionale de zeci de ani. Sistemele de gospodărire a apei au atins dimensiuni uriaşe, comparabile cu dimensiunea unor state (bazinele Amu şi Sâr-Daria, bazinul Dunării, Marile Lacuri în America de Nord). Am ajuns să declanşăm anumite procese atmosferice şi să diminuăm efectele furtunilor. În general, în limita permisă de tehnologie, am încercat să modificăm natura în beneficiul nostru. Iar în zilele noastre nivelul atins de tehnologie a ajuns la un stadiu în care avem posibilitatea de a gospodări întreaga planetă. În legătură cu stadiul perioadei pe care o trăim, potrivit opinei Domnului Academician Mihail-Viorel Bădescu există mai multe puncte de vedere, însă două pot fi relevante pentru obiectul nostru de cercetare ştiinţifică. Astfel, primul punct de vedere aparţine The International Union of Geological Sciences – Uniunea Internaţională a Ştiinţelor Geologice - şi The International Commission on Stratigraphy – Comisia Internaţională de Stratigrafie. În iulie 2018, aceste organisme ştiinţifice au prezentat structura Cartei Stratigrafice Internaţionale. Din punctul de vedere al geologilor trăim în Meghalayan. Această nouă vârstă geologică acoperă ultimii 4.200 de ani din istoria Pământului şi este una dintre cele trei noi subdiviziuni ale epocii Holocenului (care începe acum 11.700 de ani, la sfârşitul ultimei glaciaţiuni). Membrii Comisiei de Stratigrafie au apreciat drept extraordinară şi suficient de argumentată concordanţa şi convergenţa dintre datele stratigrafice şi evoluţia culturală a umanităţii [4].

Un al doilea punct de vedere consideră că în acest moment trăim în Antropocen [5], un interval de timp recent, în care activităţile umane au alterat

profund, şi mai degrabă nefast, mediul şi procesele terestre, inclusiv clima, iar tehnologia este văzută ca principalul instrument al acestor modificări nedorite. Termenul a fost însuşit de mişcarea conservaţionista şi de mass-media. Este evident că între cele două puncte de vedere există o diferenţă semnificativă. Primul punct de vedere surprinde influenţa modificărilor naturii asupra evoluţiei umanităţii iar cel de-al doilea punct de vedere reţine ca meritând a fi evidenţiată numai influenţa negativă a omului asupra naturii. În opinia majorităţii istoricilor civilizaţiilor trăim într-o vreme în care tehnologia a devenit un atribut fundamental al societăţii umane. Am intrat în epoca „civilizaţiei tehnologice" şi unii cercetători deja consideră că ceea ce trebuie spus în primul rând despre această civilizaţie este indicele său Kardashev, celelalte aspecte fiind secundare [6].

Din perspectiva „civilizaţiei tehnologice" fiecare etapă istorică a accentuat asupra unor idei, aşa-numitele valori sau categorii, care s-au adăugat altor valori din epoci istorice anterioare, constituind împreună baze greu de zdruncinat, transmise prin tradiţie. Fiecare categorie a avut promotorii şi partizanii săi, dintre care unii, câţiva, au fost creatori iar alţii au fost păstrători ai ideii, transmiţând-o din generaţie în generaţie. Astfel, Antichitatea Greacă a accentuat asupra categoriilor de Bine, Adevăr şi Frumos iar filosofii, oamenii de ştiinţă şi artiştii au fost, respectiv, păstrătorii lor. Antichitatea Romană târzie a accentuat asupra categoriei de drept, apărată de juriști, care au transformat cutumele în coduri de legi şi le-au impus pentru sute de ani de-a lungul şi de-a latul Imperiului. Mult dezagreatul Ev Mediu a accentuat asupra categoriei onoare, cu sistemul jurămintelor de credinţă iar această categorie a fost apărată de o aristocraţie redusă numeric şi înfeudată, practicând duelul judiciar. Ce a adus nou, din punct de vedere al valorilor, epoca modernă? Epoca modernă, în diferite interpretări, este definită în raport cu evoluţia civilizaţiei occidentale, urmând Evului Mediu. Modernitatea este caracterizată printr-o serie de schimbări de tip nou, manifestate în accelerarea progresului în toate domeniile: politică, societate, economie, comerţ, transport, comunicaţii, ştiinţă, medicină, tehnologie şi cultură. O caracteristică originală şi proprie numai modernităţii o reprezintă revoluţia industrială începută în secolul 18 în Anglia şi apariţia acelor tehnologii care au dus mai târziu la o industrie mecanizată şi automatizată, ce a înlocuit treptat munca manuală. Revoluţia industrială a accentuat asupra categoriei de util, sau de folos, care este binele stoicilor, având inovatorii drept promotori iar inginerii şi tehnologii fiind, prin practică, păstrătorii ei. Societatea industrială, bazată pe tehnologie, a avut un succes aşa de mare încât într-un singur secol s-a răspândit şi în Orient, iar acum este dominantă pe întregul glob. Utilul s-a alăturat celorlalte valori tradiţionale, pe care uneori pare să le subordoneze, vechea ierarhizare între „episteme" şi „techne", adică între cunoaştere şi cunoaşterea interesată, pentru controlul lucrurilor, inversându-se deseori. Utilul este în acest moment deviză şi obiectiv al activităţii unor grupuri mult mai mari de oameni decât păstrătorii tradiţionali [7].

Din punct de vedere al dezavantajelor, tehnologia s-a trâmbiţat cu avantaje extraordinare care întotdeauna s-a dovedit şi amăgitoare, adică cu creştere, progres, dar şi alunecări spre pierdere (vezi economia de hârtie promisă de promovarea calculatoarelor sau a compact discului când a înlocuit discul vinil şi banda magnetică

etc.), în realitate fiind dictată şi interesată doar de profit nicidecum de beneficiul tuturor. Globalizarea şi tehnologia aduc vestea că naţiunile vor dispărea şi împreună cu ele şi graniţele şi diferendele culturale. Să aduc aminte aici că înainte de a exista statele, a fost globalizare şi debandadă pe pământ, iar la inventarea statelor, acestea au fost şi naţiunile care au inventat şi creat democraţia nu tehnologia [8]. Avansarea tehnologică îşi asumă meritul că datorită ei vom învinge şi că nu vom mai avea problemele create de statul naţional fără să realizăm că toate drepturile democraţiei le-am câştigat în ultimii o sută şi cincizeci de ani de lupte şi zbuciumuri sociale. Dacă nu suntem atenţi, ne avertizează unii specialişti că odată cu globalizarea vom pierde şi bucăţica de democraţie pe care o mai avem de la apariţia corporaţiilor încoace. Trebuie să ne gândim că marea majoritate a noastră nu îşi câştigă existenţa din tehnologie. Trei sferturi din populaţia globului nu trăieşte din tehnologie. Sunt puţini cei care se îmbogăţesc din ea şi în lăcomia lor, cei care o fac vor declanşa prin această mare diferenţă de câştig revolte, revoluţii şi chiar un război global cu cei săraci. Noua economie globală bazată pe tehnologia modernă poate fi sfârşitul nostru, chiar şi prin impactul social cauzat de tehnologie.

3. Impactul social al tehnologiilor

Prima revoluţie industrială a făcut ca, începând cu anul 1825, în Anglia valoarea producţiei industriale să o depăşească pe cea a agriculturii. În acelaşi timp se produce o schimbare radicală în ceea ce priveşte structura cheltuielilor populaţiei din Anglia: dacă la începutul secolului XIX cheltuielile cu alimentaţia reprezentau 90% din totalul cheltuielilor de consum, la mijlocul secolului acestea reprezentau doar două treimi. În aceeaşi perioadă, cheltuielile cu îmbrăcămintea s-au dublat. Structura cheltuielilor populaţiei s-a modificat în favoarea bunurilor pentru confort [9]. De-a lungul istoriei, o parte dintre profesii au dispărut sau s-au transformat în altele. Tendinţa se va accentua în perioada următoare pe măsura creşterii vitezei de implementare a invenţiilor şi a noilor tehnologii în viaţa cotidiană. Acest lucru nu trebuie să ne sperie. Trebuie doar să prezicem, cât mai devreme şi cât mai realist, aceste modificări şi să ne pregătim pentru a le face faţă prin pregătirea forţei de muncă în şcoală, dar şi prin recalificarea ei. Oricum, profesiile care cer creativitate, abilităţi cognitive, vor constitui pentru mult timp de aici înainte un apanaj al omului. Principalele tehnologii care vor produce mutaţii în structura locurilor de muncă vor fi roboţii şi inteligenţa artificială iar cele mai semnificative locuri de muncă în care se vor regăsi noile tehnologii sunt cele în care se efectuează muncă fizică solicitantă sau repetitivă, respectiv de colectare/procesare de date. Din prima categorie fac parte meserii din domeniul construcţiilor de maşini, metalurgiei, minier, cazare şi servicii alimentare, agricultură, manipularea şi distribuirea produselor, transport, îngrijirea şi reabilitarea bolnavilor etc. Din a doua categorie fac parte meserii din domeniul secretariatului şi arhivării, contabilităţii, cel bancar şi al asigurărilor, traducerii, editării de texte etc.

În acest sens, este sugestivă evoluţia numărului de locuri de muncă în câteva profesii în perioada 1986-2016 în Franţa, unde este de remarcat creşterea numărului de conducători de autovehicule, considerată până acum vreo 10 ani

profesia cea mai dificil de automatizat şi de înlocuit cu un robot [10]. Acum conducerea autonomă a devenit realitate, iar în scurt timp evoluţia acestei profesii va fi similară cu a celor prezentate anterior. Deja ea a intrat în viaţa cotidiană şi ne-am obişnuit cu bancomatele, maşinile de vândut bilete din gări sau staţiile de autobuz, automatele de vândut băuturi sau ţigări, dispozitivele automate de check-in sau control al paşapoartelor din aeroporturi etc. Mai mult, am început să ne obişnuim cu conversaţiile cu „roboţii" care răspund la solicitarea noastră de a obţine informaţii din domeniul bancar, al telefoniei mobile, al serviciilor de transport etc. Toate aceste „maşini" au preluat activitatea unor persoane, realizând-o, de multe ori, în condiţii şi la parametri mai performanţi decât factorul uman. Sisteme de inteligenţă artificială sunt capabile să învingă campioni ai unor concursuri de cultură generală sau de jocuri de strategie (şah sau Go), sau să preia sarcinile medicului în diagnosticarea bolilor [11]. Mai mult, sunt capabile să înţeleagă nu numai limbajul uman, ci şi starea emoţională şi caracterul interlocutorului şi să formuleze răspunsurile adecvate. Implicaţiile acestor sisteme vor fi observabile în următoarele câteva zeci de ani în toate domeniile de activitate: filologie (traduceri automate, analiza şi scrierea textelor etc.), istorie (analiza, corelarea şi sinteza informaţiilor din arhive, analiza artefactelor), artă (analiza prin imagistică a tablourilor, arta digitală, compunere de muzică), psihologie/psihiatrie (diagnosticarea şi tratarea unor fobii sau boli psihice prin tehnici de realitate virtuală) etc. Sugestive sunt trei exemple: unul din domeniul artelor şi două din domeniul literaturii. Atât domeniul muzical, cât şi cel al literaturii sunt domenii cu un grad de creativitate foarte ridicat. Programul EMI (Experiments în Muzical Intelligence), iar mai recent Annie, create de David Cope de la Universitatea din California, compun muzică clasică, şi nu numai, de o asemenea perfecţiune încât nici publicul avizat nu poate sesiza diferenţa unei compoziţii create de computer faţă de o corală de Bach sau o simfonie de Beethoven.

Al doilea exemplu se referă la previziunile privind evoluţia programelor de inteligenţă artificială în domeniul compunerii de lucrări literare: se estimează că până în anul 2024 vor fi funcţionale programele de traducere automată a textelor; până în anul 2026 vor fi utilizabile programele de scriere de eseuri cu scop didactic, utilizabile de elevi şi studenţi; după anul 2050 programele de inteligenţă artificială vor scrie romane [12].

În 2018, un roman compus de un program de inteligenţă artificială a fost aproape de a câştiga un premiu literar în Japonia [13]. Al treilea exemplu este din domeniul dispozitivele electronice de citit cărţi. Firma Amazon urmează să doteze dispozitivul său Kindle cu senzori biometrici şi de recunoaştere facială, precum şi cu un program de inteligenţa artificială, ceea ce va permite evaluarea impactului fiecărei fraze sau pasaj al cărţii asupra cititorului şi evaluarea gradului de satisfacţie al acestuia. Urmare a acestui lucru, sistemul de inteligenţă artificială îţi va propune cărţi care ştie că-ţi produc satisfacţie sau interes. Impactul tehnologiilor asupra ştiinţelor exacte va fi direct, prin dezvoltarea unor echipamente de calcul sau experimentale tot mai complexe şi mai performante. Dar cel mai spectaculos şi cel mai la îndemână domeniu, pentru că ne afectează pe toţi din punctul de vedere al calităţii vieţii, este cel al medicinii. S-au dezvoltat noi domenii ale ingineriei, cum ar

fi ingineria medicală, care pregăteşte ingineri pentru proiectarea, fabricarea şi întreţinerea echipamentelor medicale. Aceştia au proiectat şi realizat echipamente tot mai performante, bazate pe noi principii fizice, cele mai relevante fiind cele din domeniul imagisticii şi roboticii chirurgicale. Noile echipamente de imagistică au schimbat complet modul de investigare a corpului uman în ultimele decenii, îmbunătăţindu-se semnificativ rata şi momentul detectării unor maladii grave. Implanturile stomatologice, utilizate în mod curent astăzi, ar fi imposibil de realizat fără asistenţa imagisticii. La fel de spectaculoase sunt şi aplicaţiile roboţilor în chirurgie, care au parcurs fazele de la concept la cercetare, realizare şi utilizare curentă, într-un ritm de câteva decenii. În anul 1984 a fost realizată prima intervenţie chirurgicală de către un robot. Astăzi roboţii de tip da Vinci sunt deja utilizaţi curent în multiple tipuri de operaţii. Cercetătorii din ingineria materialelor au dezvoltat materiale noi biocampatibile, fapt ce a făcut posibilă realizarea de implanturi osoase, de ţesuturi sau chiar de organe artificiale [14].

Realizările fascinante ale tehnicii moderne şi implicaţiile sociale ale acestora a făcut ca mari gânditori să-şi orienteze atenţia asupra acestui fenomen, fiind dezvoltată o nouă direcţie de cercetare în filosofie: filosofia tehnicii. Filosofi şi sociologi celebri precum Ortega Y Gasset, Martin Heidegger, Jacques Ellul, Hannah Arendt s-au aplecat asupra aspectelor antropologice, etice, taxonometrice ale tehnicii, precum şi asupra proceselor de inovare şi evoluţie a tehnologiilor. Un rol important l-a avut analiza impactului social al dezvoltării noilor tehnologii şi a mutaţiilor pe care le produce aceasta în mentalul colectiv. Vom aminti aici doar trei din studiile celebre care au abordat acest subiect: *Die Frage nach der Technik* (Întrebarea privitoare la tehnică) al lui Heidegger, publicat în anul 1954 [15]; *The human condition* a lui Arendt, publicat în anul 1958 [16] şi *The Technological Society* a lui Ellul, publicat în traducere englezească în anul 1964 [17]. Ellul subliniază că sistemul tehnologic proliferează, restrângând libertatea omului, nu neapărat ca un rezultat al unui plan machiavelic. El vorbeşte de converegenţa spontană a numeroaselor tehnici, de aderenţa omului la acestea, astfel încât integrarea modelelor tehnice într-un sistem tehnologic coresprinzătoe converteşte viaţa într-o existenţă tehnicizată. Acest mod tehnicizat nu admite referinţa la transcendent, omul fiind cuprins într-un flux tehnologic, scvenţializat în el însuşi, în multiple secvenţe din care sistemul integrează ceea ce este convenabil. Ellul se întâlneşte în profunzime cu abordarea lui Ioan Petru Culianu care remarca faptul că „tehnologia reprezintă o magie democretizată." Ellul precum Mircea Eliade, arată că „în societatea tehnicizată miturile sunt deturnate." Miturile din lumea tradiţională sunt substituite de noile mituri ale societăţii tehnologice [18].

Ulterior, în special în ultimii 20 de ani, numărul publicaţiilor în acest domeniu a crescut semnificativ. Relevante sunt în acest sens sunt: *Thinking about technology*, a lui Pitt, apărută în anul 2000 [19] şi *Philosophy of Technology and Engineering Sciences*, un voluminos tratat editat de Meijers şi publicat în anul 2009, reprezentând volumul al 9-lea al celebrului *Handbook of Philosophy of Science* [20]. Lansarea la târgul auto de la Paris din 5 octombrie 1955 a modelului de automobil avangardist DS 19 de către firma Citroën l-a fascinat pe gânditorul francez Roland Barthes într-atât încât i-a dedicat acestuia un eseu intitulat „*La nouvelle Citroën*",

inclus în volumul de eseuri *Mytologies*. Este unul din cele mai frumoase eseuri dedicate unei realizări a tehnicii moderne. Sugestivă, în acest sens, este fraza de început: „*După părerea mea, astăzi, automobilul este echivalentul destul de exact al marilor catedrale gotice: adică o mare creaţie a epocii, concepută cu pasiune de nişte artişti necunoscuţi, consumată ca imagine de un întreg popor, care, prin ea, îşi apropie un obiect cu desăvârşire magic*."

Schimbările produse de dezvoltarea tehnologiilor digitale au făcut ca psihologii, sociologii şi educatorii să caute să explice prin ce se diferenţiază noile generaţii de cele educate şi formate înaintea apariţiei acestor tehnologii. Asfel, Mark Prensky a introdus în anul 2001, în faimosul său articol *Digital Natives, Digital Immigrants* [21], termenul de „*Digital nativ*". Acesta a definit *nativii digitali* ca fiind tinerii născuţi în ultimii 20-30 de ani şi care au crescut odată cu calculatoarele, telefoanele mobile şi internetul. Pe cei care s-au născut înaintea acestei perioade, dar care au adaptat aceste noi tehnologii Pensky i-a numit „*Digital immigrants*" (*imigranţi digitali*). Ulterior [22], acesta a introdus un nou concept „*Digital wisdom"* (*Înţelepciune digitală*) care reprezintă acea capacitate a unei persoane de a utiliza noile tehnologii în scopul îmbunătăţirii performanţelor sale cognitive, nu numai de a le înţelege. La fel cum electricitatea ne-a schimbat viaţa acum 100 de ani, tot aşa se va întâmpla peste câţiva ani cu inteligenţa artificială. O mare parte dintre deciziile din viaţa cotidiană şi din cea profesională va fi luată de sisteme care înglobează inteligenţa artificială. Este bine, este rău? Viitorul ne va da răspunsul la această întrebare.

Cealaltă faţă a dezvoltării tehnologiilor o reprezintă efectele lor negative. Vom menţiona câteva dintre ele: o dependenţă a omului de tehnologie (de telefonul mobil, de calculator, de programele de Inteligenţă Artificială etc.), ceea ce duce la pierderea abilităţilor sociale; utilizarea în scop distructiv a acestora (spre exemplu a tehnologiilor militare de către teroriști); utilizarea tehnologiilor avansate pentru manipularea opiniei publice (spre exemplu, campania de manipulare vaccinare sau campaniile de manipulare din India, care au dus la linșaj etc.); impactul asupra mediului (încălzirea planetară, creşterea conţinutului de CO_2, deşeurile tehnologice – radioactive sau poluante); o bulversare pe piaţa forţei de muncă etc. [23]. Oricum, dezvoltarea tehnologiilor are două feţe: una angelică şi cealaltă malefică. Una care să ne ducă spre condiţia de Zei şi cealaltă care să ne ducă spre Iad. Omul va trebui să aleagă calea pe care o va urma. Din acest punct de vedere, trebuie să fim optimişti că va alege calea corectă a cărei evoluția o descifrăm.

4. Evoluţii şi tendinţe în domeniul tehnologiilor

În continuare ne vom referi la rolul pe care îl va juca tehnologia în următoarele vremuri. Vom vedea că există diferite opinii în acest sens şi vom prezenta principalele opţiuni pe care societatea umană le poate avea pentru viitor. Mai întâi, câteva comentarii pregătitoare. De-a lungul istoriei sale umanitatea a trăit sub ameninţarea dezastrelor. Orice eveniment natural major (inundaţie, cutremur, incendiu, epidemii) decima populaţia. Pentru omenire natura nu apărea ca fiind un mediu prietenos, care se doreşte conservat, atât timp cât acesta constituia şi o sursă

de dezastre. Numai când natura a început să fie controlată, efectele dezastroase s-au diminuat sau au încetat. În decadele din urmă omenirea a adus modificări mediului pe o mare suprafaţă a globului. Va continua oare această creştere a impactului umanităţii asupra naturii? Pentru a da un răspuns nu este suficient apelul la ştiinţă. Trebuie să apelăm şi la morală şi etică. În societatea contemporană s-au propus mai multe principii etice de comportament în raport cu mediul, iar câteva dintre ele vor fi reamintite pe scurt. Un principiu etic ar putea fi cel tradiţional şi anume: în acţiunile ce privesc mediul trebuie să avem în vedere beneficiul umanităţii. Alte principii luate deseori în considerare în spaţiul public sunt: conservarea biodiversităţii, apărarea speciilor pe cale de dispariţie şi conservarea naturii. Mai există, bineînţeles, şi alte principii însă este evident că nu toate principiile sunt independente sau compatibile între ele. Modul în care omenirea alege dintre aceste principii depinde însă de ideologii, care conţin şi aspecte sentimentale, ne-raţionale sau bazate pe transgresii. Vom prezenta, succint, cele mai semnificative ideologii care fac referire la tehnologie.

Una dintre ideologii, care se poate încadra în specia anti-tehnologismului, consideră că prin folosirea tehnologiilor ne-am îndepărtat de modul de viaţă din trecut şi, prin urmare, trebuie redus apelul la tehnologie, pentru a reveni către acel mod de viaţă. Un eminent susţinător al renunţării la tehnologie a fost Martin Heidegger, considerat a fi unul dintre cei mai influenţi filosofi ai secolului 20. Într-un eseu din 1954, „*Întrebarea privind Tehnologia*" el a condamnat părerea că natura este o simplă resursă pentru consum uman spunând că aerul nu este făcut pentru ca din el să se extragă azot, pământul nu este făcut să fie sursă de zăcăminte. El condamna barajele hidrocentralelor pentru că stochează energia, care altfel ar circula liberă. De asemenea, referindu-se la măsurători antropometrice, care arată că în Holocen capacitatea craniană a speciei s-a diminuat faţă de Pleistocen, cu circa 10% la bărbaţi şi 20% la femei, cercetători importanţi consideră că specia umană a regresat şi, ca urmare, pledează pentru revenire la modul de viaţă ancestral, caracterizat de trai în grupuri de vânători şi culegători, având maxim 9-12 indivizi. Pentru aceasta sunt sugerate politici agresive anticipative de tehnologizare, micşorare a numărului populaţiei şi returnare deliberată a terenurilor agricole către fondul de mediu ne-amenajat. Această ideologie propune, de fapt, o schimbare fundamentală a atitudinii de milenii a umanităţii, care a încercat permanent să iasă de sub tutela naturii, caracterizată de indiferenţă faţă de om şi furnizoare de surprize neplăcute şi dezastre: uragane, inundaţii, vulcanism, molime, cutremure. Întradevăr, strămoşii noştri nu au adoptat principiul „*Să lăsăm natura în voia ei*", pentru că dacă l-ar fi adoptat puţini dintre noi am mai fi trăit acum [24].

O a doua ideologie, făcând parte din curentul moderat al conservaţionismului, îşi propune să menţină relaţia dintre umanitate şi natură la starea actuală. Adepţii acestei ideologii nu exclud tehnologia. Din exprimările acestei ideologii face parte şi enciclica papală Laudato si, publicată în mai 2015 şi considerată a fi primul manifest ecologist papal din istorie. Următorul pasaj este edificator: „*Dacă este adevărat că, uneori, noi creştinii am interpretat numai rău Scripturile, trebuie să respingem astăzi cu putere că, din faptul de a fi creaţi după chipul lui Dumnezeu şi cu misiunea de a domina pământul, decurge pentru noi o dominaţie absolută asupra altor creaturi. Noi*

apreciem astfel că Biblia nu dă loc unui antropocentrism despotic care s-ar dezinteresa de alte creaturi" (Laudato si, §67-68). Pasajul este considerat de unii ca o modificare majoră de atitudine a Bisericii Catolice, pentru că el propune o înțelegere profund diferită față de cea tradițională a poruncii divine fondatoare: *„Să facem om după chipul și asemănarea Noastră, ca să stăpânească peștii mării, păsările cerului, animalele domestice, toate vietățile ce se târăsc pe pământ și tot pământul" (Facerea, I, 26).*

O a treia ideologie este continuatoare a tradiției, considerând că problemele umanității se pot rezolva prin creșterea controlului asupra naturii. Deosebirea față de etapele anterioare este că în aceste vremuri, datorită nivelului atins de tehnologie, anvergura proiectelor și implicit controlul naturii încep să se întindă la nivel planetar. Adepții acestei ideologii consideră că, indiferent de principiul adoptat, în atingerea obiectivelor propuse se vor folosi tehnologii, iar ceea ce va rezulta la nivel global va fi o divizare a Terrei în zone în care vor exista amestecuri în diferite grade, între lucruri numite „umane" și lucruri numite „naturale". Pe ce cale va merge umanitatea în viitor? Acest lucru depinde de modul în care aceste trei ideologii, sau oricare alta, vor rezista probei practice, și, într-o societate preponderent democratică, vor fi acceptate și însușite de majoritatea populației, aici incluzând și adeziunea femeilor. Oamenii politici, cei care sunt răspunzători de conducerea statelor și organismelor interstatale, nu sunt străini de aceste curente ideologice și fac parte din categoria oamenilor cu opinii personale bine-conturate, lucru obligatoriu pentru activitatea pe care o desfașoară. Totuși, atunci când un politician trebuie să decidă asupra unor aspecte practice, libertatea sa de alegere este îngrădită iar forța împrejurărilor îl poate determina să aleagă variante care nu sunt în acord cu ideologia preferată [25].

Aplicarea în practică a principiilor, oricare ar fi ele, întâmpină greutăți, indiferent de ideologie. În această etapă a evoluției umanității, dificultăți majore sunt cauzate direct sau indirect de creșterea numerică a populației. Este cunoscut faptul că impactul unei societăți asupra mediului este proporțional cu mărimea populației, cu cererea de resurse pe persoană și cu factorul tehnologic (adică mijloacele tehnice și resursele de energie de care dispune societatea). Situația actuală este caracterizată de creșterea exploatării resurselor de toate tipurile (de apă și combustibili clasici, în principal), iar aceste resurse fiind limitate, de extinderea prospectiunilor și exploatărilor în noi zone. De asemenea, creșterea populației, care continuă deși într-un ritm mai scăzut, necesită mărirea, la anumite intervale de timp, în condițiile aceleiași suprafețe terestre disponibile, a capacităților de asigurare a hranei, a apei, a fondului de locuințe, a transportului, a mjloacelor de evacuare și a locurilor de depozitare a deșeurilor, a mijloacelor de producere a energiei și a infrastructurilor asociate. Necesitatea continuării modificării mediului apare, prin urmare, drept una dintre consecințele inevitabile ale creșterii demografice și căutării de noi resurse. Problemele de mare anvergură pe care le va avea în față umanitatea în viitor, caracterizate de constrângeri din ce în ce mai severe, vor necesita și soluții tehnologice de mare anvergură. Multitudinea unor astfel de proiecte, conducând la modificarea mediului terestru la scară regională, continentală sau globală a primit denumirea generică de geoinginerie. Capacitatea

tehnologică actuală a omenirii permite abordarea unor astfel de proiecte iar în condiţiile şi constrângerile actuale evitarea opţiunii bazată pe geoinginerie pare lucru cu neputinţă.

În ultima perioadă în domeniul tehnologiilor pot fi puse în evidenţă câteva tendinţe. Şi vom stărui numai asupra a trei domenii: vehiculele autonome; roboţii avansaţi; tehnologiile de prelucrare prin adăugare de material. Dacă acum câţiva ani domeniul vehiculelor autonome era încă un domeniu de avangardă în cercetare (Google a anunţat realizarea primului automobil autonom în anul 2010), acestea au devenit realitate sub ochii noştri. Autovehicule autonome circulă deja pe soşelele publice, în regim de testare, atât în Statele Unite, cât şi în Germania. Prin dezvoltarea şi creşterea robusteţii sistemelor de comunicare între entităţi fizice M2M (Machine-to-Machine), aplicaţiile în domeniul industrial al vehiculelor autonome au devenit tot mai prezente, având un rol important în logistica din halele de prelucrare, de montaj, din depozitele de piese etc. Trecerea la un nou nivel de comunicare între subiectul uman şi entitatea fizică de tip H2M (Human-to-Machine, Om-Maşină) sau mai recent B2V (Brain-to-Vehicle, Creier-Maşină) a făcut posibilă deja realizarea unui vis al omului, care până acum câţiva ani era încă de domeniul literaturii ştiinţifico-fantastice: conducerea prin puterea gândului a automobilului! Firma Nissan a prezentat anul acesta noul concept de automobil, IMx, condus prin comenzile date direct de creier sistemului de conducere al autovehiculului. Un motiv de mândrie pentru noi, ca români, este faptul că directorul care coordonează proiectul menţionat este un tânăr român, cu un nume neaoş românesc: Gheorghe. Aplicaţiile medicale ale acestui mod de comunicare Creier-Maşină, prin realizarea unor membre bionice, au un impact deosebit de mare pentru inserţia socială a handicapaţilor cu paralizii sau amputări ale membrelor.

Roboţii avansaţi, dotaţi cu sisteme de inteligenţă artificială şi senzori performanţi, sunt capabili să comunice între ei, dar şi cu operatorul uman sau cu alte echipamente din procesul de producţie, în realizarea unor sarcini complexe, să se adapteze unor situaţii neprevăzute, să înţeleagă mediul în care acţionează. Numele unor roboţi humanoizi, precum ASIMO construit de Honda, Sophia construit de Hanson Robotics sau Robina construit de Toyota, ne sunt familiare [26]. Aceştia au capacitatea să dialogheze cu omul, să-i înteleagă gesturile şi emoţiile. Roboţii folosiţi în industrie sunt capabili să efectueze acţiuni rapide, complexe şi precise, precum ar fi acelea de montaj ale unor componente de automobil în zone greu accesibile pentru operatorul uman. Sau, mai mult, să coopereze între ei în scopul realizării unor sarcini noi, neprogramate [27]. S-a dezvoltat astfel un nou domeniu al roboticii, denumit Cobotică. Firma BMW din München testează deja astfel de celule de fabricaţie robotizate, utilizate în tehnologia de sudură a structurilor automobilelor. Este posibilă colaborarea între roboţii celulei în sensul posibilităţii auto-reconfigurării secvenţelor de lucru, asfel încât acestea să se adapteze automat la o nouă configuraţie a structurii automobilului, nefiind necesară reprogramarea fiecărui robot în parte.

Dintre tehnologiile avansate, dezvoltate în ultimii ani, aceea a tehnologiilor de prelucrare prin adăugare de material (Additive Manufacturing) este cea care răspunde cel mai bine cerinţelor celei de-a patra revoluţii industriale. Tehnologiile

Aditive Manufacturing reprezintă o serie de tehnologii caracterizate prin aceea că utilizează un model 3D virtual al piesei, pe care îl transformă într-un model fizic prin procese de adăugare de material. Au apărut pe plan mondial la mijlocul anilor ’80, sub denumirea de tehnologii de Rapid Prototyping şi s-au dezvoltat extrem de rapid în ultimele trei decade, aducând un plus de valoare şi o complementaritate la tehnologiile clasice. Acestea au revoluţionat domeniul tehnologiilor de fabricaţie şi au condus la introducerea, la începutul anilor 2010, a unei noi paradigme în acest domeniu, şi anume Cloud Manufacturing (prin analogie cu Cloud Computing). Tehnologiile Additive Manufacturing au aplicaţii în industria de automobile, aerospaţială, medicală, de bijuterii, încălţăminte, arhitectură, construcţii etc. Una din aplicaţiile recente ale tehnologiilor de prelucrare prin adăugare de material este cea a fabricării unui automobil în cadrul expoziţiei International Manufacturing Technology Show din Detroit, MI, USA. Lucrătorilor firmei Local Motors din Phoenix, Texas, le-au luat 44 de ore pentru a imprima 3D componentele automobilului, o zi pentru prelucrări mecanice de finisare şi două zile pentru ansamblarea altor componente precum motorul, cutia de viteze, componentele electronice şi roţile [28].

Cum va arăta viitorul? Care va fi următorul pas? Când şi în ce va consta următoarea revoluţie? „Este dificil să faci predicţii, mai ales despre viitor”. Aşa glăsuieşte un vechi proverb danez. Dar asta nu opreşte oamenii să încerce mereu - poate, poate, proverbul se va dovedi greşit până la urmă. În articolele mele am discutat despre diferite predicţii. De fiecare dată, am sperat că articolul respectiv a explicat suficient de bine de ce este dificil să faci predicţii, în special despre viitorul lumii tehnicizate. Dar, se pare, unora le place să construiască şi altora să citească permanent scenarii de tot soiul: alarmiste, pesimiste, optimiste, apocaliptice însă viitorul mai cuprinde şi aspecte impredictibile, neprevăzute, neanticipate. E bine să lăsăm loc şi pentru indeterminat, neştiut, miracol. Poate că şi în asta constă frumuseţea existenţială, descoperirea, mersul nostru înainte. Nu aduce anul ce aduce ceasul. O predictibilitate absolută, mecanică ne-ar transforma în ne-oameni, iar lumea ar deveni o inginerie planificată, o maşinărie monotonă, plată. Nu toate previziunile se îndeplinesc şi nu toate sunt benefice. Să nu uităm că oracolul din Delfi a prevăzut sau indus şi lucruri neconforme cu mersul firesc al lumii. Nu de astfel de „predictori” avem nevoie. Educaţia ar avea ca sarcină şi pregătirea noastră pentru a asuma sfidări şi experienţe inedite, neprefigurate, surprinzătoare. Nu tot ce se iveşte pe ne-veste este de repudiat. Continuitatea cronologică – individuală, umană – se întâmplă şi datorită permanentizării, adâncimii, insondabilului unor feţe necunoscute aduse de viitor. Şi totuşi, potrivit opiniei Domnului Academician Dorel Banabic următoarea revoluţie industrială se va realiza în momentul în care maşinile (uneltele) se vor reproduce (multiplica) ele însele: îşi vor gândi, proiecta şi realiza singure mijloacele de care au nevoie pentru îndeplinirea sarcinilor date de subiectul uman. Cât de departe este acest moment? Greu de spus. Prefigurări în acest sens sunt deja realizate: există deja programe de calculator care „scriu” la rândul lor programe. Ţinând seama de faptul că viteza implementării unei noi invenţii în viaţa cotidiană este din ce în ce mai mare, momentul apariţiei următoarei revoluţii poate fi estimat la câteva zeci de ani. Dacă privim istoria tehnologiilor din punctul de

vedere al adaptării acestora la cerinţele consumatorului, o putem periodiza în următoarele patru etape, care se suprapun, în general, peste cele patru revoluţii industriale.

Perioada dinaintea primei revoluţii industriale (cea a producţiei artizanale) este caracterizată prin aceea că fiecare produs era proiectat şi realizat pentru un anumit client (încălţămintea, hainele etc.). Revoluţia industrială din secolele XVIII şi XIX a condus la o creştere a productivităţii şi a volumului de producţie pe variante de produs, ceea ce a făcut ca, la începutul secolului XX, să se treacă la o altă paradigmă, aceea a producţiei de masă (introdusă de Ford în fabricaţia modelului de automobil Ford T). În această etapă este fabricat un număr limitat de produse, acestea fiind realizate într-un număr foarte mare, presupunându-se că vor fi suficienţi cumpărători pentru ele. Anul 1955 se consideră a fi caracteristic pentru producţia de masă, fiind anul cu volumul cel mai mare de producţie pentru o anumită variantă de produs. Începând cu acest an, de cotitură, varietatea produselor creşte, iar numărul de produse pe o variantă începe să scadă. Anul 1969 este anul trecerii într-o nouă etapă, aceea a personalizării de masă, în care clientul selectează produsul dorit, dintr-o listă de opţiuni, înaintea realizării acestuia (exemplu clasic este cel al alegerii configuraţiei autoturismului de către client pe baza unei liste de variante şi apoi lansarea acestuia în producţie). Cea de-a patra etapă tehnologică este aceea a producţiei personalizate, care începe în prima decadă a secolului XXI. În această perioadă, opţiunile produsului sunt alese de către client, cumpărate de la producător şi apoi realizate cu sisteme avansate de prelucrare. Din cele de mai sus rezultă că tehnologiile au parcurs o dezvoltare ciclică, de la producţia artizanală personalizată (orientată pe individ), la producţia de masă (orientată pe produs), apoi la cea personalizată de masă (orientată pe grupuri de consumatori) şi revenind la producţia personalizată (orientată pe consumatorul individual). Din acest punct de vedere, următoarea revoluţie industrială va apărea în momentul în care fiecare consumator îşi va produce singur bunurile de care are nevoie, într-un timp rezonabil, utilizând tehnologii de tipul Additive Manufacturing şi programele necesare pentru aceasta, descărcate din internet (Cloud). În felul acesta, ciclul se închide complet, revenindu-se la tipul de producţie din comuna primitivă, în care fiecare individ îşi producea singur bunurile necesare [29]. Până atunci să analizăm o nouă situaţie des întâlnită în societatea de azi, „sindromul vulnerabilităţii" al „sclavilor fericiţi" care ascunde primejdii nebănuite.

5. „Sindromul vulnerabilităţii al sclavilor fericiţi" sau despre „Demenţa digitală"

La începutul secolului XXI, occidentalul se simte din ce în ce mai „vulnerabil". Panica, nesiguranţa, apatia socială, evitarea riscurilor, însoţită de măsuri drastice de securitate au înlocuit spiritul temerar şi eroic, activismul politic, dorinţa de-a experimenta şi a depăşi limitele. Se naşte sub ochii noştri o nouă paradigmă culturală în jurul conceptului de „vulnerabilitate". Totul a devenit subordonat noţiunii de „safety", siguranţă într-un sens restrâns, pur tehnic. Perceperea realităţii prin ochelarii vulnerabilităţii este un fenomen cultural, strîns legat de statutul

individului în epoca hiperglobalizării şi postmodernităţii instituţionalizate [30]. Încântat de sine însuşi şi de lumea sa aseptică, omul postmodern rămâne sclavul unei mentalităţi a confortului. Căutarea cu orice preţ a „vieţii confortabile" s-a transformat într-un ideal personal şi colectiv de necontestat; confortul este noua religie, promovată de tehnologism, globalism şi consumismul de masă. Lipsit de confort, de mistica şi imaginarul social pe care acesta le presupune, omul postmodern ar fi cuprins de o teribilă panică; faţă în faţă cu realitatea şi cu propria sa conştiinţă, s-ar simţi gol şi neputincios. Sursă de satisfacţii imediate, confortul îi risipeşte însă temerile, îl apără de confruntări dezagreabile. Îl transformă într-un sclav fericit. Titlul i-a fost inspirit de Huxley, marele scriitor şi intelectual britanic, care în anii '30 a înţeles că manipularea fiinţei umane nu se face doar prin instrumentul fricii, ci şi prin acela al confortului. Paranteza comunistă s-a încheiat, urmează însă un capitol vast în care oamenii îşi vor închipui că sunt liberi fără să fie. Ovidiu Hurduzeu ne demonstrează că nu există libertate acolo unde omul şi-a uitat divina tensiune lăuntrică. O opinie lucidă, împotriva manipulării [31]. Însă mult mai grav este efectul nefast al tehnoligiei asupra creerului uman, cauzator al „demenţei digitale" aşa cum o cerceta şi denumea Manfred Spitzer într-o cunoscută lucrare a sa [32].

„Demenţa este un declin mental. Ca orice descensiune, durează mai mult dacă începe de la o înălţime mai mare. La rândul ei, această înălţime sau capacitatea funcţională a minţii depinde, la fel ca în cazul muşchilor, de antrenament. Antrenamentul mental – învăţarea – se petrece automat, ca la muşchi, odată cu efortul mental şi fizic. Facem efort mental atunci când *interacţionăm în mod activ cu lumea*." În timpul învăţării se modifică sinapsele, adică legăturile dintre celulele nervoase, iar randamentul creierului creşte. Pe deasupra, în hipocamp, responsabilul cu înmagazinarea de date, se formează celule nervoase noi, care rămân în viaţă doar dacă sunt solicitate intens. Învăţarea foloseşte nu doar hardware-ul neuronal deja existent, ci şi neuronii noi, pe care îi ţine în viaţă. Un lucru este clar: capacitatea noastră mentală depinde de cât efort mental depunem mai ales în cazul tinerilor în perioada lor de formare. În opinia unanimă a medicilor, educaţia este cel mai important factor pentru sănătatea unui om. Lucrul este valabil atât pentru sănătatea mentală, cât şi pentru cea fizică. Şi, pentru că sănătatea mentală depinde şi de cea fizică, educaţia are un efect dublu. Mai mult chiar: educaţia ne face liberi de multe constrângeri, căci cine este educat se poate poziţiona critic faţă de sine şi faţă de mediul înconjurător, fără să trăiască la voia celorlalţi şi a întâmplării. Toate acestea reduc stresul, care distruge celulele nervoase. Astăzi se vorbeşte mult despre învăţarea neîntreruptă, care durează toată viaţa. Dar adesea se trece cu vederea că bazele ei se pun printr-o bună educaţie în copilărie şi în tinereţe, după cum se va vedea ceva mai încolo. „Google ne prosteşte?" – acesta este titlul unui eseu de critică media al expertului în internet şi publicistului american Nicholas Carr [33]. Când tratăm despre mediile digitale şi posibilele pericole pe care le prezintă, trebuie să ne îndreptăm atenţia nu numai înspre Google; de asemenea, nu poate fi vorba pur şi simplu de prostie. Cercetarea modernă a creierului arată că folosirea la o scară mai largă a mediilor digitale reprezintă un motiv serios de îngrijorare. Creierul nostru se află într-un proces continuu de schimbare, de unde

rezultă în mod necesar că întrebuinţarea zilnică a mediilor digitale nu poate să nu aibă efecte asupra noastră, utilizatorii. Mediile digitale – calculatoare, telefoane inteligente, console de jocuri şi nu în ultimul rând televizorul – ne schimbă viaţa [34]. În acest context, mai mult decât alarmant, chiar sumbru se configurează deja paradigma „educaţia tradiţională vs. educaţia digitală" [35].

6. Educaţia tradiţională vs. Educaţia digitală sau Şcoala: *copy–paste* în loc de scris şi citit?

6.1. Contextul european şi naţional

Începând cu luna martie 2020, criza COVID-19 a determinat instituţiile de educaţie şi formare din Europa să îşi închidă uşile şi să treacă rapid la predarea la distanţă/online. În câteva săptămâni, peisajul educaţional din Europa şi din întreaga lume s-a schimbat fundamental. Profesorii, elevii şi familiile lor s-au adaptat rapid şi au continuat să înveţe, dând dovadă de hotărâre şi perseverenţă. Pandemia COVID-19 a determinat conştientizarea lacunelor şi deficienţelor semnificative în ceea ce priveşte abilităţile digitale, conectivitatea şi utilizarea tehnologiilor în educaţie. În plus, conform celui mai recent Index al economiei şi societăţii digitale, 42% dintre europeni nu au abilităţi digitale de bază, iar piaţa muncii europene se confruntă cu un deficit semnificativ de experţi în domeniul digital. Mai mult, criza COVID-19 a atras atenţia atât asupra oportunităţilor şi riscurilor vieţii online, cât şi a necesităţii unui mediu digital mai bun şi mai sigur pentru toţi, mai ales pentru tinerii sub 18 ani. Adaptarea sistemelor de educaţie şi formare la era digitală a devenit o temă de interes major pe agenda europeană, aspect reflectat în următoarele iniţiative : lansarea la 01 iulie 2020, de către Comisia Europeană a noii Agende Europene a Competenţelor pentru competitivitate, echitate socială şi reziliență, care cuprinde următoarele obiective:

- Consolidarea competitivităţii durabile şi asigurarea echităţii sociale;
- Creşterea rezilienţei sociale şi promovarea învăţării pe tot parcursul vieţii;
- Formarea competenţelor pentru un loc de muncă şi rezilienţa economiei.

În esenţă, această iniţiativă pune accentul pe abilităţi şi educaţie profesională, propunând un set de 12 acţiuni ale UE, care stabileşte obiective cantitative ambiţioase la nivelul UE şi prezintă modul în care UE va sprijini investiţiile pentru competenţe. Astfel, o Recomandare a Consiliului privind educaţia şi formarea profesională pentru competitivitate, echitate socială şi reziliență care pune accentul pe formarea competenţelor pentru realizarea tranziţiilor ecologice şi digitale, asigurând totodată incluziunea dar şi un set de indicatori pentru învăţarea adulţilor până în 2025 când 230 de milioane de adulţi din populaţia UE ar trebui să aibă cel puţin competenţe digitale de bază.

Lansarea, la 30 septembrie 2020, de către Comisia Europeană, a noului *Plan de acțiune pentru educația digitală*, denumit „*Resetarea educației și formării pentru era digitală (2021-2027)"* a continat și completat primul Plan de acțiune în domeniul educației digitale, care a fost adoptat în ianuarie 2018, forma revizuită constituind parte a viziunii privind Spațiul european al educației. Premergător, Comisia Europeană a realizat în perioada iunie – septembrie 2020 un amplu proces de consultare publică pentru revizuirea planului de acțiune pentru educație digitală. În esență, noul *Plan de acțiune pentru educația digitală* reprezintă un apel la o cooperare mai strânsă între statele membre ale UE, astfel încât sistemele de educație și formare să devină adecvate pentru era digitală, dat fiind impactul transformării digitale asupra societăților, asupra pieței muncii și a viitorului acesteia, precum și asupra sistemelor de educație și formare. Din această perspectivă, transformarea digitală în educație este determinată de progresele în materie de conectivitate, utilizarea pe scară largă a dispozitivelor și a aplicațiilor digitale, nevoia de flexibilitate individuală și cererea din ce în ce mai mare de competențe digitale. Totodată, constituie un apel la acțiune pentru o cooperare mai strânsă la nivel european, pentru a trage concluzii în urma crizei provocate de pandemia de COVID-19, criză pe parcursul căreia tehnologia este utilizată la cel mai ridicat nivel în domeniul educației și formării, respectiv pentru adaptarea sistemelor de educație și formare la era digitală. Din perspectivă structurală, noul *Plan de acțiune pentru Educația digitală* include recomandările formulate pe baza consultărilor extinse cu părțile interesate și cuprinde două priorități strategice: dezvoltarea unui ecosistem educațional digital de înaltă calitate și consolidarea competențelor digitale.

Inițiativa vizează consolidarea sistemelor de educație și formare în urma crizei provocate de coronavirus, concomitent cu demersurile de redresare a UE, bazate pe tranziția către o Europă verde și digitală. În esență, crearea Spațiului european al educației se înscrie în sfera obiectivelor stabilite de noua *Agendă Europeană a Competențelor pentru competitivitate sustenabilă, echitate socială și reziliență* și completează panorama acțiunilor subsecvente priorităților strategice din noul Plan de acțiune pentru educația digitală, întrucât vizează următoarele direcții de acțiune: formarea competențelor de bază și transversale, incluziune și egalitate de gen, tranziții ecologice și digitale, formarea cadrelor didactice, învățământ superior, consolidarea cooperării internaționale în educație și formare, inclusiv prin deblocarea potențialului de cooperare din sectorul învățământului profesional și tehnic. Similar statelor membre, și în România, începând cu luna martie 2020, criza „COVID-19" a reconfigurat practicile educaționale de la interacțiunea „față-în-față" la mediul online. Această provocare a evidențiat rolul educației digitale ca obiectiv-cheie pentru predarea-învățarea-evaluarea de calitate, accesibilă și favorabilă incluziunii, precum și necesitatea unei abordări strategice privind dobândirea competențelor digitale pe tot parcursul vieții, pentru toți actorii implicați. În această perioadă, „predarea-învățarea" s-a mutat preponderent în mediul online, iar provocările cu care s-au confruntat școlile din România au fost legate de lipsa de predictibilitate într-o rețea școlară eterogenă, cu un puternic decalaj digital între unitățile de învățământ coroborat cu competențele digitale insuficient dezvoltate pentru organizarea eficientă a procesului didactic în mediul

online datorită accesului redus la tehnologie şi conectivitate redusă la internet. Totodată, o influenţă negativă au avut-o şi posibilităţile reduse ale familiilor în a acorda sprijin beneficiarilor educaţiei, copiii, pentru participare la lecţii online.

Într-o lume tot mai agitată şi mai scindată, preocupările privind educaţia copiilor s-au intensificat. Atât în România, cât şi în alte ţări, se pune tot mai des întrebarea: „pentru ce viitor ne educăm copiii?" Pentru contemporani, răspunsul la această întrebare ar trebui să fie mai limpede dintr-o perspectivă echilibrată asupra tehnologiei vazute în contextul zilelor noastre, evidenţiind însă şi riscurile acesteia. Să evităm, aşadar, tehnofobia, păşind cu răbdare şi curaj către ziua de mâine în lumina tradiţiilor noastre lăzăriste şi haretiene . Astfel, putem ridica educaţia la treapta de artă, dobândind mai târziu recunoştinţa din partea copiilor, dar şi mijlocire pentru propriul viitor al naţiei noastre, combinând digitalul cu educaţia tradiţională. Acum când majoritatea opiniilor regăsite pe site-uri educaţionale sugerează că educaţia digitală câştigă tot mai mult teren iar, într-o anumită manieră, şcoala tradiţională începe să piardă teren. Putem citi chiar şi previziunile centrelor educaţionale care, în forma lor actuală, vor dispărea şi vor face loc educaţiei online. Dar haideţi să dezbatem un pic mai mult acest subiect pornind de la întrebarea adepţilor necondiţionaţi ai digitalului: „Este educaţia tradiţională îndeajuns? Rar întâlnim pe cineva care ţine copiii departe de şcoală şi se îndreaptă doar spre educaţia online. Cine procedează aşa este considerat acum nebun şi va primi o mulţime de sfaturi gratuite şi contra-argumente. În acest moment, majoritatea oamenilor cred că şcolile tradiţionale sunt cele mai bune. Dar oare este de ajuns? Copiii mai învaţă cu acelaşi drag şi interes ca acum 10 ani, de exemplu? Generaţia de azi este mult mai activă, mai curioasă şi mai dornică de informaţii rapide şi la subiect, iar şcoala tradiţională nu mai este suficientă. Iar aici intervine tehnologia şi avantajele sale inclusiv în domeniul educaţiei. În continuarea acestei opţiuni se afirmă că educaţia online are farmecul său oferind drept argumente faptul că este mai avansată din punct de vedere tehnologic, de aceea are un farmec aparte. Educaţia online este ideală pentru a-ţi face copiii să prospere în domeniul lor de interes şi să se pregătească pentru job-urile pe care le vor avea când termină şcoala, fiind mereu actualizată cu ultimele progrese în ştiinţă, tehnologie, medicină, artă, cultură, călătorii, transport şi alte domenii. Educaţia digitală merge dincolo metodele de predare clasice, care nu mai ţin pasul cu nevoile elevilor de azi. Este mai flexibilă şi se potriveşte cerinţelor specifice pe care le au copiii. De ce? Deoarece copiii vor să ştie întotdeauna mai mult, întotdeauna ceva nou, care să le stimuleze şi mai mult creativitatea şi gândirea critică.

Copiii de azi vor să ştie cum să facă lucrurile practice, iar nu totul este explicabil prin manualele actuale. Desigur că, în afară de cursurile online, putem căuta să îmbunătăţim cunoştinţele prin Google, Wikipedia şi YouTube – care conţin cele mai recente informaţii despre ştiinţă, oameni, progrese tehnologice şi descoperiri. Cele mai multe site-uri online sunt actualizate periodic şi oferă noi perspective. Lucru pe care manualele clasice nu îl pot face atât de activ. Apoi, este educaţia digitală bună pentru copiii noştri? Cum ne dăm seama? Iată câţiva factori care trebuie luaţi în considerare:

1. *Flexibilitatea.* Educaţia digitală este foarte flexibilă. De exemplu, dacă trebuie să stai acasa pentru că eşti bolnav, nu pierzi lecţia de la şcoală, îţi faci temele online, iar acest lucru înseamnă că nu e nevoie să recuperezi ceea ce au făcut colegii la clasă. Dar dacă vrei să devii mai organizat, atunci e nevoie să înveţi după un program bine stabilit şi să renunţi la o mare parte din timpul liber. În acest caz, studiul la şcoală este cel mai potrivit.
2. *Costurile.* Educaţia tradiţională are, de cele mai multe ori costuri suplimentare, incluzând taxele pentru cămin sau chirie, hrană şi manuale. În cazul educaţiei digitale, cursurile se fac online, iar cei care crează aceste cursuri folosesc echipamente profesionale de software, la care ai acces fără costuri sau cu costuri foarte reduse. Cursurile online vin şi sub forma de video, având o calitate a imaginii şi sunetului la fel de bune ca şi cele reale. Aceste lecţii video sunt accesibile oricând şi de oriunde. Totuşi, educaţia tradiţională, deşi costisitoare în foarte multe cazuri, are şi avantajele ei, cum ar fi accesul la bibliotecile vaste şi contactul direct cu profesorii şi colegii.
3. *Interacţiunea socială.* Dacă dorim copii care să-şi construiască relaţii, să întâlnească oameni, să se bucure de viaţa de elev/student, să participe la excursii şi programe culturale – putem alege şcoala convenţională. Educaţia online este în mare parte despre învăţarea bazată pe video şi despre mentoratul online – în care lipsesc contactul personal şi interacţiunile faţă în faţă iar dacă eşti mai mult decât un tocilar, îţi plac gadget-urile şi eşti la curent cu tendinţele în tehnologie – învăţarea digitală este varianta potrivită. Dacă vrei să ai un avantaj faţă de ceilalţi elevi şi să îţi îmbunătăţeşti abilităţile pentru a avea o carieră de succes în viitor, atunci educaţia digitală poate fi o opţiune. Dacă vrei să înveţi într-o manieră mai lentă, conservatoare, uneori fără fundament solid pentru lumea reală de dincolo de şcoală şi să ai un parcurs lent al dezvoltării tale, atunci educaţia tradiţională este altă opţiune. Între aceste două - tradiţional şi digital - cea mai potrivită abordare? Răspunsul nostru este educaţia combinată întrucât dacă privim lucrarile unor mari artişti, fie ei pictori, sculptori, arhitecti sau fotografi, se observă că multe dintre ele au la bază regula de aur.

Conform acesteia, „pentru ca un întreg împărţit în părţi inegale să pară frumos, trebuie să existe între partea mică şi cea mare acelaşi raport ca între partea mare şi întreg". Potrivit lui Rudolf Arnheim, „acest raport este considerat ca deosebit de satisfacător datorită modului în care îmbină unitatea cu varietatea dinamică. Întregul şi părţile sunt perfect proporţionate, astfel ca întregul predomină fără să fie ameninţat de o scindare, iar părţile îşi pastrează în acelaşi timp o anumită autonomie". Raportul de aur este un numar irational, 1,618033..., putind fi definit in diferite moduri, cel mai important concept matematic asociat cu regula de aur fiind sirul lui Fibonacci, un şir de numere în care fiecare se obţine din suma celor două dinaintea sa: 0,1,1,2,3,5,8,13,21,34,55 etc. Împărţind orice număr la predecesorul său, se obţine aproximativ numărul de aur. Aceste valori au mai puţină importanţă practică, nimeni nu stă să măsoare exact atunci când creează o operă de artă, dar

arată că există o legatură strânsă între matematică şi artă. Primii care l-au folosit au fost egiptenii, majoritatea piramidelor fiind construite ţinând cont de numărul de aur. Grecii au fost cei care l-au denumit astfel, folosindu-l atât în arhitectură cât şi pictură, sculptură. De altfel el se mai notează şi cu litera grecească „fi", de la sculptorul grec Phidias care a construit Parthenonul pornind de la raportul de aur. În pictură a fost folosit mai ales în Renaştere, probabil cea mai discutată utilizare a acestui concept fiind în tabloul lui Leonardo da Vinci, „Mona Lisa". Numărul de aur nu este prezent doar în artă, ci mai ales în natură. Chipul omului are la bază acest principiu.

Aşadar, învăţarea tradiţională combinată cu cea digitală devine din ce în ce mai atractivă. Astfel, nu se face trecerea bruscă de la tradiţional, la digital, ambele aduc plus valoare dacă sunt combinate, iar schimbarea şi trecerea numai la educaţia digitală este mai uşor de asimilat, în special de către profesori, care au fost educaţi şi „antrenaţi" foarte mulţi ani în maniera clasică, tradiţională. Iar trecerea bruscă la mediul digital poate da naştere la frustrare, dar mai ales la rezistenţă la schimbare. Abordarea mixtă de educaţie online şi convenţională oferă, să spunem, interacţiunea umană se face puţin o dată pe săptămână, iar temele şi proiectele sunt de obicei online. De asemenea, dacă lucrezi la un proiect ce implică mai multe persoane, toţi participanţii pot lucra de acasă, în ritmul lor, pe acelaşi document, fiecare persoană având acces la modificările făcute de ceilalţi, iar profesorii putând oferi feedback în timp real. Astfel, se câştigă foarte mult timp, iar alte costuri sunt reduse. Acum, că opţiuni există, depinde numai de elevi şi profesori să decidă ce variantă aleg. În plus, procesul de digitalizare a educaţiei este de durată. Singura certitudine fiind aceea că doar într-acolo ne îndreptăm, către tehnologie în toate domeniile, acesta fiind parcursul firesc al evoluţiei, singura certitudine a vieţii rămânând schimbarea. Cum se schimbă sistemul educational în era digitală? Experţii din domeniul educaţiei văd potenţialul care stă în spatele dispozitivelor electronice de care majoritatea oamenilor sunt dependenţi în ziua de astăzi. Dacă în ultimii ani cărţile electronice au câştigat teren în faţa celor clasice, învăţământul poate atinge un nivel superior, adaptat cerinţelor şi obişnuinţelor generaţiei crescute în era digitală. Problema care poate apărea în această direcţie este aceea că profesorii sunt obişnuiţi cu metodele de predare clasice şi, chiar dacă folosesc un laptop, o tabletă sau un telefon mobil, nu se pot descotorosi atât de uşor de stilul cu care s-au obişnuit. Societăţile actuale din Europa şi din întreaga lume sunt puternic modelate de accesul larg la internet, ceea ce face posibil ca cetăţenii nu numai să aibă acces la un volum de informaţii copleşitoare şi uneori confuz, ci şi să le conecteze şi să le combine, cu instituţiile publice şi cu părţile interesate ale societăţii civile în diferite moduri, într-o lume digitală. Transformarea digitală este o realitate pentru întreaga societate, însă vine cu o serie de situaţii provocatoare pentru toate mediile. Fără îndoială, elevii sunt cei care au preluat şi integrat tehnologia ca un mod de viaţă.

Mai mult, evoluţia instrumentelor de predare folosite în şcoli cunoaşte în această perioadă un salt spectaculos. Deşi sunt încă o noutate pentru profesori, acestea sunt familiare şi des utilizate de către elevi. Bineînţeles că metodele clasice de învăţare nu trebuie eliminate din procesul de învăţare, însă elevii şi profesorii au nevoie de instrumente de învăţare moderne, asemenea celor folosite în timpul liber.

Tehnologia modernă poate fi privită ca o completare adusă în sprijinul educației și nu ca un factor negativ. Echipamentele digitale și-au demonstrat deja eficiența ca metode de predare și învățare. Lucrul cu echipamentele digitale moderne este o provocare pentru profesori. Totuși, mulți dintre ei accesează și folosesc la ore metode moderne de predare, adaptându-și lecțiile clasice pentru mediul digital. În ceea ce privește documentele electronice în era digitală, unitatea de învățare este orientată spre rezolvarea unor sarcini de lucru, utilizându-se preponderent metoda învățării și a formării deprinderilor prin rezolvarea unei game cât mai variate de aplicații practice și punându-se accent pe realizarea de proiecte. Revoluția digitală e un fenomen care are implicații și în educație. Aspectul instrumental este important, pentru că instrumentul poate să aibă influență și asupra conținutului, reconstruindu-l sau resemnificându-l. De pildă, atunci când delimităm conținutul de învățare, trebuie să luăm în calcul și extensiile care se ivesc în spațiul virtual și care pot fi aduse, într-o formă sau alta, în sala de clasă și racordate la curriculum-ul tradițional. Adică, predând literatură sau filosofie, profesorul se raportează întotdeauna la programă, care îi prescrie un anumit conținut ideatic. Însă el poate să extindă și să le spună elevilor că vor găsi lucruri suplimentare sau mai aprofundate accesând o anumită pagină de internet. Prin urmare, profesorul trebuie să cunoască, să stăpânească și să îmblânzească acest mijloc, să-l aproprie, să-l racordeze la instrumentarul clasic de ordin metodic.

Învățământul nu se rezumă numai la activitatea de predare-învățare. Există și o dimensiune administrativă, care poate fi perfectată recurgând la aceste platforme. De asemenea, comunicarea dintre școală și familie poate fi perfectată utilizând noile tehnologii - spre exemplu, catalogul digital, prin care părintele este informat în mod operativ în legătură cu situația școlară a copilului. Progresul tehnologic este o realitate care nu poate fi oprită și care trebuie acceptată și abordată ca parte a vieții de zi cu zi, și care poate fi văzută ca o provocare pentru educație. Pentru copii și tineri, internetul și social media sunt o parte esențială a vieții lor. Conform studiilor internaționale, o proporție foarte mare de adolescenți au folosit o formă de social media și au un profil pe un site de socializare. În ciuda viziunii comune a două lumi diferite, a unei lumi reale și a unei lumi digitale, adesea văzute ca fiind în opoziție, tinerii trăiesc de fapt într-o singură lume, ce cuprinde realități online și offline. Dacă educația devine mai eficientă și mai semnificativă atunci când ia în considerare viața reală și elementele realității, care sunt familiare cursanților, înseamnă că educația ar trebui să ia în considerare și realitatea online. Dacă procesul educational este perceput ca fiind centrat pe altceva decât acumularea de cunoștințe prestabilite, ci pe dezvoltarea competențelor și pe sprijinirea cursanților pentru a-și construi propria înțelegere a lumii, ar trebui să se refere în mod explicit la experiențele lor de viață. Astfel, educatorii trebuie să aducă procesul de învățare mai aproape de viața reală a copiilor și tinerilor, încorporând astfel și aspecte legate de experiențele lor în lumea digitală.

Procesul educațional ar trebui să aprecieze și să utilizeze competențele acumulate de copii și tineri prin învățarea informală în mediul online sau prin participarea la activități educaționale non-formale legate de TIC. Tinerii sunt din ce în ce mai obișnuiți să învețe explorând un nou instrument sau folosind diferite

tutoriale online. Aceasta este de fapt o dovadă a abilităților de învățare autonome și ar trebui să fie recunoscută și încurajată în contextul școlar, împreună cu abilitățile de gândire critică pentru a dezvolta abilitatea de a identifica surse de învățare fiabile și valabile. Profesorii trebuie să se simtă încrezători într-o poziție în care nu știu neapărat mai mult decât cei care învață. În calitate de „nativi digitali", este normal ca tinerii să învețe foarte repede cum să utilizeze diferite instrumente TIC noi. Este, bineînțeles, foarte bine ca profesorii să-și dezvolte continuu abilitățile TIC, dar nu este neapărat necesar să țină pasul cu elevii în acest sens. Chiar fără a fi ei înșiși competenți în domeniul TIC, profesorii pot găsi modalități de a aduce competențele TIC ale tinerilor în procesul de învățare ca resurse. Noi strategii educaționale, inspirate de educația non-formală, pot fi dezvoltate pe baza utilizării internetului și a dispozitivelor mobile pe care elevii le au deja. De asemenea, multe dintre activități educaționale cu care profesorii sunt obișnuiți pot fi adaptate prin luarea în considerare a lumii digitale. Profesorii ar trebui să fie sprijiniți pentru a accepta faptul că elevii pot reprezenta parteneri viabili pentru un dialog îmbogățit reciproc, bazat pe respect și încredere. Prin acceptarea rolului de facilitator al învățării, profesorii ajută elevii să își dezvolte abilități de învățare autonome și înțelegere critică.

Noile metode de comunicare dintre școli și părinți reprezintă un element important al managementului școlar de zi cu zi. Utilizarea Internetului se afla la baza acestor transformari. Modul în care trăim, modul în care se fac afacerile, maniera în care se lucrează, metodele de studiu, comunicarea între oameni și chiar maniera de petrecere a timpului liber sunt influentate de Internet. Factorii importanți pentru trecerea la Societatea Informationala sunt infrastructura de comunicații și aplicațiile informatice. Astfel, din punct de vedere politic, Societatea Informațională trebuie să rămână o societate democratică, din punct de vedere economic, ea trebuie să-și sporească posibilitățile de dezvoltare și, din punct de vedere cultural, ea trebuie să devină o societate bazată pe cunoaștere. Cantitatea informațiilor pe care le avem la dispozitie are o creștere exponențială și, din acest motiv, este necesar un sistem de coordonare a acestora, precum și servicii de selectare corespunzătoare, bazate pe capacitatea specialiștilor de a analiza și evalua informația, cu scopul de a-l ajuta pe beneficiar să obțină informații de calitate, de ultimă oră și rapid. Ca atare, pentru dezvoltarea societății informaționale, alaturi de tehnologiile de transmitere a informației, un rol hotaărâtor îl are și conținutul informației transmise, care, alături de programele de calculator și muzică, constituie bunuri virtuale, bunuri ale unei lumi digitizate, care se pot descărca direct din rețea. Noua eră digitală determină un nou tip de abordare a fenomenului educațional prin intermediul noilor tehnologii ale comunicării și informației. Analiza educațiilor de tip virtual, online ne conduce la concluzia că există o perspectivă nouă de abordare a procesului de învățământ în condițiile societăților de tip postmodern. Actualmente, sistemul dezvoltat în procesul de învățare al tehnologiilor este caracteristic formulei învățământului informal. Avantajul în cazul noilor tehnologii este gradul ridicat de receptivitate al tinerilor, consumatori de new media. Cultura globală dominată de tehnologie produce o alfabetizare media cu caracter de masă și conturează un nou model de învățare. Procesul de învățare este accesibil și interactiv, în funcție de cerințele unor

modele sociale acceptate. Educaţia online, virtuală conferă deprinderi utile pentru tinerii aflaţi în plin proces de şcolarizare. Instrumentele dezvoltate de programe aplicative, marcate de design specializat. Diferenţele de valorizare şi conţinut în raport cu învăţământul tradiţional conferă un model de educaţie nonstandardizată, informală de conexiune în ceea ce priveşte utilizarea cunoştinţelor, informaţiilor şi formulelor de învăţare. Utilizarea sistemelor multimedia indică un barometru social de orientare a tendinţelor inclusiv în planul vieţii educaţionale. Învăţarea cu caracter interactiv implică o nouă abordare în accesarea informaţiei şi conţinuturilor de text, iar educaţia în era digitală presupune evoluţii, provocări şi tendinţe.

6.2. Educaţia în Era Digitală: evoluţii, provocări şi tendinţe în relaţia educaţiei cu tehnologia

Copiii reprezintă speranţa la nemurire a unui neam şi a părinţilor care le-au dat viaţă, nădejdea că vor trăi în sufle- tul acestora, atât timp cât amintirea faptelor bune săvârşite în timpul vieţii va fi vie în conştiinţa urmaşilor. Una dintre faptele cele mai înalte pe care le pot face părinţii pentru copii, dincolo de vegherea la creşterea lor fizică, este educarea acestora în spiritul valorilor morale. Din astfel de considerente, Sfinţii Părinţi ne-au lăsat cuvinte dintre cele mai frumoase şi profunde, referitoare la valoarea actului de educare. Acesta este o adevărată artă şi are valoare soteriologică, în sensul că, în funcţie de educaţia oferită copiilor lor, părinţii primesc răsplată din partea lui Dumnezeu, atunci când ea are efecte mora- le pozitive, sau osândă, când aceasta nu a fost făcută responsabil şi în duhul valorilor duhovniceşti înalte. Sfântul Porfirie Kavsocalivitul are profundă dreptate când spune că acei părinţi care nu le-au oferit copiilor lor educaţia potrivită sunt nişte „rataţi", că au „eşuat" nu doar în educarea copiilor lor, ci la modul general. Sfântul Ioan Gură de Aur consideră că actul instruirii copiilor are valoare soteriologică, prin grija arătată faţă de aceasta, ei având şansa iertării păcatelor şi dobândirii mântuirii. În acelaşi duh şi cu acelaşi farmec duhovnicesc, Sfântul Paisie Aghioritul considera că atunci când oferă o educaţie „bună", părinţii şi educatorii, dacă nu au pă- cate, se sfinţesc, iar, dacă în viaţa lor există nedeplinătăţi, proporţional cu dragostea şi responsabilitatea arătate, li se iartă din acestea. De-a lungul vremurilor, stilurile de educaţie au suferit numeroase transformări, înclinând tot mai mult spre ofe- rirea unor cunoştinţe din ce în ce mai bogate din punct de vedere teoretic, dar cu o finalitate morală şi duhovni- cească diminuată. Din crearea unor caractere puternice şi înalte, ea s-a orientat spre oferirea de informaţii cât mai variate, într-un mod cât mai performant [36].

Recent, pandemia de Covid-19 a constituit o provocare nu doar pentru sistemele de sănătate, ci şi pentru cele de educaţie. Formatul fizic, „faţă către faţă", în care educatorul comunica direct cu învăţăcelul, a fost în- locuit cu o comunicare online, mediată de ecrane. Efectele acestor realităţi, forţate de evenimente obiective, vor fi observate în timp. Cu sau fără pandemie, tehnologia digitală a pătruns şi continuă să se insereze tot mai mult în viaţa noastră. Specialiştii consideră că vom ajunge, în curând, să nu mai putem face prea clar deosebirea dintre online şi offline, că vom fi înconjuraţi tot mai mult de inteligenţa artificia- lă, în forme tot mai variate,

prin intruziunea acesteia în spaţiul nostru, inclusiv cel privat, şi prin imersiunea noastră entuziastă în ea. Există, însă, şi specialişti care avertizează asupra riscurilor pe care le presupune „digitalizarea" activităţilor, forma lor extremă constituindu-le „ciber- adicţiile". Iar copiii şi adolescenţii par a fi categoriile cele mai vulnerabile. Neavând suficient discernământ şi în lipsa unei educaţii parentale şi digitale, aceştia pot deveni robi sau sclavi ai tehnologiei reci, dar cu o capacitate de seducţie şi adicţie deosebită. Studiul de faţă nu are pretenţii de exhaustivitate şi nici de maximă originalitate. El adună mai multe materiale în încercarea de a răspunde unor întrebări şi provocări actuale, arătând importanţa şi rolul părinţilor, iar apoi ale educatorilor, învăţătorilor şi profesorilor, în creşterea şi formarea copiilor, a elevilor. Cei iubitori de sens înalt şi profund în viaţă şi responsabili faţă de instruirea intelectuală şi devenirea morală a copiilor cu care Dumnezeu le-a binecuvântat viaţa în cuvintele nostre sfaturi clare şi îndemnuri practice, care să le uşureze deosebita lor lucrare şi să îi dea un sens spiritual.

În al doilea rând, am inserat câteva reflecţii morale asupra prezenţei, rolului şi relaţiei cu tehnologia digitală, cu referire la actul educaţiei. Ideea fundamentală, specifică spiritualităţii iudeo-creştine, este aceea că orice lucru e bun dacă este folosit cu discernământ şi spre o finalitate înaltă. Astfel, credinţa creştină nu este tehnofobă, în sensul că ar condamna tehnologia şi diversele ei forme. Răul nu stă în materie, ci în uzul greşit pe care îl putem da acesteia. Lumea nu este rea, dar, în funcţie de atitudinea noastră faţă de lucrurile ce o alcătuiesc, ea poate deveni cale spre Rai sau drum spre iad. În mod similar, atunci când este folosită în baza unor reguli sau a unei conduite echilibrate, în scopuri şi cu o fi- nalitate instructivă şi morală înaltă, tehnologia reprezintă un beneficiu. În astfel de circumstanţe, ea uşurează, înfrumuseţează şi înnobilează viaţa. Dimpotrivă, în lipsa unei conduite adecvate, ea are un potenţial adictiv, căruia un suflet încă nedeplin maturizat îi poate rezista cu greu. Paginile ce urmează sesizează unele dintre riscurile acesteia, în lipsa discernământului moral, cu speranţa identificării lor şi a dobândirii unui comportament digital optim, care să susţină şi să întărească actul educării, oferindu-i valoare formativă şi finalitate morală.

Îmi exprim un gând de înaltă preţuire şi sinceră recunoştinţă faţă de Universitatea Naţională de Studii Politice şi Administraţie Publică, Facultatea de Administraţie Publică organizarea Conferinţelor internaţionale Securing Smart Cities, şi faţă de ostenitorii ei. De înaltă preţuire, pentru că, pe parcursul anilor, au dăruit cititorilor lucrări de o aleasă ţinută ştiinţifică şi de o reală valoare practică. Acestea, alături de lumina cunoaşterii, aduc sens bogat şi pace în suflete. Le datorez, deopotrivă, recunoştinţă sinceră pentru cinstea de a fi acceptat publicarea volumelor conferinţelor, între atât de numeroasele şi valoroasele lucrări publicate până în prezent. Nădăjduiesc, în acelaşi timp, ca, în paginile lor, toţi cei care îşi vor asuma osteneala şi răbdarea lecturii să afle adevăruri ştiinţifice actuale şi îndemnuri morale folositoare de suflet, cu privire la principiile unei educaţii întru virtute şi morală. Şi, astfel, copii, părinţi şi educatori să îşi împlinească vocaţia şi să descopere bucuria faptei bune, săvârşite spre slava lui Dumnezeu, spre împlinire sufletească în această lume şi viaţă şi spre un viitor mai bun al generaţiilor care urmează.

La întrebarea „Când trebuie să înceapă educaţia copiilor?”, am putea răspunde, fără a greşi prea mult, că încă de la conceperea lor, din perioada intrauterină. Ba chiar am putea afirma că şi mai devreme, de la „împrietenirea” viitorilor lor părinţi, pentru că, încă din acele momente, aceştia îşi propun, în calitate de potenţiali soţi, idealurile, aspiraţiile, aşteptările, dorinţele şi speranţele lor, cea mai mare parte legate de viitoarea familie pe care ar putea-o întemeia. Nimic nu este mai frumos şi mai înălţător pentru părinţi decât calitatea de a aduce pe lume noi făpturi, copiii lor. Însă, în mod deosebit, de această calitate se bucură viitoarea mamă. Femeia însărcinată se află într-o perioadă binecuvântată şi de graţie din viaţa sa. Perioada sarcinii, dincolo de greutatea şi de dificultăţile ei, este, pentru aceasta, una privilegiată, un timp optim pentru adâncă meditaţie asupra sensului propriei sale vieţi, sens ce nu poate fi gândit în afara familiei şi în absenţa darului naşterii de prunci. Este, totodată, un timp potrivit în care să reflecteze asupra trecutului, dar mai ales asupra viitorului, a realizărilor de până la acel moment şi, în mod deosebit, asupra împlinirilor viitoare, inaugurate prin însuşi actul naşterii copilului. Un timp al dialogului interior, cu sine, dar şi cu ceilalţi membri ai familiei, şi mai ales cu soţul ei şi tatăl copiilor lor, privind atmosfera din căminul lor şi, în special, asupra principiilor creşterii şi educării viitorului copil. Din aceste motive şi înţelegând situaţia specială în care se află viitoarea mamă, întreaga familie are responsabilitatea de a o înconjura cu afecţiune, creându-i un climat de armonie şi înţelegere, pentru ca aceasta să se „odihnească” sufleteşte şi să se pregătească în aşteptarea copilului. Orice nelinişte trebuie înlăturată din sufletul acesteia. „Dacă mama care poartă în pântece se supără şi se mâhneşte atunci şi fătul se tulbură în ea. De aceea, femeia, atunci când este însărcinată, trebuie să nu-şi pricinuiască nelinişti, dar şi ceilalţi să caute să nu o mâhnească. Făcând astfel, copilul se va naşte liniştit, iar părinţii nu vor avea probleme cu el nici când este mic, nici când va creşte mare [37].”

Stilul de viaţă al mamei influenţează determinant caracterul copilului În timpul sarcinii, viitoarea mamă trebuie să-şi schimbe întregul stil de viaţă, pentru a da naştere unui copil sănătos, care să aducă mai târziu bucurie şi mângâiere familiei sale. Principala preocupare a femeii însărcinate este aceea de a se pregăti pentru aducerea pe lume a viitorului copil, iar apoi pentru creşterea şi educarea lui. După naşterea copilului, viaţa întregii familii se schimbă, aceasta fiind chemată să arate dragoste şi grijă, preocupare şi responsabilitate faţă de educarea noului vlăstar. În privinţa alăptării copilului, prin alăptare, copiii nu sug numai lapte, ci şi dragoste, afecţiune, mângâiere, siguranţă, dobândind astfel un caracter puternic. Este cunoscut faptul că, în virtutea unor campanii care au avut ca scop emanciparea femeii, astăzi, cele mai multe soţii şi mame sunt angajate, prestând, uneori, profesii incompatibile cu firea lor delicată. Multe dintre „femeile de succes” sunt chiar mai ocupate decât soţii lor, au un venit mai mare şi, ceea ce s-a constatat în ultimii ani, pe fondul creşterii independenţei lor sociale şi economice, cele mai multe cereri de divorţ sunt introduse de astfel de femei, care doresc să-şi trăiască viaţa din plin, să se bucure de plăcerile ei, adeseori alături de alte persoane decât tatăl sau chiar „taţii” copiilor lor. Însă tot mai multe dintre femeile şi mamele de astăzi constată preţul mare al acestei emancipări, şi anume trădarea căminului conjugal şi negarea

propriei lor vocații – de soții, dar mai ales de mame. Timpul petrecut la serviciu este smuls din timpul care, altădată, era consacrat, aproape exclusiv, familiei. Or, este cunoscut faptul că, spre deosebire de bărbat, care se poate împlini în viață prin muncă, în afara sau în absența familiei, femeia nu se simte niciodată cu adevărat realizată sufletește decât în sânul căminului, alături de soțul său și, mai ales, prin copiii ei. Serviciul mamei este cerut de creșterea dorințelor familiei de astăzi, într-o spirală fără de sfârșit a așteptărilor și într-o comparație socială permanentă cu alții, din dorința de a-i depăși. Și în acest caz, el recomanda simplificarea vieții, stabilirea unor obiective raționale și rezonabile, decența în cele materiale și cultivarea valorilor duhovnicești, între care prioritatea fundamentală o are educația frumoasă a copiilor, pentru viață. Educația copiilor este o responsabilitate deosebit de înaltă a părinților. Din acest motiv, toate celelalte datorii de familie trebuie subordonate acesteia [38]. Revenind la obiectul demersului nostru, care ar fi „lecțiile", mai mult sau mai puțin explicite, din care am putea învăța, indiferent de niveluri, roluri, responsabilități, din experiența online de exercitare a educației? Supunem atenției o serie de coordonate, lista rămânând deschisă:

a) Statuarea și garantarea unei deschideri, flexibilizări sau auto-reglări a întregului sistem de învățământ în raport cu dinamici imprevizibile ale lumii în care trăim; un sistem de învățământ – ca structură, funcționalitate, resurse, competențe, exercițiu previzional etc. – trebuie să fie acomodabil, adaptabil, flexibil, fiind pregătit pentru orice evoluție de nivel macro/extra ce excede propria sa responsabilitate sau funcționalitate (cataclisme naturale, sociale, medicale etc.); un sistem de educație trebuie să își asume un „coeficient realist de vulnerabilitate", să își conserve, permanent, alternative sau linii de menținere și exercitare a funcțiilor specifice și în cele mai neașteptate sau sumbre scenarii (sociale, istorice, naturale etc.) [39];
b) Valorificarea, integrarea și „pedagogizarea" noilor descoperiri în materie de comunicare și informare la nivelul practicilor formative; din perspectivă procedural-instrumentală, procesul educativ se cere a fi mai atent și mai „interesat" în raport implementarea noilor achiziții din câmpul tehnologiilor în teritoriul specific (mai ales, față de inovațiile care vizează comunicarea); orice descoperire sau instituire tehno-culturală, în decursul istoriei (tiparul, muzeul, radio-televiziunea, internetul etc.), a avut și implicații educaționale; prima întrebare care ar putea fi pusă, când apare ceva nou în acest domeniu, ar fi aceasta: în ce măsură putem exploata noul mijloc tehnic și din punct de vedere didactic, instructiv, formativ (desigur, prin adecvări subsecvente și prin „îmblânzirea" cadrajului tehnic în raport cu obiectivele, posibilităților și nevoile formării persoanei);
c) Regândirea curriculumului școlar și a corespondentelor lor concrete (planuri de învățământ, programe, manuale, auxiliare didactice etc.) și în raport cu oportunitățile de generare și transfer ale unor conținuturi virtuale, digitale, ce pun accentul pe activism, implicare și auto-învățare, etc.; desigur, digitalul poate veni cu unele constrângeri – dacă avem în vedere aspectul relațional –, dar și cu multe oportunități ce trebuie

valorificate; pe viitor, e de aşteptat ca anumite secvenţe ale programelor şcolare (teme sau activităţi preconizate) să fie proiectate, încă din start, în perspectiva învăţării online;

d) Racordarea secvenţială, progresivă – inteligent şi inspirat – a culturii oferite de şcoală şi la cea disponibilizată virtual; cyber-cultura poate deveni un referenţial al învăţării prin integrări, valorificări şi semnificări didactice eficiente, profitabile; spaţiul virtual poate adăposti un vast material ce poate deveni relevant şi din punct de vedere didactic, dacă este aureolat/integrat din perspectiva unor obiective de învăţare; curriculumul şcolar poate cuprinde şi secvenţe deschise, chiar indeterminate, ce se propagă în spaţiul virtual (de altfel, tot mai multe structuri culturale clasice îşi construiesc „dubletele" lor virtuale: cartea digitală, muzeul virtual, conferinţa online, şcoala la distanţă, universitatea deschisă etc.);
e) Găsirea unor soluţii tehnice şi didactice de suplinire sau atenuare a carenţei de empatie, contact şi socializare purtate de cadrele informatice utilizate în formare; „umanizarea" şi „spiritualizarea" artefactelor comunicaţionale cu scop formativ, prin „naturalizarea" relaţională a mediului virtual, prin diminuarea distanţei psiho-sociale dintre protagoniştii antrenaţi în activitatea educaţională;
f) Decelarea unui partaj nou dintre educaţia în prezenţă şi cea online, inclusiv prin delocalizare şi asincronie (cea din sala de clasă rămânând preponderentă), prin degajarea de timpi suplimentari pentru activităţi cu caracter didactic şi trecerea în online a unor activităţi peri-didactice, de rezolvare a unor teme, de lucru în grupuri virtuale, de realizare de proiecte, de învăţare suplimentare, de consiliere şi sprijin psihologic, pentru consultaţii şi meditaţii, pentru rutine cu caracter administrativ, pentru comunicarea cu părinţii etc.
g) Actualizarea şi adaptarea eşafodajului evaluativ sau a unor componente ale acestora (testări, examene, concursuri etc.) şi în raport cu condiţiile unei situaţii de învăţare la distanţă (prin regândirea întregului sistem de evaluare, a procedurilor, a instrumentelor administrate, a sarcinilor/cerinţelor preconizate etc.); docimologia, ca subdomeniu al pedagogiei, trebuie să ia în calcul şi formule sau situaţii de examinare „în absenţă", „asincronice", „la distanţă";
h) Pregătirea profesorilor, atât în stadiul iniţial, cât şi pe parcursul dezvoltării profesionale, trebuie să vizeze şi formarea unor competenţe de identificare şi uzanţă pedagogică a mediului virtual şi pentru a valorifica, în practica didactică din şcoală sau extra-şcoală, oportunităţile sau valenţele purtate de noile tehnologii; am propune ca didacticele predării disciplinelor şcolare să cuprindă teme explicite privind predarea prin utilizarea NTIC, exerciţii de transpoziţii didactice dinspre clasic către online, exemple de interactivitate virtuală, modalităţi de asigurare a feed-back-ului şi de evaluare online etc.;
i) Prezervarea şi afirmarea autonomiei, demnităţii, importanţei exercitării profesiunii didactice prin pârghii normative, materiale, simbolice,

deontologice aferente; profesiunea didactică, acoperită de competenţe verificabile, validate ca atare, trebuie apreciată şi recompensată; mulţi actori (părinţi, elevi, studenţi etc.) şi-au putut da seama, prin parcurgerea/depăşirea acestei etape, cât de complexă şi dificilă e prestaţia didactică;

j) Responsabilizarea, susţinerea şi oferirea de suport material şi educaţional pentru actori mai puţin evidenţi în exerciţiul formativ: elevi/studenţi, părinţi, exponenţi ai comunităţii locale, asociaţii suportiv-implicative, entităţi nonguvernamentale etc.; aceşti factori „secunzi" pot deveni de primă linie şi importanţă, în ce priveşte completarea şi continuarea educaţiei, atât în condiţii normale, cât şi în cele speciale, de limită; o „şcoală a părinţilor" nu este deloc desuetă, structurile asociative pot prelua sarcini ale unor entităţi statale debusolate, iar reprezentanţii comunităţilor locale nu trebuie să se derobeze de responsabilităţile lor cultural-educaţionale etc.;
k) Instituirea şi propagarea unui optimism educaţional, mai ales în situaţii de criză, demonstrat prin principalii actori – profesori, manageri şcolari, unii decidenţi – care au dovedit responsabilitate, creativitate, implicare, dăruire, descoperire de soluţii rezolutive pentru continuarea şi finalizarea unor parcursuri educaţionale, inclusiv prin examinare, validare, certificare;
l) Garantarea şi instituirea culturii competenţei la toate nivelurile – de la ministrul educaţiei, al inspectorului şcolar, până la nivelul directorului de şcoală, al profesorului; încrederea este o importantă dimensiune ce rezolvă – managerial, practic, psihologic – multe probleme; din momentul în care un decident important spune astăzi una şi mâine alta, lucrurile pot scăpa de sub control etc.;
m) Evitarea sau diminuarea inegalităţilor pornind de la accesul la tehnologii; există riscul ca inegalităţile datorate intervenţiilor educative ale mediului proxim să se adâncească; cine are deja, i se va da, cine nu are (condiţii tehnice, etc.) va rămâne şi mai mult în urmă;
n) Revizuirea teoriilor psiho-pedagogice despre învăţare, forme şi strategii de instruire, despre construirea cunoaşterii, despre receptarea şi interiorizarea valorilor; actuala pandemie a demonstrat că nu tort arsenalul teoretic ştiut a făcut faţă sau s-a nimerit cu complexitatea noii realităţi; o astfel de chestiune rămâne o provocarea pentru cercetarea fundamentală şi aplicată din domeniul ştiinţelor educaţiei.

7. În loc de concluzii, ccurte consideraţii despre etică şi integritate academică

Şcoala formează oamenii iar universităţile elitele. Şcoala în general şi universităţile în special reprezintă cele mai puternice concentrări de elite intelectuale. Ele au misiunea ca prin educaţie să asigure sănătatea morală şi spirituală a naţiunii, să pregătească tinerii pentru viaţă, asigurând prin aceasta şi

viitorul naţiunii. În timp ce elitele sociale s-au asociat şi întreprind acţiuni coerente pentru promovarea şi protejarea lor în societate sau pentru a impune reguli care să le recunoască valoarea, elitele profesionale beneficiază, în primul rînd, de recunoaştere în cadrul asociaţiilor profesionale, recunoaşterea lor în cadrul societăţii fiind condiţionată de atitudinea liderilor politici, a factorilor formatori de opinie, de modul în care societatea este pregătită să recepteze rolul elitelor în asigurarea progresului şi a prestigiului acestora. Un scurt excurs de „Etică şi integritate" academică este, desigur, prea puţin pentru a acoperi tematica relevantă în toate domeniile ştiinţei şi la toate nivelurile de studii. Ideal ar fi fost să avem la dispoziţie, pentru învăţământul universitar – nefiind exclus cel preuniversitar- , adaptări şi dezvoltări separate ale acestui text, câte una pentru fiecare facultate şi pentru fiecare nivel de studii la care disciplina a devenit obligatorie. Nevoia de particularizare provine din suprapunerea doar parţială a problemelor etice de care ne lovim în mod curent: într-o măsură semnificativă, de exemplu, ele vor fi diferite dacă facem cercetare de laborator sau pe subiecţi vii, ori dacă lucrăm în special cu texte sau în arhive. Notând din start acest neajuns, credem totuşi că oferim un instrument util, deşi incomplet. Deşi o parte dintre provocările de natură morală vor fi specifice, rămâne totuşi un nucleu consistent de teme transversale. Analiza şi evaluarea competente din punct de vedere etic ale unei situaţii presupun familiarizarea minimală cu un set de concepte şi instrumente argumentative de bază; mecanismele instituţionale ale universităţii în domeniul managementului eticii sunt comune pentru toţi; argumentele morale împotriva plagiatului rămân în mare măsură aceleaşi, chiar dacă regulile de citare „tehnice" pot diferi; hărţuirea este la fel de respingătoare şi când se întâmplă într-un laborator, şi când se întâmplă într-un şantier arheologic sau într-o bibliotecă etc. Cazuistica poate varia, dar caracteristicile structurale ale situaţiilor se suprapun adesea [40]. Acest studiu abordează cu precădere astfel de teme transversale, nu doar din zona filosofiei morale. Am încercat să folosim însă ilustrări care provin şi din ştiinţele naturii, şi din cele sociale sau din disciplinele umaniste. Ele pot funcţiona, sperăm, cel puţin ca puncte de plecare ale unei dezvoltări mai ample. Intenţia noastră a fost de a gândi un text util pentru profesori, dar de a-l scrie mai ales pentru toţi cei interesaţi.

Etica este interesantă cu precădere atunci când pune în joc intuiţii morale sau valori diferite şi când ne confruntăm cu dileme în care decizia nu este evidentă, iar dezacordul este rezonabil. Prin urmare, am încercat să ne ferim pe cât a fost posibil de verdicte şi de simpla enumerare a unor interdicţii. Dilemele şi întrebările deschise generează dezbateri şi prilejuiesc reflecţie. Sentinţele, pe de altă parte, tind să ucidă discuţia şi să prilejuiască mai curând reacţii de îmbrăţişare sau de respingere vehementă. Dacă vom ajunge, în comunităţile noastre profesionale şi în societate, să vorbim mai mult unii cu alţii şi mai puţin unii la alţii, vom fi făcut probabil un pas major în direcţia corectă pentru dezvoltarea unei atitudini morale. Există şi alte materiale care pot fi extrem de utile pentru completarea conţinutului. Cu un simplu clic descoperim exemple semnificative astfel încât, împreună, ele să ofere o primă aproximare a unui domeniu de reflecţie şi cercetare deja foarte vast. Fără a intra în prea multe detalii vă propunem un exerciţiu: Imaginaţi-vă o lădiţă cu mere proaspăt culese. După un timp, observaţi că un măr a mucegăit, astfel că îl

îndepărtaţi ca să nu strice şi merele vecine. Situaţia se repetă de câteva ori în decursul zilelor următoare. În final, cercetaţi mai amănunţit lădiţa cu mere şi constataţi că lădiţa însăşi e putredă şi din acest motiv prindeau mucegai toate merele. Dar dacă lădiţa de mere este o metaforă pentru universitate, iar merele, pentru membrii comunităţii acelei universităţi? Ce credeţi că este mai relevant pentru a explica acţiunile imorale perpetuate şi generalizate, lădiţa stricată (mediul universitar în care apar comportamentele imorale) sau merele stricate (indivizii care se comportă imoral)? imorale nu sunt nici lipsite de importanţă şi nici atât de dificil de evaluat pe cât s-ar putea crede. Ele contribuie la crearea unui mediu organizaţional imoral, în care pare că totul este permis, ceea ce va favoriza şi mai multe comportamente imorale.

Să luăm de pildă cazul Universităţii X, cunoscută printre candidaţii la admitere, cursanţi şi profesori ca un spaţiu relaxat, în care „te descurci" fără prea mari bătăi de cap: se intră uşor, cerinţele la cursuri sunt minime, lucrările de seminar „se rezolvă" pentru suma corectă, la examene poţi să nu înveţi nimic pentru că treci oricum, iar de absolvit, nici nu se pune problema să te stresezi. Profesorii „închid ochii" atunci când observă sau află despre lucrări cumpărate sau plagiate, iar cei mai mulţi aşteaptă diverse „atenţii" în zilele de examen. Noul rector al Universităţii X are însă o altă viziune asupra modului în care ar trebui să funcţioneze instituţia şi îşi doreşte să conducă o universitate morală, în care etica şi integritatea academică sunt apreciate şi respectate de către toţi membrii. Ce e de făcut? De exemplu, rectorul ar putea sancţiona drastic fiecare abatere individuală, în speranţa că cei care au greşit vor învăţa o lecţie şi se vor comporta etic pe viitor. Soluţia este necesară, dar este ea şi suficientă? Problema este că abaterile nu sunt excepţia, ci mai degrabă regula (nescrisă) de comportament în cadrul Universităţii X. Toţi se comportă imoral, pentru că „aşa merge treaba" aici. Pare că există o „contaminare" de grup cu acţiuni imorale. La fel ca în cazul oricărei organizaţii, putem vorbi şi în cazul universităţilor despre un nivel de moralitate general şi colectiv, situat dincolo de moralitatea fiecărui membru al instituţiei respective. Aceasta deoarece o universitate este morală dacă practicile sale curente (contextul sau mediul universitar) stimulează membrii săi să adopte o conduită morală [41].

De ce avem nevoie de etică şi integritate în mediul academic? Întrucât, aşa cum susţin Kaptein şi Wempe, o diagnoză morală a Universităţii X pe baza unui un sondaj de opinii realizat informal arată că principalele comportamente imorale sunt, în ordinea descrescătoare a frecvenţei, următoarele: relaţia viciată profesor-student: adresare, hărţuire, tratarea arogantă a studenţilor, plagiat, conflict de interese, nepotism, concurenţă neloială, probleme de evaluare etică a proiectelor de cercetare, trafic de influenţă, corectitudinea notării – corupţie, încălcarea dreptului la confidenţialitate (în notare, în calificativele finale, în datele statistice etc.), statutul micilor cadouri instituţionale, probleme de etichetă la ore şi în serviciile administrative la rândul lor, un mediu în care se dezvoltă un cumul de practici organizaţionale ce pot fi supuse evaluării morale [42]. Aceste practici organizaţionale specifice fiecărei universităţi sunt exprimate propriu-zis prin acţiunile membrilor universităţii respective şi formează contextul moral în care sunt luate deciziile etice, aşa cum ar susţine Menzel [43]. Departe de a fi neutru sau pasiv,

contextul sau mediul universitar joacă un rol activ în procesul de luare a deciziilor etice, prin aceea că poate constrânge sau, după caz, stimula membrii universităţii să acţioneze moral ori imoral. Acest lucru poate fi exprimat fie explicit – prin intermediul politicilor şi procedurilor în vigoare (formal, la nivelul structurii universităţii), fie implicit – prin atitudini, tradiţii perpetuate, valori asumate (informal, la nivelul culturii organizaţionale dintr-o universitate). Comportamente imorale în universitate produc consecinţe şi găsim rostul să ne preocupăm atât de mult de crearea unor univeritǎţi morale. Pare în definitiv mai degrabă un ideal decât ceva ce am putea transpune în realitate [44].

Desigur, putem şi ignora dimensiunea morală a vieţii universitare, dar o vom face riscând daune de toate felurile, de la cele privind satisfacţia muncii, la cele ce vizează reputaţia şi pierderile financiare întrucât aşa cum spunea Spiru Haret, „Cum arată astăzi şcoala, aşa va arăta mâine ţara". Şi invers: cum arată astăzi ţara, aşa va arăta mâine şcoala iar cei care aţi avut răbdare să citiţi analiza noastră ştiţi că adevărul dur e corespunzător descrierilor de mai sus, eu vă invit în plus să încercaţi previzionarea viitorului în baza asumării acestui prezent, e în mod sigur neplăcut, dar e necesar, asemenea tratamentului unei boli. România este azi asemeni unui spital de nebuni, şi din păcate această comparaţie nici măcar nu e una forţată, realizată doar ca o eventuală figură de stil. Din păcate, societatea românească prezintă în mod evident similitudini şocante cu cele ale unui ospiciu, iar cetăţenii ei se comportă de aşa manieră, încât pot fi asimilaţi lesne medicilor şi gardienilor, pe de o parte, respectiv pacienţilor, pe de altă parte. Pentru că, o societate supusă în mod repetat unor traume majore, aşa cum a fost societatea noastră cel puţin în ultimul secol, generează în mod consecutiv boli nervoase la nivelul indivizilor ce o compun. După 45 de ani de comunism impus cu teroare, în care am conştientizat închisoarea în care trăiam, care veneau după experienţa, nefericită în a doua sa jumătate, a unei monarhii de import, egoistă, coruptă şi dictatorială, au urmat peste 30 de ani aşa-zis postrevoluţionari, în care speranţa a fost ucisă în mod repetat, civismul şi democraţia reprezentativă au fost practic compromise definitiv, traumele aplicate grupurilor sociale dezavantajate s-au cronicizat. Acest studiu prezintă simptomele pe care trebuie să le urmărim, ale unor boli ce s-au instalat în mediul nostru social. „Firește, anii au trecut și școala este obligată să țină pasul cu viața, dar nu aruncând peste bord valorile reale în favoarea unora iluzorii. Iar programele europene, naționale sau locale de educație sunt foarte importante, dar nu de ele ducem lipsă, în primul rând, ci de aplicarea legilor existente, de scoaterea educației din statutul de cenușăreasă, de tratarea cu seriozitate a școlii. Altminteri, vom distruge, fără bombe și fără pandemii, dar, pas cu pas, acest popor" [45].

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Creation of a distinct culture for the overall system "Compliance, IT security and Data protection" in municipalities in Germany

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Abstract

Public administrations in Germany today are increasingly exposed to attacks from the digital space. Threats to their IT systems or organizations in the physical world require security strategies. The Objectives of the work are the conviction of government leaders to enable themselves to control the implementation of data protection and IT security in their organizations with priority and resources. This also includes compliance as part of information security management systems in order to better anchor compliance in the overall organization, especially at the operational level. The Prior work shows that only a few protective measures are implemented in municipalities in Germany, although models for IT-Governance are available. One reason could be the scope and abstractness of the management systems, which lead to avoiding the introduction phase. To close the gap between awareness of the relevance of the topic and the actual taking action of measures, clear vision of practical implementation must be conveyed in order to protect the organization sufficiently and permanently. The Approach is based on a combination of technology, strategy and people. A bipolar approach is to be chosen in this thesis: Government leaders are to be simulated by a game-based learning approach knowledge around the topics of IT security, data protection and compliance through serious games scenarios. At the operational level of the security officers, building blocks such as "Building information security", "Compliance processes and applications" and "Risk management" are to be developed collaboratively as predefined building blocks and meaningful process models are to be visualized at a uniform level of abstraction. The first Results lead to the realization that technical and organizational measures for institutional protection can be developed independently, so that no external consultants are required. Authority management can increasingly assume their responsibility in this area as soon as a basic understanding of sufficient resources has been established and their own roles in the overall system of compliance, IT security and data protection are assigned. The Implications include enabling government leaders to initiate and manage compliance in their organizations. The

operationally responsible employees must be enabled to implement compliance in practice in cooperation with experts from thematic departments. In the long term, this is intended to create a distinct compliance culture in an organization. The Value of the work lies in getting compliance directly linked to the working level in order to anchor it directly in the organization. Government leaders are tasked with building a security- and risk-based culture. The thesis focuses in particular on adapting the mindset of employees and operational managers with regard to security risks and their consequences. Prioritization in preventive measures must therefore be shown in order to take up decisions on activities against cyber attacks and other incidents.

Keywords: *IT security, data protection, compliance, mindset security risks, game-based learning, process modelling awareness.*

1. Introducition and current Situation in the Field

Today, the threat situation of IT system environments can be found not only in large-scale industry but also in small and medium-sized enterprises as well as public authorities in ongoing cycles. The frequent gaps in the IT infrastructure of municipalities in particular have repeatedly been part of headlines in Germany since 2022 about successful hacking and the failure of the entire system. According to a BITKOM survey, this caused a total loss of 202.7 billion euros to the economy and the public sector in Germany in 2022 [1].

The vulnerability in the digital space presumably results from a mixture of a lack of funds for technology updates, failures in IT strategy and a lack of know-how. Information security is a strategic task of the top management level. In particular, the development of a security- and risk-based organizational culture, the sensitization of the specialist departments, the development of a measurable criteria in a security strategy and the permanent transformation of the mindset of employees as designers of their own sphere of activity to behave under the awareness of constant cyber attacks is of great importance. Especially in municipalities, considerations are hardly made about mature concepts of procedural data protection according to ISO 27xxx, let alone such a technically oriented Information Security Management System (ISMS), although the legal obligation and also the awareness of the necessity are given [2].

There is already a process model with a focus on SMEs or municipalities: CISIS12®®. IT stands for Compliance and Informationsecurity in twelve steps and is an ISMS as a result of a ten year development period based on the experiences accumulated from different surveys of SMEs and authorities initiated by the IT Security and Safety Cluster. The framework is designed to roll out information security processes both horizontally and vertically within a fixed security structure modell focused on Riskmanagement [3].

Several reasons related to technical complexity or lack of procedural control may be reasons why so few administrative managers live up to their role in this area and also do not allocate sufficient resources to the security area.

Against this background, this paper is intended to create a new, playful approach for the target group of decision-makers in municipalities on the topics of IT security and technical infrastructure security and to provide a toolset for visualizing and structuring the necessary steps to implement an information security system.

2. Research interest and methodology

The overall goal of the study is to better understand the mechanisms and barriers to active implementation of security measures. Systemic structures in the organization are intended to permanently invest in actually better cybersecurity. In addition to the importance and implementation paths for decision-makers, employees should be enabled to playfully put current business processes into practice in terms of IT compliance.

2.1. Research interest

With a focus on public administration, specific aspects of the organization and management of municipalities in the sense of a compliance culture in the field of IT security and data protection will be examined in more detail. This study therefore deals with questions about gaining knowledge (What still needs to be understood?) and with regard to recommendations for implementation (What constitutes successful transformation in IT security? What else needs to happen?). The following areas of interest and questions are considered:

- Analysis of the current handling of information security in the context of change and transformation in public administration
- Development of a better understanding of concerns and uncertainties at the decision-making level in this field
- Finding structural starting points and a methodological xmis for access to the topics of IT security, data protection and compliance for municipalities?
- How can business and government leaders be enabled to initiate and control compliance in their organizations?
- How should the empowerment concept of employees be designed in the future so that an ISMS can be lived in everyday life after it has been introduced?

2.2. Methodology

The methodological approach followed a mixed-method approach, which was based on the approach of a Delphi study according to Häder&Häder [4]. The research design includes exploratory and prognostic components. The first empirical step of the data collection was expert inverviews, on the basis of which dimensions for the first approaches of game-based learning in the field of IT security were identified. In two rounds, a high degree of agreement between the statements

and approvals of the experts was achieved. The results of the first round of surveys were presented for evaluation in the form of resulting scenarios of the mediation of ISMS building blocks during a second round.

Interviews with experts

For a sound empirical basis,various group and individual interviews with 18 experts were conducted between September and December 2022. The sample consisted of various representatives of federal levels and areas of administration, as well as associations with a scientific perspective and also consulting firms that collaborate on projects with public administration. As a rule, the municipalities were These semi-structured interviews were conducted using a conversation guide after it was designed with a test group as a pretest. All conversations were conducted and recorded via video calls. The average duration was 90 minutes. Key questions on various focal points provided the framework and stimulated discussion and exchange for the participants.

The thematic focus of the guide can be divided into four areas:

1. Status quo on challenges,
2. Status quo on dealing with compliance,
3. Dealing with experiences from previous training,
4. Classification of the importance of risk management and degree of organizational transformation.

Key questions were, for example:

- In view of the resistance and inadequacies of the employees, what do you think are the biggest challenges in the introduction of standardized information security systems?
- Which ideas, concepts, methods and approaches do you consider to be particularly relevant for dealing with the challenges discussed in practice?
- What degree of maturity of the systematic prevention measures and methods and approaches do you consider to be particularly relevant for better dealing with the challenges discussed in practice in the future?
- What are the most important administrative approaches that could increase data sensitivity for public administration workers?

The further substantiation of these approaches was pursued by means of a series of workshops in the format presented below for the acquisition of further insights with 30 decision-makers for digitization measures in municipalities. The meetings held between January and April thus represent the second part of the qualitative data collection:

Course of a workshop (2-2.5 hours)

10 min: Welcome/Short Inquiry of Expectations/Experiences

15 min: Input (e.g. on CISIS12® procedure) with knowledge level query with scenario maps + classification
25 min: Role play (at the table with everyone)
30 min: Compliance processes in groups
Pause
40 min: Risk Games: Risk Scenarios/Risk Cases; protection target abacus; TOM
Reflection/Discussion/Feedback

For the research topic in the field of technology research, a qualitative clustering was used in order to prepare the complexity of real-causal relationships in framework conditions for generalizability [5].

3. Theoretical Framework: Management Approaches to Learning of Security Infrastructure Measures

With regard to the theoretical foundation, a distinction must be made between two levels.

On the one hand, there is the cybersecurity system to be conveyed in terms of content, the concept of an information security system developed as CISIS12® is geared towards reduced complexity for SMEs and municipalities.

The model comprises twelve steps with different building blocks.

- The topic of "Compliance and related processes" is becoming an essential new element, in that a vision and guideline of understanding the importance of the topic is planned.
- The structure specifications with technical standards, catalog of measures or audit scheme for criteria of excellence in security.
- References to relevant standards and catalogues often measures from BSI-IT-Grundschutz and ISO/IEC 27001.
- Integration possibilities of industry-specific standards and catalogues, such as TISAX, B3S-KRITIS.
- Supplemented documents by: Manual, training concept
- Software with project management, DSGVO module, document control

On the other hand, organizational, model or software development in the context of IT security should be methodically combined conceptually in the teaching of competencies. Since concrete demands of practice are to be included in the design phase, the Action Design Research (ADR) approach according to Sein et al. [6] is followed. In it, after an analysis phase of the real requirements, a design phase is started, based on the accuracy of the successful implementation according to the requirements.

Accordingly, a distinction must be made between the following phases within the process model:

1. Problem analysis: the exploratory interest in knowledge lies in further narrowing down the causes of problems and methodically questioning the clarity through game-based learning methods.
2. The design of game-based learning and a haptic process support system as a modular system correspond to the CISIS12® system: "Building Information Security", "Compliance Processes and Applications" and "Risk Management" as well as preparatory governance for decision-makers.
3. Evaluation and further development: practical determination of which methods of game-based learning are accepted for the target group of business/authority management or which adjustments are necessary to differentiate between different process elements. Furthermore, long-term workshops are to be held with operational staff in order to evaluate implementation details. As a result, manageable and user-friendly forms of visualization are to be further developed or adapted.

4. Results and Value

In this section, the main findings from the above mentioned qualitative surveys into a status-increasing of acceptance, concrete strategies of the cultural change and parallels of the acquisition of competence process optimization and a culture of security awareness.

4.1. Results

From the interview material from the Delphi process, three overarching categories could be derived. Based on the categories, three dimensions of implementation in the change process were developed:

1. Current state of understanding compliance in relation to information security

The following aspects can be summarized as a definition of "compliance". Compliance as a

...Introduction oft a procedural view of compliance fulfilment

...Level based ranking, which takes into account all internal and external specifications

...Responsibility of the management level

...Basis for decision making in corresponding processes

...Implementation standard of the applications, the IT infrastructure and the buildings

...Implementation requirement for a superordinate PDCA cycles (Plan-Do-Check-Act)

This category describes the current state of affairs within the German public administration. From the different perspectives and experiences of the experts, a broad picture can be drawn of how the German administration behaves when dealing with changes in central systems. The spectrum of this status quo is diverse

and ranges from active ignorance ("Existing fears are often deliberately swept under the carpet.") to active handling, but in a select circle ("In confidential meetings with executives from the administration, consequential risks are definitely addressed.").

2. Opportunities for systemic risk management in cybersecurity in municipalities

An understanding of the target group inrelation to risk management is a combination of several criteria. Risk Management as Chance for

... an Introduction of a systematic management approach

... Implementing a structured ISMS processes in risk assessment and evaluation

... Core processes of identifying the "critical applications"

... Developing and implementa charta of comprehensible decision-making criteria

... Central Information pool for strategic documents of results for decision-making (management reports, internal audits, etc.)

In particular, the interviews result in approximation and attitude goals, which are evident from the adjectives used such as "better" or "higher". With regard to the goals, different areas can be differentiated, which differ in terms of their impact. Although a fundamental solution orientation for systemic approaches is still vague, it has a fundamentally positive connotation within the target group.

3. Path for a systematic transformation model to increase the implementation of an ISMS

The creation of a culture of innovation with operational implementation of known goals and long-term desired changes can fit through the exemplary representation of dependency relationships in the context of the practical steps to establish an organization-wide system of risk impact assessment.

For this purpose, a triangular ratio of the following elements must be implemented:

A) Awareness/Sensitivity

B) Intention to act/behave

C) Ability to act (resources/structure and governance)

The prerequisite for successful change and transformation is the communication of opportunities and expectations, barriers and potential assessments. At the same time, the degree of open and transparent handling of risks for all parties involved is a decisive lever for making cultural aspects of leadership measurable in the sense of organizational transformation.

From these categories, the in-depth workshops were able to develop further important information for the design of learning settings for decision-makers. In order to allow municipalities to take concrete steps for the introduction of an ISMS in accordance with ISO standards of the 27xxx series, a reduction of the documentation obligations and the level of abstraction is essential. Certification of

internal personnel as implementing experts does not solve the problem of nationwide penetration. Top management also needs to understand the link between IT security and other compliance requirements in order to determine appropriate resources and priorities. This is particularly evident from the discussions about module 2: "Raising awareness among employees", in which a series of training courses for experts is already planned as a fixed step. However, empirical results show that these measures often do not lead to an actual change in behavior in terms of compliance without signs of leadership [7].

That Teaching concept for ISMS CISIS12® comprises hence the recommendation followingr Complementary Building blocks at a base level "0":

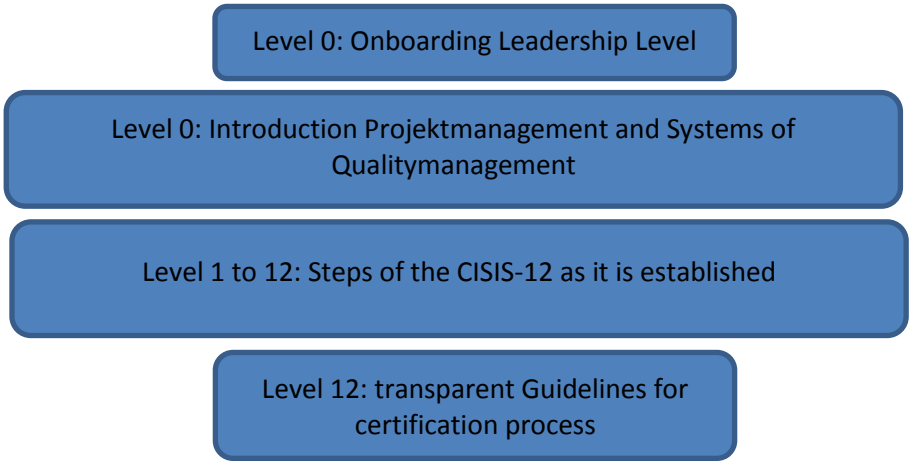

Fig. 1. Additional Moduls for Teaching CISIS12®
Source: Own Diagramm based on the SHI-Concept "SECUMO" (unpublished)

Thus, a conceptual distinction is made between leadership and management in compliance, which means that specific methods would have to be developed for the respective target group in further investigations. In many small companies, but also in public administrations, this distinction between the two leadership roles has so far been little practiced.

4.2. Value

Based on the results, it can be stated in an abstract way that a two-part approach to the creation of implementation requirements for the topics of IT security, data protection and compliance can be supported in a targeted manner with game-based learning approaches.

When imparting knowledge about aspects of vision, instead of passively absorbing information, the seminar participants should actively engage with learning content in order to create an opportunity for behavioral change in the first place [8].

Simulating serious gaming scenarios such as a hacker attack with the participants creates an organizational identification with concrete steps of information and action. The creation of a protected space also increases the joy of experimentation and the willingness to accept being allowed to make mistakes oneself [9].

The modularization of CISIS12® building blocks also shows the overall responsibility of all parties involved. Thus, the level of creating the necessary framework conditions such as raising awareness, forming the will to act and the competence to act must be addressed in the circle of the highest level of management. The process description and visualization of implementation components is aimed at the employees in operational implementation responsibility of the ISMS as technical experts.

Thus, a cross-cutting topic such as IT security/compliance also creates a direct connection between the working levels, which should also be anchored organizationally and made visible.

5. Conclusion

The above remarks show that municipalities are well aware that technical and organizational measures to protect them from cyber attacks are an urgent concern, as there is a high risk potential without an integrated information security system in the organization. However, the empirical surveys show weaknesses in the determination of concrete steps and meanings of compliance or risk management. Complex processes can therefore only be combined with a created culture of values of security aspects in digital work, which already addresses one aspect of the idea of digital transformation.

In the teaching of competences, it has been shown that it is not enough to leave the modelling of data and information models to a few experts. Even hiring external consultants does not create the necessary culture of compliance. Rather, modularized seminar units in game-based learning help to make the activities of the work areas comprehensible for the participants and to work out the process flows collaboratively with predefined modules of the ISMS CISIS12® and to visualize meaningful visual model adaptations at a uniform level of abstraction. This enables a new quality of participation across disciplinary and organizational boundaries. In addition to the established ISMS, additional modalities must therefore be integrated into the overall process in the didactic mediation.

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Health Policies in Times of Crisis

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Abstract

Current events in recent decades have highlighted crisis-causing events, through the emergence of the Covid-19 epidemic and other communicable diseases, but also through manifestations caused by climate change at zonal level - floods, droughts, violent storms or earthquakes. All have been unpredictable and have caused major budgetary expenditure. In all cases, the importance of the local, regional and global health system, the need for collaboration and cooperation, and the development of standards under the coordination of the World Health Organization were highlighted. At the same time, new specialisations within the health system have emerged, as well as the organisation of government departments for emergency situations.Consequently, it can be stated that health policies need to be drawn up to deal with the various unforeseeable crisis situations, which means legislation, organisation, training of specialised staff, equipment, budgetary expenditure, but also preventive measures in some cases, as well as special attention to be paid to eliminating the consequences of the effects of crises with their specific characteristics. Currently, the Covid-19 epidemic is considered almost eradicated according to WHO, the main consequence being the death of more than 7 million people worldwide. For the realization of the material we took into account the documents and norms issued by the World Health Organization, the European Union, the Romanian Authorities as well as statements in the media of international and local specialists about the appearance, evolution, treatment methods, effects and consequences of the vaccines used.

Keywords: *types of crises, adequate functional administrative organisation, staff training, regulations, budgetary evaluation.*

1. Introduction

The 21st century began with various disasters, natural disasters and crises affecting and affecting populated geographical areas, which administrations have been taken by surprise, while the major negative effects have involved unprecedented measures and huge budgetary funds. These have been superimposed

on major social and economic crises at regional or global level (epidemics, pandemics, military conflicts, financial and banking crises, etc.).

Implicitly, administrations have applied various forms of protectionism in an attempt to limit the consequences for countries and areas and to find ways of collaborating and safeguarding them (see the SARS-COV2 epidemic).

Disasters and natural disasters are unpredictable in nature, but their consequences can affect economic and social developments in the short and medium term, as in the case of major earthquakes, prolonged droughts, floods, forest fires, climate change, etc.

For natural disasters and calamities as well as for the various types of crisis, there should be synchronised area-based measures for prevention, where appropriate, or for combating them, or for resilience, especially as some of them may be repetitive.

Since every state entity or geographical region is or may be affected by such phenomena, both local and regional bodies should be set up that can operate in such a way as to minimise the effects of disasters, calamities and crises. This requires logistical expenditure, but also the training of qualified staff for the types of events.

In Romania, the effects of periodic earthquakes in the Vrancea area, to which the Oltenia area has been added since this year, have led the Institute of Earth Physics to diversify and increase the number of specialists, to provide expensive modern equipment and to draw up rules for emergency situations. At the same time, it has been necessary to urgently assess residential buildings and other targets that could constitute imminent dangers (dams, bridges, nuclear power plants, etc.).

Climate change, which regularly manifests itself in some areas of Romania, floods, droughts, fires, storms, snowfalls, with economic and social consequences, are still not adequately managed, with a lack of embankments, modernised transport network, logistical facilities, irrigation network, even if projects have been developed that can be financed from EU funds and budget, managed by political actors. Also, the COVID-19 pandemic, which also occurred in Romania through the random measures imposed, caused negative effects on the economy, education and the health system, as well as epidemics of measles, influenza, chickenpox and TB, especially due to the temporary lack of vaccines and specific medicines.

The Russian Federation's war against Ukraine has affected Romania's economy, both in terms of higher fuel prices and the losses suffered by farmers, who have been unable to compete with low grain prices in Ukraine and the rising cost of chemical fertilisers.

Lack of imports of raw materials and finished products from Ukraine and Russia have created synergy in Romania's economy.

Health policy is part of any country's strategy to protect its population, both in the event of different types of crises and in the event of normality.

Health policy can be understood in terms of the following aspects:

- Specialist medical education;
- Sufficient health units and their adequate provision of instruments and specialists;

- Health-specific legislation and regulations, with responsibilities at central and regional levelCollaboration with world specialist institutions;
- Salary policy and legislation.

These can only be achieved through medium and long-term budgetary investment as an integral part of the national development strategy and raising the living standards of the population.

The Covid-19 pandemic, which has also occurred in Romania, has highlighted the shortcomings and weaknesses of the Romanian healthcare system, with significant consequences for social and economic life and particularly high expenditure on purchases to combat it, many of which have proved ineffective and costly.

On the other hand, the recent earthquakes in the Oltenia area, which were of course unforeseeable, have affected many health units in the area, in outdated buildings without sufficient medical staff.

It should be pointed out that many graduates of medical faculties in the country, as well as residents, cannot find satisfactory jobs, so in the last approx. Over 20,000 senior and mid-level medical professionals have migrated from Romania in the last 20 years.

Health policy is of particular importance in preventing various diseases, through vaccinations immediately after the birth of children, but also through health concepts in school education and through the media in the public domain. In the following I will present the positive and negative aspects of the Covid-19 epidemic, following the indications from the European Union and WHO and the measures taken by political and administrative decision-makers in Romania.

The first cases of Covid-19 appeared in Wuhan locality in China as early as late 2019, as a result of research in a laboratory of a private institute, largely funded with US funds.

The public was not informed about the emergence of this virus until after the outbreak of the disease in the United States and the western European Union.

Thanks to international air travel, the disease began to spread rapidly on all continents as an unpredictable epidemic, creating international panic.

The European Union negotiated on behalf of the Member States, about. 3 billion doses of vaccine from the companies mentioned and delivered on demand and at cost to member countries.

The Romanian authorities agreed to take the following measures, for which very large budgetary and extra-budgetary funds were allocated:

- The purchase of more than 130 million doses of vaccine, given that each vaccinable person would have to undergo three consecutive vaccinations at different times;
- The import and emergency production of protective masks, differentiated for health professionals and citizens, which should have been given free of charge to citizens;
- Import of specialised sanitary isolators and tents;

- Legislation, some of which is considered abusive, to isolate people affected by Covid-19 and to convert hospitals or hospital wards specifically to treat those infected and those who have had contact with infected people;
- Closure of educational establishments and inauguration of the online education system for pupils and students; Limiting the number of people at public or private meetings;
- Measures to detect potentially infected people at border points, at the entrance to institutions or shops by thermoscanning and detaining people with hyperpyrexia;
- Establishment of the "green certificate" for domestic and international travellers;
- Develop hygienic and sanitary measures to prevent and control the spread (hand washing, wearing masks, etc.).

Criminal fines and other punitive measures were provided for most of the non-compliances, restrictions, and sanitary rules, which led to dramatic damage to economic and social life.

At the European Union (EU) level, financial support has been provided to Member States, including Romania, but this financial support has primarily targeted the economy.

As early as 30th of March 2020, a €37 billion package was approved under the Coronavirus Investment Initiative. On the 14th of April 2020, the EU budget was supplemented by €3.1 billion, and in May 2020 a €540 billion package was adopted to protect jobs and businesses (SURE - the European Instrument for Temporary Support to Mitigate the Risks of Unemployment in Emergency Situations). In February 2021, the Council of the European Union adopted the Regulation establishing the Recovery and Resilience Mechanism (RRM), worth €672.5 billion, to help Member States cope with the economic and social impact of the COVID-19 pandemic.The process of documenting and gathering evidence on the effectiveness of the GFP responses and the extent to which they will play a key role in the future is still ongoing. Most countries have conducted a review or evaluation of their COVID-19 responses, but it is too early to assess their effectiveness. Most of the available findings relate to their relevance and effectiveness. The medium-term implications of the response in terms of healthcare financing are rightly of particular interest. It remains to be seen whether governments will seize the opportunity and build on the short-term measures to strengthen policies on health spending and other potential epidemics. And the converse is true: a key decision facing governments in the coming years is which adjustments to PFM made during the COVID-19 response should be maintained and which should be removed. This point has already been made in relation to some of the extra-budgetary funds allocated to combat COVID-19 examined, which do not have a so-called "sunset clause" determining when they will be de-obligated.

Table 1. Budgeted expenditure on health 2019

Current health expenditure, 2019

	Million EUR	EUR per inhabitant	PPS per inhabitant	% of GDP
EU (¹)	*1 386 255*	*3 102*	*3207.51*	*9.9*
Belgium	50 759	4 418	3 901	10.7
Bulgaria	4 364	626	1 317	7.1
Czechia	17 546	1 644	2 443	7.8
Denmark	31 137	5 355	3 915	10.0
Germany	403 444	4 855	4 659	11.7
Estonia	1 892	1 426	1 792	6.7
Ireland	23 782	4 820	3 633	6.7
Greece	14 376	1 341	1 657	7.8
Spain	113 674	2 412	2 573	9.1
France	269 541	4 008	3 770	11.1
Croatia	3 785	931	1 440	7.0
Italy	155 249	2 599	2 611	8.7
Cyprus	1 562	1 771	1 946	7.0
Latvia	2 001	1 046	1 457	6.6
Lithuania	3 420	1 224	1 949	7.0
Luxembourg	3 411	5 502	3 870	5.4
Hungary	9 277	949	1 551	6.4
Malta (²)	1 110	2 290	2 754	9.0
Netherlands	82 365	4 749	4 102	10.2
Austria	41 483	4 672	4 078	10.4
Poland	34 400	906	1 636	6.5
Portugal	20 392	1 983	2 393	9.5
Romania	12 810	661	1 354	5.7
Slovenia	4 125	1 975	2 361	8.5
Slovakia	6 534	1 198	1 565	7.0
Finland	21 992	3 983	3 258	9.2
S	51 824	5 042	3 968	10.9
u	1 900	5 270	3 245	8.6
	333	8 626		5.6
e	38 113	7 127	4 821	10.5
d	73 787	8 605	5 102	11.3
	:	:	:	9.1

(1) UE 2019, calculated with data from 2018 for Malta
(2) Data from 2018

eurostat

Source: https://www.oecd.org/coronavirus/policy-responses/first-lessons-from-government-evaluations-of-COVID-19-responses-a-synthesis- 483507d6/#tablegrp-d1e385 [1]

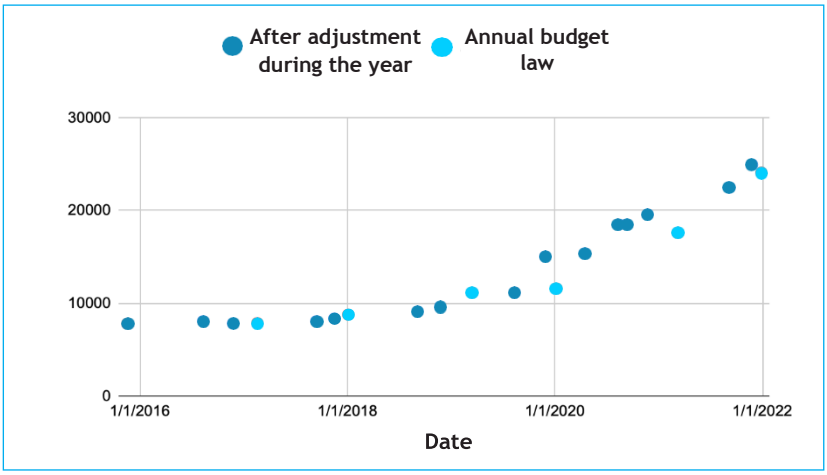

Fig. 1. Budget allocations for the Romanian Ministry of Health within 2016- 2022
Source: https://www.igsu.ro/Resources/COJ/ProgrameStrategii/pdf24_merged.pdf [2]

However, the Ministry of Health's annual budget adjustments in 2020 and 2021 exceeded previous patterns in both timing and amount. First, there was a first adjustment during April, followed by two more in August and November. Second,

the amount of adjustments was substantially higher than usual, namely 33% of the budget approved in the annual budget law (April 2020), 27% (August 2020) and 9% (November 2020). The year 2021 marked a return to the usual pattern of two adjustments during the year, but the amount of these remained significantly higher than usual, i.e. 28% (September 2021) and 14% (November 2021) of the budget approved in the Annual Budget Law. In 2020 and 2021, respectively, in-year adjustments were made to the Ministry of Health's budget in the amounts of 7.9 and 7.3 billion lei. If this was the situation of the allocation of funds from the Gross Domestic Product for health in Romania, before the Covid-19 pandemic, the Romanian authorities during the pandemic had to increase, by biannual budget rectification, the funds for combating the effects of Covid-19, concomitantly with collateral investments (purchase of tablets for e-learning). With all the measures to combat the pandemic, it was found that the immunity of the sick proved to be inferior to that of the vaccinated, as well as negative consequences for other illnesses that could no longer be treated in hospitals dedicated to the pandemic.

Romania was the only country in the world that established and published in the official gazette the compulsory treatment for all health professionals of those affected by Covid-19, restricting the initiative of some health professionals to have the initiative of other treatments, depending on the specifics of each patient.

I must mention that the Covid-19 epidemic, both at the level of the European Union leadership of vaccine manufacturers and other factors has caused pecuniary crimes, which are under investigation. Following the declaration by the World Health Organization of the cessation of the pandemic and mutates, the consequences noted by epidemiological specialists and authorities can be listed as follows:

- Spike protein should have been under study for at least 5 years, as it influences a human's immunity throughout his or her lifetime;Vaccines have contributed to heart problems (myocarditis and pericarditis) and abnormal functioning of the central nervous system through blood clots;
- The secrecy of negotiations and contractual clauses between vaccine companies and leading signatories of the European Union have been partially revealed, with the result that the companies responsible for the vaccines do not assume any responsibility whatsoever for the possible negative consequences for vaccinated patients, which are the responsibility of each state receiving the vaccines.

The Romanian authorities presented the Covid-19 epidemic as follows:

- The virus has not affected the human population in the past. Currently more than 90% of the population is susceptible to this infection;
- The virus has a higher transmission rate than other pathogens, coupled with airborne transmission leads to rapid infection of the exposed population, in the absence of control measures, with the potential to generate widespread community outbreaks and overburden or overwhelm health systems.

The long incubation period means that epidemiological investigations do not identify all the possible ramifications of transmission chains, and that the effectiveness of infection control and containment measures and the effect of relaxation measures are only apparent 14-28 days after implementation.Currently no specific effective antiviral compound or vaccine is being developed, so that control measures rely solely on non-pharmaceutical measures, the effectiveness of which is dependent on the understanding and cooperation of communities.

In Romania, as of 09.12.2020, 532,040 cases of people infected with SARS-COV-2 have been registered, of which 425,816 people cured and 12,821 people died. Regarding the residence environment, the majority of confirmed cases were registered in urban areas (69.1%), which is characteristic of communicable diseases given that in urban areas there is a higher density of people with increased mobility and level of interaction. The majority of deaths were among people over 60 years of age (82.5%) and 59.7% of deaths were among men. 95.6% of the deceased had at least one associated comorbidity.The case fatality rate increases with age, with high case fatality rates from the 70-74 age group (1 in 10 cases resulting in death) to the 85+ age group (1 in 5 cases resulting in death).

In Romania, the level of contagiousness with Covid-19, according to data published by the Department for Emergency Situations (DSU) during the period 09.11.2020-09.12.2020, the daily average of people confirmed positive with SARS-CoV-2 virus was 7,592, exceeding the average value recorded during the period 09.10.2020-09.11.2020 (4597 confirmed people), which required ad hoc emergency measures.

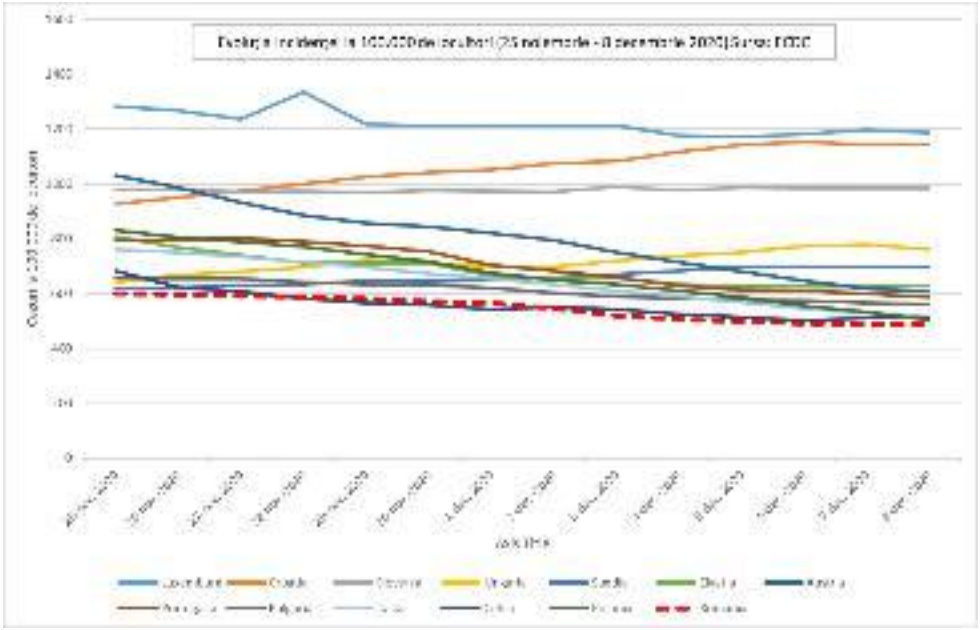

Fig. 2. Evolution of SARS-COV-2 incidence in EU MS (pe acelasi considerent, este evident un grafic de evolutie a incidentei SARS in timp, doar ca este foarte neclar
Source: https://www.igsu.ro/Resources/COJ/ProgrameStrategii/pdf24_merged.pdf [2]

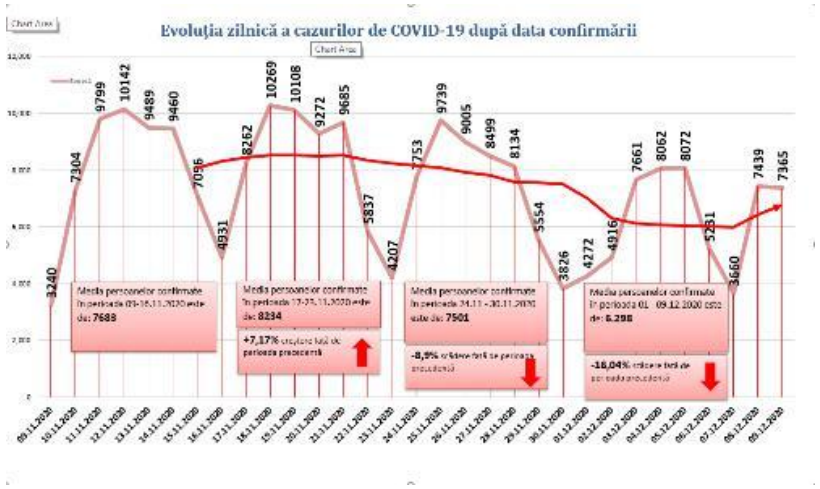

Fig. 3. Daily evolution of SARS-COV-2 cases in Romania
Source: https://www.igsu.ro/Resources/COJ/ProgrameStrategii/pdf24_merged.pdf [2]

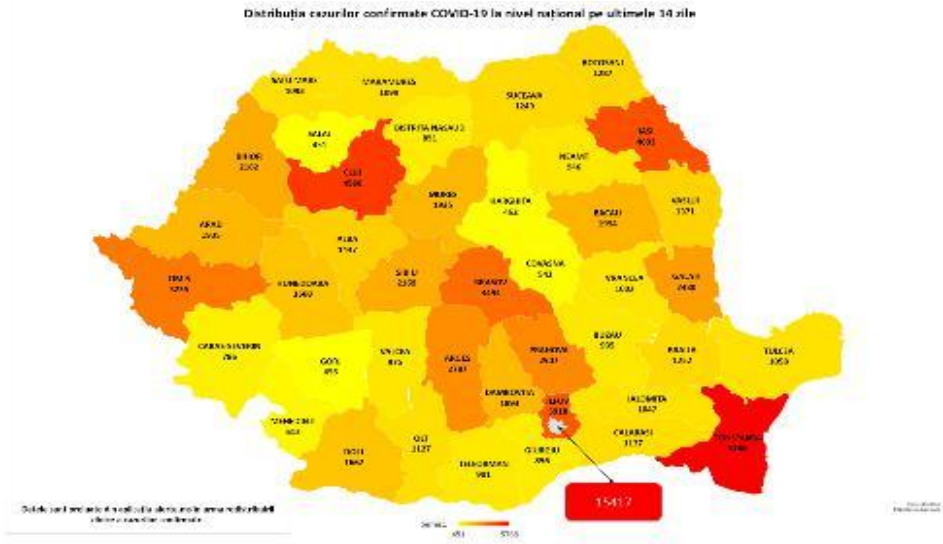

Fig. 4. Distribution of confirmed cases at national level
Source: https://www.igsu.ro/Resources/COJ/ProgrameStrategii/pdf24_merged.pdf [2]

From this map published by the Department for Emergency Situations, it appears that the most affected by Covid-19 were the most populated localities, while the more isolated localities (villages, communes in the hill and mountain areas), were not affected at all or only slightly.

It was revealed that, in Romania, the incidence of the epidemic on 09.12.2020 out of the total number of active cases reported (sum of confirmed cases in the last

14 days persons hospitalized on the date of reporting more than 14 days after the date of hospitalization) is 93,403, as shown in the table below:

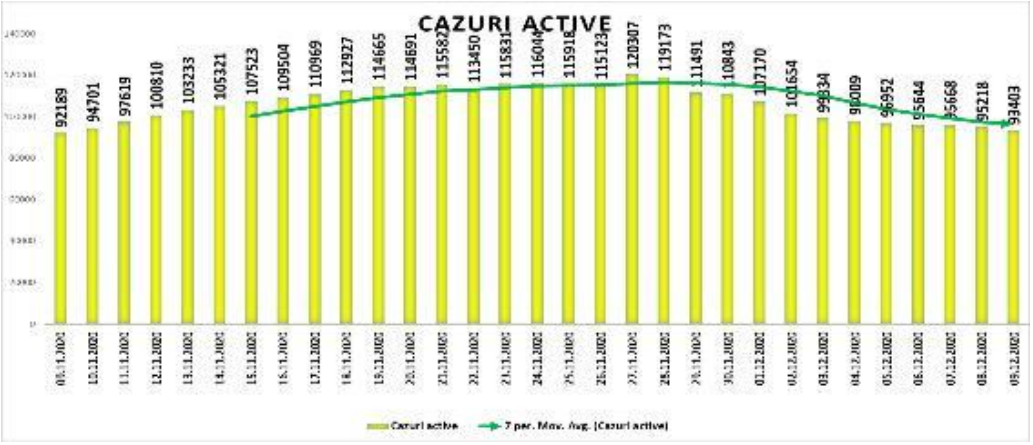

Fig. 5. Evolution of active SARS-COV-2 cases between November and December 2020
Source: https://www.igsu.ro/Resources/COJ/ProgrameStrategii/pdf24_merged.pdf [2]

As a result of relatively poor conditions in some hospital units, people affected by Covid-19 requested discharge according to data 09.11.2020-09.12.2020 9,817 confirmed patients were discharged on request (average 326/day), reaching on 09.12.2020 the value of 39,106 people discharged.

The localities characterized by tourist traffic or business interests were the most affected by the Covid-19 pandemic, so the main areas with intra-community spread are in Bucharest (16.8% of total active cases) and the counties of Constanta (6.29% of total active cases), Cluj (4.98% of total active cases), Iasi (4.46% of total active cases), Ilfov (4.27% of total active cases) and Brasov (3.81% of total active cases).

Currently, the 14-day cumulative infection rate per 1,000 inhabitants shows that 884 localities (of which 27 municipalities and 69 cities) have between 1.5-3 cases per 1,000 inhabitants and 733 localities (of which 75 municipalities and 96 cities) have a cumulative incidence of more than 3 cases per 1,000 inhabitants.

In this context, non-pharmaceutical measures are needed to prevent the spread of infections and to avoid reaching an uncontrolled level of infections, with a direct impact on recorded mortality and an influx of patients beyond the capacity of the health system in the region. At the same time, as of 09.12.2020, in Constanţa, Ilfov and Bucharest there is a cumulative incidence of cases in the last 14 days of more than 6 cases per 1,000 inhabitants, in 15 counties there is an incidence of more than 3 cases per 1,000 inhabitants, and 24 counties have an incidence of less than 3 cases per 1,000 inhabitants.

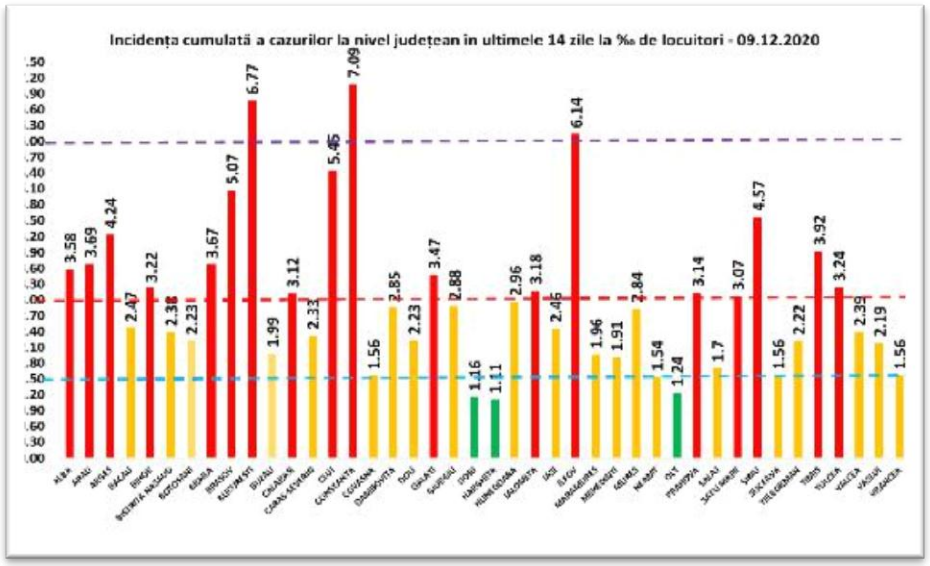

Fig.6. Cumulative incidence of SARS-COV-2 at county level (November-December 2020)
Source: https://www.igsu.ro/Resources/COJ/ProgrameStrategii/pdf24_merged.pdf [2]

Thus, the situation recorded by the competent authorities in Romania is as follows:

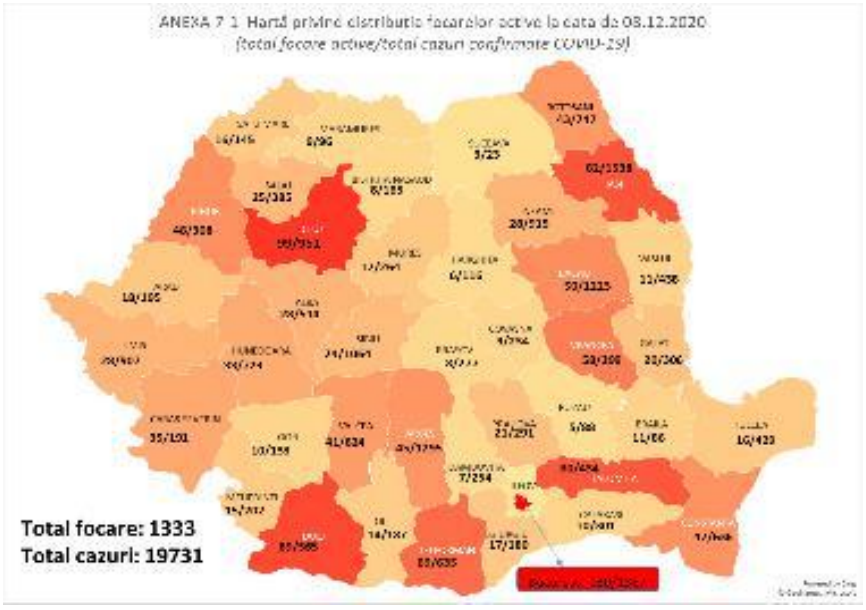

Fig.7. Map showing the distribution of active COVID-19 outbreaks on 08.12.2020
Source: https://www.igsu.ro/Resources/COJ/ProgrameStrategii/pdf24_merged.pdf [2]

It was observed that the rate of cases doubled every 45 days.

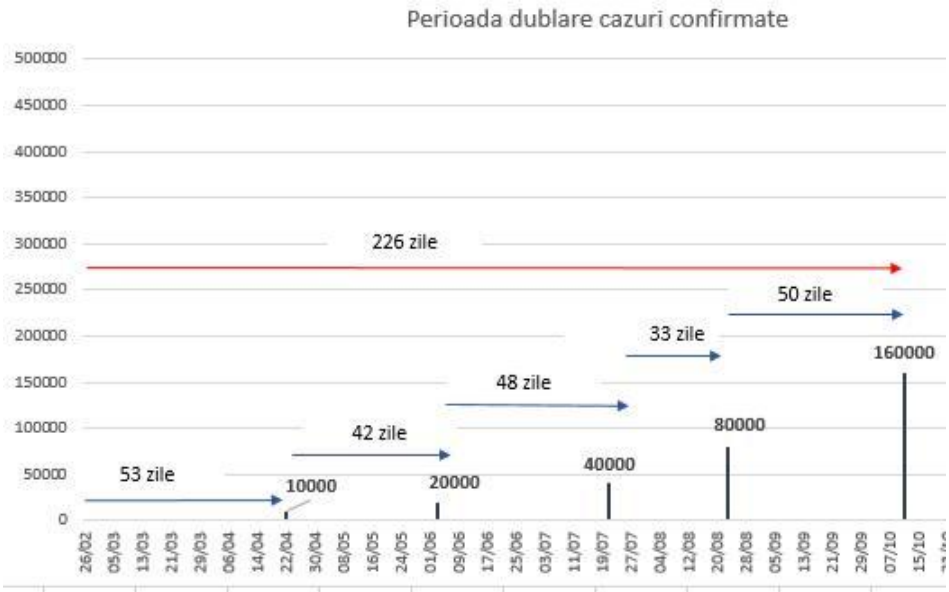

Fig.8. Analysis of the doubling period of cases registered between March and October 2020
Source: https://www.igsu.ro/Resources/COJ/ProgrameStrategii/pdf24_merged.pdf [2]

2. Conclusions

The Covid-19 pandemic in terms of emergence, mode of spread and manifestation, incidence and effects on the economic and social environment has taken all countries and the health system by surprise, so that more or less effective measures had to be taken to limit the spread of the SARS-COV2 virus, the possibilities of treatment with major unforeseen investments in budgets.

On the positive side, the Covid-19 epidemic, which forced each affected country to set up specialised departments for such cases, highlighted the shortcomings of the emergency health system, the need for collaboration and cooperation between countries and the relevant world organisations, the dangerousness of laboratory experiments, the establishment of health strategies in times of crisis at national and regional level, the training of specialists and the allocation of funds for such unpredictable situations.

It can be seen that Romania, like other countries, was taken by surprise by the Covid-19 pandemic and has tried, through practical and ad hoc legislative measures, to cope with this crisis, which may recur.

In Romania, the Covid-19 epidemic has prompted collaboration between various ministries, given the effects on the economy, education and social life in general.

In Romania, too, epidemiological specialists have expressed different opinions about the outbreak of the epidemic worldwide, ways of preventing the spread of Covid-19 and treatments, since there is no common view both worldwide and within the WHO, but the only consequence of the epidemic is that each country has understood that it must be prepared for such a situation.

Proposals:

1. Establish central administrative bodies responsible for health policy in times of crisis;
2. The need for specialised health and pandemic response staff;
3. Investment in regional health units capable of adapting to situations similar to the Covid-19 pandemic;
4. Develop ways of promptly informing citizens and how to behave in epidemic situations;
5. Continue studies on the health effects of the Covid-19 outbreak, vaccination and subsequent treatment;
6. Development of production units for various medicines and laboratories and equipping them with modern equipment;
7. Continuation of collaboration within the World Health Organisation and other international specialised institutions with Romanian representatives.

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URBAN IDENTITY
Highlighting the Landmarks - The Tale of One City

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Abstract

According to urban and environmental psychology studies, city residents are developing an attachment, a behaviour and an attitude towards the city they inhabit depending on physical elements present in the city space but also abstract elements related to the history, fame or cultural background of the city, of some events that took place in the city or personalities who lived in the space they travel, use and finally appropriate as "their city". The "silhouette" of the city is often recognized by visually identifying the silhouettes of the striking visual elements such as: historic buildings, structures made up of interesting, unique volumes and which are defined as an emblematic landmark for the respective city, as the Eiffel Tower is emblematic for the city of Paris, the CN Tower for Toronto, the Opera House for Sidney, the Romanian Athenaeum for Bucharest, the Parthenon Building for Athens, a.s.o. Such architectural landmarks give the city a unique urban identity and provide the inhabitants a sense of historical, cultural belonging and important international prestige. A city, however, has multiple striking visual accents, which, in addition to the importance given by their historical, cultural or architectural value, have also the role of visually contributing to the definition of the urban space itself, the cohesion of the urban fabric, being important landmarks for the orientation of the inhabitants and visitors in the urban space. As a result we can conclude that it is necessary for these urban landmarks to be extremely well highlighted from a visual point of view. We will see what are the modalities of insuring a good visual access to those landmarks by a correct design and management of the public outdoor circulation routes, correct artificial lighting, controlling the volume of the vegetation, and a well designed and accessible digital and physical informative platform.

Keywords: *famous landmarks, monuments, city icons, emblematic buildings, famous structures.*

1. Introduction

The perceived image of the urban area is essential for any city in the world. The aesthetics of exterior spaces, architecture, urban planning, integration into the natural landscape, the inclusion of natural elements are important both for the city's inhabitants and for the impression created to the visitors, tourists, even spectators who watch photographed or filmed images of the city without even ever having visited it.

In order to highlight all these aesthetic features of the city, several conditions related to access and visual comfort must be met:

- • Care for the built heritage: clean, well-kept façades, renovated buildings, well-maintained parks and gardens;
- • Correct exterior lighting, bearing in mind that during the night any element that does not benefit from artificial lighting is invisible, therefore non-existent in the nocturnal urban landscape;
- • Implementation of an advertising policy that does not allow the superimposition of any type of image on any type of building, limiting the risk of blocking visual access to valuable architectural, cultural or artistic elements or diverting viewer's attention from them.

1.1. Physical elements that can block the perception of the city landmarks

According to urban and environmental psychology studies, city residents are developing an attachment, a behaviour and an attitude towards the city they inhabit depending on physical elements present in the city space but also abstract elements related to the history, fame or cultural background of the city, of some events that took place in the city or personalities who lived in the space they travel, use and finally appropriate as "their city" [1].

The "silhouette" of the city is often recognized by visually identifying the silhouettes of the striking visual elements such as: historic buildings, structures made up of interesting, unique volumes and which are defined as an emblematic landmark for the respective city, as the Eiffel Tower is emblematic for the city of Paris, the CN Tower for Toronto, the Opera House for Sidney, the Romanian Athenaeum for Bucharest, the Parthenon Building for Athens, a.s.o.

Such architectural landmarks give the city a unique urban identity and provide the inhabitants a sense of historical, cultural belonging and international prestige.

The inhabitants of urban areas mentally build their "cognitive map of the city" with which they orient themselves, resonate and model a certain type of behaviour specific to it.

The mobile and internet applications positively influence smart city orientation for both the tech savvy and nontech savvy population, but nevertheless we need to be able to keep the old fashioned way of being able to navigate the urban environment by visually perception of the main landmarks of the city environment, and this is not possible if we are not able to visually spot easily those key points from the distance or even from the close proximity because of different elements

that are able to hide those landmarks from our visual perception or distract our attention from them [2].

A city can have multiple striking visual accents, which, in addition to the importance given by their historical, cultural or architectural value, also having the role of a visual landmark that contributes to the definition of the urban space itself, the cohesion of the urban fabric, being important landmarks for the orientation of the inhabitants and visitors in the urban space.

The best situation is if the city landmarks have sufficient free space around them in order to benefit of an optimal visual access from far away.

It is also advisable that the city landmarks should not be covered or have in their proximity tall vegetation (trees) that partially block the visual perception of the integrity of their volume from close by or from the distance.

It must be taken into account that it is preferable that they should be visually perceptible from great distances, so the possibility of their perception must be facilitated by removing as much as possible the obstacles that can prevent this on more generous surfaces in the urban space. Most of the major historical city monuments all over the world have already been positioned in visually advantageous positions, such as on hills (Acropolis - Athens) or as focal point of important avenues or boulevards. But mistakes can still be made, such as planting tall trees or positioning water fountains with tall water jets in the middle areas of those boulevards, covering the view of the landmark placed at the end of that route.

Fig. 1. Polytechnic University of Bucharest by night
Source: arch. Monica-Mihaela Frangulea, November 6, 2022

In the image above we can see the impressive Rectorate building of the Polytechnic University of Bucharest that benefits of a spectacular lighting system, a beautiful view unfortunately partially blocked by the presence of some massive trees in the vicinity of the building.

1.2. The city landmarks by night

The cityscape by night is a major feature of any city. In order to preserve the urban recognizable silhouette the major landmarks must be present, which means during night time they must benefit of a generous and correctly designed lighting system that visually set them apart from the rest of the urban elements.

Fig. 2. Doha city by night (Qatar)
Source: Tom Archer

Before even starting a lighting project for a landmark, the specialist must study the visual influence of the surrounding existing environment, that can influence the perception of the targeted element with light, physicality blocking elements, reflective surfaces (horizontal - water surfaces or vertical - glazed walls), a.s.o. This environment surrounding a city landmark creates also the visual " background" of the iconic element.

Early 20-th century theorists such as Kurt Koffka, Max Wertheimer, and Wolfgang Köhler (students of Carl Stumpf) saw objects as perceived in an environment in conjunction with all component elements as a unitary whole. This gestalt or "whole form" approach sought to isolate the principles of perception—apparently innate mental "laws" that determined how objects are perceived by the observer.

The perception of any architectural object is undoubtedly linked, as I mentioned before, to the context in which it is located, and this context brings together a number of aspects of a visual, psychological, memory, historical value, a.s.o. The vast majority of these aspects are related to the image and daily life of this object, the active period of the communities and of every person in general unfolding in a much greater proportion during the day than at night. We know, can recognize or remember a particular building by correlating it with its image in natural daylight. At night, however, the entire urban or natural context around that building changes dramatically, both due to the darkness of the night and the artificial lights present in this environment, fundamentally different from the uniform light during the day.

We therefore observe an effect of decontextualization of the architectural object or landmark, which can suddenly become solitary, with an accentuated visual presence like a lone actor on a dark stage, unique protagonist under the spotlights. This object, however, can be in many other poses, up to the critical situation where the buildings or other surrounding elements are intensely or spectacularly lit while it remains "in the shadow", the lack of proper artificial lighting can minimize its presence and the complete lack of of a lighting system to make it effectively invisible, therefore non-existent. This is obviously an undesirable situation in the case of some architectural objects in the category of those that are the purpose of this study, important monuments or landmarks belonging to the national cultural heritage or unique natural features.

There are studies (David Stea, 1986, Canter apud Garcia Mira, 2002 apud Ilin, 2008) in which researchers analysed the meaning attributed by citizens to the constituent elements of the urban framework, especially the architectural ones, in the process of perceiving the meaning attributed to these elements, and the conclusion was that this process is eminently social. This study allows an analysis of the individual experience related to the built space or structure, its symbolic value and the emotions related to the meaning of the urban space and the architectural object. This shared meaning of the built environment is the subject of extensive studies that have highlighted the major importance of emotional meaning for certain places or architectural objectives valued especially in environmental representation, the emotional meaning for urban space in relation to public art, the evaluation of symbolism and the role of public art in urban regeneration [3].

In this context, we note the fact that an alteration of the way of perception of an architectural object through an inadequate lighting system or due to random lighting diffusing from the environment towards this object can lead to an effect of alienating the respective object from the urban context in which it is integrated and of non-recognition of it by the observer or of a negative reaction, of rejection of the perceived image, which can ultimately cause the alteration of the identity and value of that architectural object.

When we formulate the term "background" we are obviously aware of its ephemerality, because from different observation positions of an architectural objective we will perceive another background image behind it.

The analysis of the site, of the existing environment, are essential to analyse before proceeding with the design of a lighting system. We will therefore have to visit and observe very carefully what exists and is perceived on the spot, identify which are the main observation routes of the landmark in question, which are the positions from which the object will be observed and make a synthesis of the data obtained that we will have to take into account when the lighting project begins to take shape, even before we outline the basic concept that will give the main characteristics of the lighting project that we want to realize.

The background is a component part of the environment that surrounds the objective, substantiating the spirit of the place, that genius loci that makes its presence visually but also the unseen but still present elements. We will have to give special importance to the study of this external environment of our intended

objective, our key element, because its influence on the perception of the object by the viewer but also on the intrinsic existence of the object itself is an important one, as Alexander Pope advises us to take into account this spirit of the place in these famous lines from Epistle IV to Richard Boyle, Earl of Burlington:

"Consult the genius of the place in all;
That tells the waters to rise, or fall;
Or helps th' ambitious hill the heav'ns to scale,
Or scoops in circling theatres the vale;
Calls in the country, catches opening glades,
Joins willing woods, and varies shades from shades,
Now breaks, or now directs, th' intending lines;
Paints as you plant, and, as you work, designs."

The fact that brightly lit areas automatically attract our attention is obvious. Using an appropriate distribution of the brightness of the component objects makes it possible to order the multitude of information contained in an environment. Areas containing essential information can be highlighted by accent lighting, while secondary elements can be softened by applying a lower level of lighting. This facilitates a fast and accurate flow of information, whereby the visual environment is easily recognizable in terms of its shapes and the meaning of the objects it contains. Our desire is obviously to emphasize the important, valuable elements in the built environment (the landmarks), placing the other elements in the background. However, this is not easy to achieve, taking into account the fact that the lighting projects of different architectural objects located in the same area are not designed at the same time nor by the same lighting designer. We have monuments that have a functional lighting system made many years ago, perhaps already with deficiencies (missing lights, sources replacing some damaged light sources with other new sources with a different light color, a.s.o.) , with older types of light sources, extremely poor systems with only a few sources of general light from a distance, alongside architectural objectives newly renovated benefiting of a generous or perhaps even excessively bright lighting system (with an increased light intensity per unit of facade surface).

We can also observe from the reality that surrounds us that the current built environment in Romania at night is a Babylon of colors, a random amalgam of bright elements, with dynamic lights interspersed with extensive areas of low brightness or total darkness. The old areas of our cities with a high density of buildings of historical value are by no means an exception, an overwhelming majority of these valuable architectural objects being illuminated by the diffuse light seeping from the public street lighting system that sometimes manages to reach some portions of the façades in question.

So let's start our discussion with the situation in which the elements surrounding the architectural object in question do not have too much brightness (artificial, at night), so our environment is a dark one.

Such a situation can occur in several circumstances, and here are the most common ones: the lack of other architectural objects around, the presence of architectural objects in the vicinity that are insufficiently lit or of the place, the existence of a large distance from other such objects, the presence of tall vegetation (trees) that are blocking the visibility of other illuminated architectural objects in the vicinity, a.s.o.

The targeted architectural object located in such an environment will, after highlighting it through an artificial lighting project at night, be the unique, central protagonist of an observed environment.

This situation therefore implies an increased responsibility on several levels regarding the realization of a correct artificial lighting project. But it is also an advantageous situation at the same time, because the object will be visible and well outlined also by applying a lighting project with a low brightness. Of course, this approach is preferable only in the situation where we are absolutely sure that in the future the area around our objective will remain in terms of artificial lighting in the same situation, so relatively dark, because the emergence of light sources or illuminated objects in this ambient will be able to alter the perception of our landmark on which we have chosen to apply a lower luminance.

Another advantage would be of course the fact that a lighting system with a lower average intensity index will consume less electricity, being therefore more economical.

However, the current situation of a relatively extensive area with a low level of brightness presents the risk of not providing the necessary safety for pedestrian traffic in the area, so when we refer to an area around the target objective that is darker, of course we will have to take measures to place safety lights and public lighting systems in this environment in accordance with the imposed regulations, and if they do not exist at the time of the analysis of the existing situation, it must be taken into account that they will probably be required and installed in the future.

A relevant example for this situation would be the Palace of the Parliament in Bucharest, located in its extremely advantageous location from a visual point of view at the urban level as a focal point of some major traffic arteries in the center of the capital city and on the elevated area of Dealul Arsenalului (Arsenalului Hill) which limits the access to the premises through the perimeter fence located at the base of the hill. Even if the Palace of Parliament is not catalogued as part of the Romanian architectural heritage of historical and cultural value, we will mention it as a striking example of the situation of excessive lighting of an architectural object located in a dark environment . The Arsenalului Hill is currently a green park area (inaccessible to the public) with minimal lighting. The massive building of the former "People's House", however, benefits from a generous night lighting system of high intensity, which is put into operation at full capacity quite often, the building becoming a bright beacon and a sharply visible landmark from a very long distance . Even on nights when the lighting system is only partially switched on, the building remains highly visible due to its location in the large dark area around it (Arsenal Hill) but also due to the size of the building itself. Obviously, if the lighting system were completely non-functional, the building would remain completely invisible, the

accidental light from its surroundings not being nearly enough to make it even remotely visible. In this situation, if we choose a variant in which the volume receives minimal light from a few general lighting fixtures located at a distance, we will see that the structure will suddenly become visible even from a distance precisely because it is located in - a dark environment.

A similar solution was adopted at this moment for the Romanian Athenaeum, a representative icon for Bucharest.

Fig. 3. Romanian Athenaeum by night, Bucharest
Source: arch. Monica-Mihaela Frangulea, February 20, 2022

Located in George Enescu Square in the heart of Bucharest, the emblematic building of the capital town currently benefits from an external lighting system consisting of four reflectors placed at a distance that provide minimal light to the monument. Although obviously insufficiently highlighted by a much too simplistic lighting system, the main façade of the Romanian Athenaeum becomes visible at night due to the fact that the environment surrounding it is one with extremely poor brightness. The park in front of the building benefits from a minimal lighting that is blocked by the rich vegetation of the green area and the volumetric massiveness is silhouetted against the night sky without having a nearby building that surpasses it in height and stands out in the background. We therefore see how the architectural object benefiting from a reduced light intensity is still visible, silhouetted against a dark background. Since we are talking about the main landmark of the city, it would certainly not be an exaggeration to highlight it with a much more generous lighting system, which would bring out both the volume and the architectural details, the dark background bringing an extra element to visually enhance and emphasize the valuable monument without fear of exaggerating its importance. We can also notice how the presence of tall trees from the green area in front of the monument is blocking the visual perception of the entire façade from the distance.

The opposite situation, however, in which the environment surrounding the landmark is bright (or generously lit), is a more special situation that will require increased attention in terms of the options we have in order to solve the problem of highlighting the targeted architectural object.

The situation in which our objective is in front of a generously or excessively lit monument which will constitute the background on which the targeted architectural object stands out, the landmark can become visible precisely due to the fact that an element located on a background contrasting with it will implicitly produce a visual effect of highlighting the targeted object. The situation in which the three-dimensional light environment around our objective is very bright is not much different and it can occur for several reasons: the existence of a large number of street lighting sources nearby or street lighting sources located at higher heights large or of a higher intensity (for example in the case of major road intersections), the existence of a large number of buildings in the vicinity that benefit from lighting with a high luminous intensity, the existence nearby of large illuminated advertising banners (sometimes even colorful or dynamic).

But let's imagine how we would proceed if we were asked to create a lighting project for an objective located in such an environment, with a multitude of neighbouring buildings benefiting from generous lighting to which is added a street lighting of maximum intensity, in a highly trafficked urban area.

We will give as an eloquent example for this situation the well-known San Marco Square in Venice, where, as we can see in the next image, all the façades surrounding the square benefit from generous lighting both in terms of surface and intensity. On the sides, we notice on the left the façade of the Old Procurator's Palace and the right the façade of the Procurattie Nuove Palace, both illuminated at night with proximity sources mounted on the buildings, all horizontal registers and each individual frame being well accentuated with light. In the background we see how the Basilica of St. Marco benefits from flood lighting (from the distance), also generous in terms of intensity, the façade having a brightness comparable to that of the other perimeter buildings. In this enchanting landscape with light coming from all sides, it was chosen that the imposing silhouette of the famous tall Campanile building does not have an artificial lighting system. The building receives enough incident light from the environment that surrounds it (the neighbouring buildings) which rends it very visible even though it does not shine and at the same time it creates a balance from a light point of view, soberly compensating the abundance of light that the other objectives are giving off.

This is undoubtedly an admirable solution from all points of view: chromatic (we notice also the use of the same color of light throughout the entire Square), sizing of the light intensity, the distance between the sources, the play of light and shadow, emphasizing the architectural details and highlighting both The Basilica by using a different type of lighting (general / from a distance) as well as the Campanile by refraining from adding light to it.

We should bring now into discussion the reverse phenomenon : the ambient light produced by the artificially lit landmark, the beacon effect that this one has on the city landscape.

Fig. 4. San Marco Square, Venice
Source: https://s1.1zoom.me/b5050/209/Italy_Piazza_San_Marco_Night_Venice_Town_square_550057_3840x2160.jpg

An architectural object that benefits from a correct lighting system will certainly dissipate light in the area around it. However, this light can be very useful, bringing benefits to the safety of the traffic around it. However, in the situation where we are dealing with an excessively lit objective or a landmark that has lighting fixtures that are oriented or installed incorrectly, we will already notice negative effects such as the dissipation of strong light in the environment that becomes incident light for other surrounding architectural elements, the blinding of passers-by or road traffic participants, so the appearance of the light pollution effect with all its effects that we have already mentioned. The architectural object practically "illuminates", becomes a light source in itself and attract the attention of the observer from very long distances.

In the example below we can see how the excessive brightness of the large billboards that cover a large part of the façades of the Creditul Minier Block on Nicolae Bălcescu Boulevard corner with Batiştei Street in Bucharest diffuses light towards the Intercontinental Hotel building located at a considerable distance. The lighting fixtures installed on a series of metal structures located on the fragile façade of the unrenovated building not only bring a high risk of further damaging the façade, it creates a high degree of danger for the passers-by safety (the lights can fall, being of course quite heavy structures), but their orientation also produces a blinding effect in the entire adjacent area, easily observable in the photographic image.

Fig. 5. Creditul Minier Building and the Intercontinental Hotel, Bucharest
Source: arch. Monica-Mihaela Frangulea, March 15, 2022

The Creditul Minier building, built in 1937, is a representative building of the modernist and art deco avant-garde from the 1930's on the Universitate-Romană axis. Still not renovated and presenting a great risk of irreparable damage in the event of an earthquake, the block is covered over a large area with unsightly sheets of advertisements (a situation we find in many neighbouring buildings in the same area, along Nicolae Bălcescu Boulevard), which, in addition to hiding the special architecture of the building, also benefits from this excessive lighting system that highlights them along the entire height, length and width of the building.

The Intercontinental Hotel, designed by architects Dinu Hariton, Gheorghe Nădrag, Ion Moscu and Romeo Belea, was put into use in 1971, and although it is not classified as a heritage objective, it is still one of the emblematic buildings of the capital city. However, the massive silhouette of the hotel is not illuminated at night, being visible mainly due to the incidence of ambient light such as the one coming from the Mining Credit Block in the image or the light that diffuses from the inside through the windows of the rooms occupied by guests with an incidence obviously random on the façades (not all rooms are occupied or not all guests keep the lights on).

This example represents an unfortunate situation in which, in addition to the effect of the light influence that an over-lit urban object exerts around it, other factors (listed above) overlap that should not exist and even less should not be visually emphasized through a high intensity lighting system.

A valuable architectural objective located in a context without other constructive elements around it or as a focal point of an urban perspective

benefiting from a generous lighting system can become a spectacular visual landmark, visible from the distance, emblematic for the night silhouette of a city, justifying the approach of applying a light surplus.

As an example for this situation, we will bring the Monument to the Heroes of the Air located in the center of Aviatorilor Square, in the axis of Aviatorilor Boulevard in Bucharest.

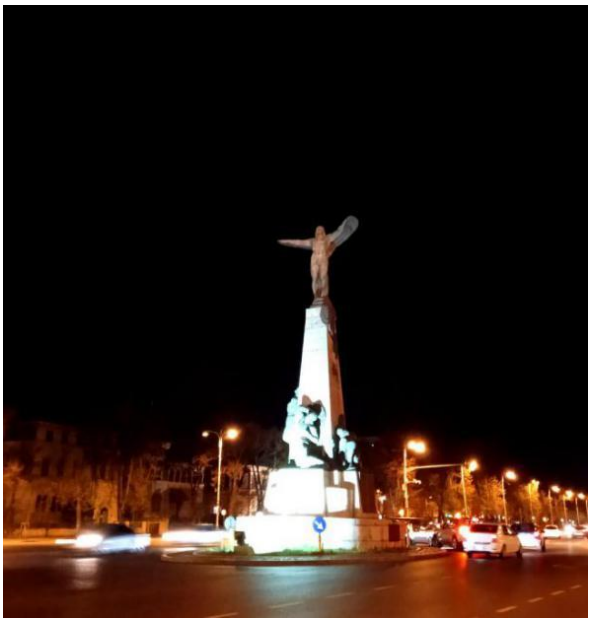

Fig. 6. The Monument to the Heroes of the Air, Aviatorilor Square, Bucharest
Source: arch. Monica-Mihaela Frangulea, April 2, 2022

The monument, dating from 1935 dedicated to the military and civil Romanian pilots that contributed to the development of Romanian aviation is 20 meters high and is a perspective point from Aviatorilor Boulevard from both directions. Illuminated upwards from the ground level from two diametrically opposite sources, from a short distance, the statue benefits of excellent lighting that highlights it well and adds monumentality. The statue is the focal point for Aviatorilor Boulevard towards Victoriei Square for a distance of 690 m in a straight line, in the other direction - for Charles de Gaulle Square for a distance of 650 m and from the side for architect Ion Mincu Street for a distance of 670 m , until the intersection with Ion Mihalache Boulevard.

Another example with a remarkable solution in terms of night lighting and which falls into this situation of a major visual landmark highlighted by light and transformed into the focal center of the scenography of an extended area is the facade of the majestic Academie Nationale de Musique, center of perspective for the Opera Square (Place de l'Opéra) in Paris.

Fig. 7. Academie Nationale de Musique, Place de l'Opéra, Paris
Source: Mariana Sebe, March 3, 2022

The Parisian architectural monument receives artificial light from a suite of flood lights placed far apart that create an increased, spectacular brightness.

The Academie Nationale de Musique is located at the northern end of the Opera Square and stands alone, detached in terms of volume on both sides from other buildings. We notice also the lack of tress or any other elements around it that could block the view of the building. The building dominates the open area of the square through its monumentality during the day and through the light accentuation the same visual effect is achieved at night time in a masterful way through this general lighting from a distance which manages to highlight the entire façade with all its elements, offering and a play of shadows and lights necessary to highlight decorative details and volumetric play.

The building radiates light around it, dominating the scene of the square which is 65 m wide by 150 m long and which continues with the Boulevard of the Opera (Avenue de l'Opéra) which for a length of 860 m in a straight line has as focal view this monumental landmark.

As a final example, we will bring the Arcul de Triumf monument from Bucharest, a major historical and visual landmark of the city.

Fig. 8. Arcul de Triumf, Bucharest
Source: arch. Vlad Bină, April 18, 2022

The majestic silhouette of the Triumphal Arch, 27 m high, located in the middle of the square that bears its name, is the focal point of five major traffic arteries that intersect in the generous intersection in the centre of which the monument is located. The lighting project made by architect Adrian Bălăşoiu with iGuzzini lighting technology accentuates its visual presence, so that the Arc de Triumf is visible from long distances: 1.3 km in a straight line from Piaţa Presei Libere and obviously from the building of the House of the Free Press (“ Casa Scânteii”), located 1.5 km away, 1.8 km in a straight line from the road Pavel D. Kiseleff to Victoriei Square. Placed in the centre of the circular space of the square, the Arc de Triomphe has an empty space of 60 m all around it, so it stands up alone and it does not influence any architectural object in the vicinity with its light. The lighting system transforms it into a luminous beacon that radiates light into the empty space, giving off at the same time an air of solemnity, magnificent by its mere presence.

However, since it is a road intersection with an extremely large area, the presence of too many public lighting poles required in such spaces could have brought a degree of traffic danger, blinding the drivers. The triumphal arch illuminated in this way releases a sufficient amount of reflected light around it that can help increase the illumination index of the roundabout of the giant intersection. We therefore see the beneficial role played by any architectural object that, being illuminated, becomes a source of light in its turn, thus bringing benefits to urban security and the safety of pedestrian or motorized traffic in its immediate vicinity.

1.3. The flashing digital advertising banners and the city

In 1898, the British chemist William Ramsay (1852–1916) together with Morris Travers (1872–1961) discovered neon, an inert gas that has the property of

emitting a red light if an electric discharge passes through it, in a closed container. Neon is obtained through a process of liquefying air by cooling, then capturing the component gases through controlled reheating. The French engineer Georges Claude, the owner of the Air Liquide company, had significant amounts of neon resulting (as a by-product) from the technological process of air liquefaction that was carried out in his factory. Starting from 1910, Claude produces the first neon light tubes, trying to target customers interested in interior lighting, the new light device having a special light intensity. The intense red color of the light of the neon tubes, however, did not have the expected success on the market. Two years later, Claude's associate re-launches the neon tubes on the market, this time with the intention of being used as advertising banners with luminous writing, an initiative that this time was proved to be a great success on the French market. The product came to the attention of the American public in 1923 when the Packard car dealership in Los Angeles ordered two such banners, paying for them the excessive price of 2,500 dollars. Some news sources of the time even claim that the amount paid for the two neon light banners was actually $25,000, which would represent a fabulous price even for the 1920's America, years of economic and financial glory [4]. The red shining banner with the company's name written by the curved lines of the neon tubes, however, has a considerable visual, public and commercial impact, this new type of advertising being different from everything that existed at that time. We are witnessing an important moment that marks the emergence of "electro-graphic architecture", the American public getting excited about the new technology that allows them to visually mark an era of economic boom that transforms cities at night into a show of light and color [5].

In 1925, the first neon tubes with blue light appear in the centre of London, a color obtained by adding argon and mercury to the glass tubes, and then green neons appear, a color obtained in a simple manner by using yellow bottles for neon tubes that produced blue light.

The era in which colored light tubes visually dominated American cities happens between the 1920 and 1960. The streets are visually overwhelmed with illuminated banners promoting shops, restaurants, businesses and services.

Fig. 9. „Las Vegas Strip" - Fremont Street, Las Vegas, 1952
Source : https://www.northamericansigns.com/golden-age-neon/

To diversify the colors, the method used was to add color to the neon tube, and with the evolution and improvement of this technology, the chromatic range has widened significantly.

This excess of bright colors and advertising graphics due to the crowding of street advertisements is visually overwhelming, the street is perceived as a show on its own, the architectural forms and volumes become secondary elements in the background although they are visible due to the light diffused from the light sources, the viewer being practically mesmerized by the highly visible and attractive shapes of neon tubes. We can say that this type of nocturnal advertising lighting has the ability to totally alter the way of perception of the city at night, even the shape, the volume of the buildings as well as the urban visual landmarks. For example, a tall, imposing building in a privileged position from a visual point of view (focal point of a street, location in an open area - park, square or intersection) will of course have a marked presence during the day . But if at night it is not lit enough or even left in the dark, it becomes invisible, and any large illuminated banner in its vicinity, which does not stand out too much during daytime, will be a focal point of great visual appeal during the night, eclipsing the importance and prestige of the adjacent landmark building in question.

Fig. 10. Times Square, New York, 2013
Source: Wikimedia, Chensiyuan, Creative Commons 4.0

The image of a city full of bright publicity banners, although spectacular and generally accepted by the vast majority of the population who perceive it as a proof of the technologic evolution and the prosperity of the city, lately comes more and more to the attention of specialists because it is a generator of light pollution, a negative phenomenon with major implications in terms of traffic safety, disruption of the human biological clock, negative impact on the biological environment and many others.

In the image below is an aerial view of the centre of Bucharest where we can spot in the middle the impressive Palace of the National Bank of Romania with a beautiful lighting system that highlights the historic monument in a very elegant manner. Underneath in the image we can see the massive volume of the Oscar Maugsch Palace from Universității Square, under renovation, covered by a large advertising banner strongly visible due to a lighting system placed on the top and on the bottom. As we can see the banner covered palace has an almost equal visual impact as the National Bank Palace.

Fig. 11. Aerial view of the historic center of Bucharest
Source: arch. Monica-Mihaela Frangulea, November 21, 2022

Images of the night cityscape full of colored lights and animated by heavy traffic, giant dynamic advertising banners and many passers-by in the centers of the world's great cities are already part of the world photographic culture and are even in high demand for display as art in office spaces , homes, restaurants, etc. But walking through such spaces in reality is much different than admiring them in a static poster, framed and placed in a quiet space with a pleasant atmosphere. The noise, the temperature, the smell, the vibration of such a space, but especially the dynamic play of the blinding lights create in many of these places an overwhelming, obviously memorable sensations, creates psychological stress, but nevertheless turning the place into a top tourist and business destination.

Fig. 12. A visual hodge-podge in the narrow shopping streets of Japan
Source: Akshaya Murali Kumar, "The love-hate relationship between Advertising and Built Environment", https://www.re-thinkingthefuture.com/

The presence of a multitude of digital light banners in the urban space, especially the high-traffic central areas, is a phenomenon we encounter often these days, for the same reason as in the early years of the XX-th century on the American continent - the desire for financial gain through enhanced visual impact advertising of products, companies or services. This phenomenon must be viewed and treated seriously, because it can negatively impact the city from a visual point of view, eclipsing the prestige of the image of some important architectural monuments and landmarks that bring cultural, touristic, and social fame and glory to the city.

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On the need to create a monitoring system for safe gas consumption in multi-apartment residential buildings for a smart city

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Abstract

Smart city is not only the application of a large number of digital and electronic technologies for transforming the life and working environment of the city, it is mainly ensuring the safety of citizens' lives. The security component in the Smart City concept includes issues of safe consumption of electricity, gas and water. To solve the problems that have arisen and ensure the safety of the population, it is necessary to install devices for detecting and fixing gas leaks in apartments, houses and buildings. For several years, the Georgian Technical University (Tbilisi) has been working on the creation of a new, innovative gas leak detector based on the semiconductor sensor of the Japanese company Figaro Engineering and on the creation of a gas control and gas leakage system in residential premises, including for multi-apartment high-rise buildings, which will be an obligatory component (subsystem) of the "Smart Home" and "Smart City". However, it should be noted that the installation of the above devices in individual apartments does not solve the problem of ensuring security for the entire apartment building, since they should be installed in all apartments without exception. It is clear that a gas explosion in high-rise buildings will lead to destruction of neighboring apartments. Therefore, it is necessary to create a monitoring system for safe gas consumption for the entire apartment building.

***Keywords**: gas leak, semiconductor sensor, detector, identification, solenoid valve.*

1. Introduction

At the very beginning of our report, we want to note, that unfortunately our apartments and houses in our beautiful city Tbilisi are still far from being called smart.

However, we can talk about our little experience in this direction. Back in the 70-80s of the last century, we and our friends worked on the creation of devices and systems that can be considered elements of a "smart" home and "smart" city. We simply did not know these terms then.

Here are some examples:

- By order of the Ministry of Internal Affairs of the Republic of Georgia, we developed a television surveillance system on the Tbilisi-Rustavi highway (about 20 km). two surveillance cameras were installed on the track and experimental tests of the system were carried out.
- A project was developed for a control system for the operation of passenger aerial cableways in the city of Tbilisi. At that time, five passenger cable cars operated in our city. We beat made a control panel with the function of locating the cable car cars.
- Our project of a system for accurate metering and advance payment of electricity consumed by subscribers seems to be very interesting. The system has passed experimental tests in two cities of Georgia.
- We carried out work on automated accounting of working hours using biometric methods of personnel identification. In this direction, the system of conducting biometric elections at the faculties of the educational institution successfully worked.
- A project was developed and systems for automatic switching on and off of lighting in the entrances of multi-apartment residential buildings were manufactured.

Today, all this can be considered as the first experiences of creating separate "smart" devices and "smart" home systems. However, specialists dealing with the problems of smart home and smart city understand that a systematic and integrated approach to the problem is needed.

After such a long preface, we want to move on to our issue - the creation of an air quality monitoring system. And the issue of detecting leakage of dangerous and toxic harmful gases is an obligatory part of a "smart" home.

The importance of detecting (identifying) leaks and accumulation of household and sparkling gases and protecting human safety is clear to everyone. Alarms, detectors, monitoring devices and safety systems are designed for the safety of people in residential apartments and houses.

Various gas identification devices are currently being developed in European countries, the USA, Japan and China. Gas leak detectors and detectors occupy a large place among them. They differ from each other in purpose, functions to be performed, and obviously in price.

The increasing number of accidents in our country in recent years has raised the need to address these issues in order to avoid explosions, fires, poisoning and death. The statistics are very deplorable. For example, in 2014, 2,089 people were poisoned with natural gas in Georgia and in 2015 - 3 356 people. 27 people have been killed by gas in those two years. All this indicates the urgency and necessity of detecting gas leaks and warning people about it. Extensive implementation of gas alarms, detectors and monitoring systems in multi-storey residential buildings can be said to practically solve this problem.

2. Main part

A new microprocessor system (device) for ensuring the safety of gas consumers created by a group of scientists and specialists of the Automation Scientific-Research and Engineering-Technical Center of the Georgian Technical University. The system consists of three main parts (blocks):1. Primary transmitter (semiconductor sensor); 2. Electromagnetic shut-off valve.3. Microprocessor electronic unit;

The technical documentation of the processed system, the test samples of the device have been prepared, the laboratory test of the methane leak detection device has been carried out, the works for the serial production of the devices for fixing the leakage and accumulation cases of household and exhaust gases in residential apartments have started. Three samples have been prepared to be tested for compliance with international standards, after which it will be possible to obtain the ISO standard.

Several variants of the system electrical circuit have been developed. At this stage, a circuit based on a single semiconductor sensor (Figaro sensor TGS and one microcontroller) was selected; three test samples of the system were made using a PIC12F675 type microcontroller.

The proposed new system has several advantages over other existing alarms, detectors and devices:

- Using stabilized current to heat the sensor reduces the degradation rate of the sensor and increases its operating time;
- Two-dimensional measuring circuit ensures high sensitivity of the device to both small and large air pollution;
- The power consumed by a semiconductor sensor is almost 100 times less than the limit value;
- Due to periodic automatic calibrations it is possible to avoid annual periodic verification and calibration.
- Additional automatic periodic calibration eliminates the negative impact of sensor degradation and contamination process, were we will use the outsourcing method. “Outsourcing” generally means using external resources. This term was first used in 1989 to refer to the transfer of any particular activity or function to another company. One of the basic principles of outsourcing can be: "Instruct someone else to do what they do best and cheaply to you." Outsourcing has gained a

foothold in almost every field. It is especially widely used in instrumentation as well as in information technology. In order for a new innovative device, device or system to work, we need to place (load) the software product we created in a programmable microcontroller.

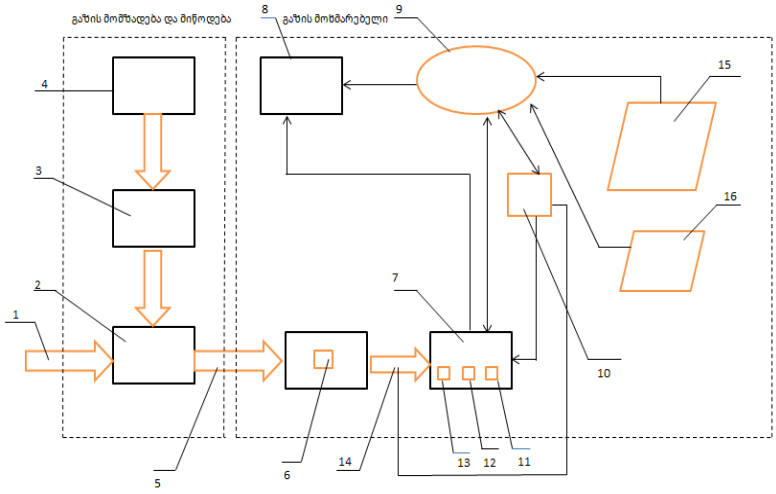

Fig.1. Structure of household gas consumption
1. Main gas, 2. Gas distributor, 3. Odorant; 4. Odorization device; 5. Odorized gas; 6. Gas flow meter; 7. Gas household appliances; 8. Smoke-ventilation ducts; 9. User (resident); 10. Gas detector; 11. Gas stove; 12. Gas heater; 13. Gas heater; 14. Locking electromagnetic valve; 15. Rules for operation of gas installations; 16. Gas consumption rules

After that, the system will be installed, assembled, initialized and final checked. Then another component of the problem will be involved in the work - "certification" (or "metrological certification stand"). The system should be checked for compliance with international standards.

3. Conclusion

Thus, in order to solve the problem, it is necessary to develop and manufacture a special metrological stand, on which the tools made in the first stage will be tested and certified.

Only then should it take place in the trading network of manufactured systems. The stand created by us will be able to test not only natural gas leak detectors, but also other gas control devices and devices. It is also advisable to consider the test of electromagnetic shut-off valves at the same stand.

Particular consideration should be given to the fact that users do not experience discomfort. To fully solve the problem, it is necessary to create a special service that will install tools directly in apartments, houses and buildings, as well as check them at intervals specified by technical conditions. Obviously without this

component it is impossible to carry out the "technical services" provided for the performance of all these works.

A specialized service – “Technical Service Center” will be established. These components completely cover the range of issues that need to be addressed in order to avoid accidents, fires, explosions, human injuries and possible casualties caused by gas leaks.

The new system has no competitors in the domestic market of the country; It can also be used in other neighboring countries; The device complies with modern European analogues with basic technical parameters and it is protected by our country's patent.

We hope that very soon our city of Tbilisi can be classified as a “smart” city and it, on a par with Oslo and Singapore, Zurich and Geneva, Helsinki and others, will become a city where you can live and work very comfortably and safely, and residents can be happy.

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Smart Aspects of Academic Life: Research and Education

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Abstract

This paper addresses the topic of how smart elements can drive two main areas in academic life: academic research and the teaching process. The objectives consist in using smart elements to benefit academic research and teaching our subjects to students. In the case of the author of this paper, who teaches English and French language seminars for engineers, a course in Culture and civilization and one in European Union Institutions, benefits of students using digital resources, visual materials and prompting interactivity are considered. Prior work in the domain of psychology of education using advantages related to visual learning which helps students assimilate the information easier will be considered. Students can find the digital environment familiar, and, according to environmental psychology, this can create a comfortable medium for efficient learning and interaction with colleagues and teachers. The approach used is that of participatory observation, based on the experience of the author of the paper in her work with students and in her work regarding research during the pandemic and post-pandemic era in the online medium. The results show that technology can make both research and teaching activity more interesting, motivating, and more productive. The implications of this study have to do with helping with ideas for better performance in both research and teaching activities the academics interested in using digital methods more. With respect to foreign languages and culture and civilization seminars, information that could be of interest to students may be suggested to be taken from the domain of smart cities, for activities such as reading comprehension and examples of technological advancements in history and their role in connecting through digital communication researchers from various cultures. The value of the paper consists in sharing the experience of the author as researcher and teacher, in the context of today's smart culture.

Keywords**:** *smart cities, ESP, cultural awareness, digital natives, student needs.*

1. Introduction

The concept of smart city does not have a definition everyone agrees with currently [1]. If a city is intelligent, it means that "when an intelligent system adapts itself to the users' needs" [1]. According to Harrison et al., a smart city means an "instrumented, interconnected and intelligent city." Albino et al [1] sum up these features proposed by Harrison et al as follows:

> "Instrumented" refers to the capability of capturing and integrating live real-world data through the use of sensors, meters, appliances, personal devices, and other similar sensors. "Interconnected" means the integration of these data into a computing platform that allows the communication of such information among the various city services. "Intelligent" refers to the inclusion of complex analytics, modelling, optimization, and visualization services to make better operational decisions.

A smart city, therefore relies on technology in order to improve the lives of its inhabitants. These improvements reach as far as the education system is concerned. Universities in a smart cities can be expected to have various benefits for their staff and for their students.

A smart city also includes access to electronic resources for education purposes. Therefore, teacher and students can benefit from research platforms and from educational resources for holding their classes. Since the COVID-19 crisis, at the Technical University of Civil Engineering where the author of the paper teacher, the use of Microsoft Teams platform has been maintained, and now classes are taking place in both face-to-face and online format. This is because some buildings and classes on campus are being rehabilitated through existing projects. As for teachers at this university, they have free access to the enformation.ro platform for research, which offers them access to papers from valuable journals in various domains, including Humanities, the field of research of the author of the paper.

The present paper has as an objective to present the experience of the author as a teacher and researcher at the University of Civil Engineering Bucharest, within the Department of Foreign Languages and Communication. The author of the paper teaches this academic year seminars of English as a foreign language for engineering students, a seminar in French as foreign language, a seminar in Humanities (Culture and Civilization) for engineers, as well as a course in European Union Institutions for students of the specialization in Translation and Interpretation. The paper will address questions regarding the advantages of using Microsoft Teams groups for both staff and students. The opportunities that have been seen concern the efficient exchange of information and keeping up to date with the events going on within the university, as well as the ease of access to the courses and seminars materials.

Efficient communication within the campus regarding both administrative, teaching and scientific resources are part of the smart city system, since "A smart city is based on intelligent exchanges of information that flow between its many different subsystems." [2]. Information regarding class requirements was usually lost at some point during the classes held before the COVID-19 pandemic. The

dissemination of the information was based on real-time, direct communication during class, in the very beginning, when not all the students were present. Later on, students could ask and the teacher could provide the information again. Still, the deficiencies in information passing on were clearly seen, as at any time before the end of the seminar or course there would be at least one student claiming he/ she did not know about how to get the final grade or when to show up for the final test. For teachers, workshop opportunities are presented in a specific Microsoft Teams group. Some workshops can still take place online, organized by the university staff. Other workshops and other administrative information regarding academic year structure, elections, procedures regarding classes, such as hybrid classes, or opportunities for teachers to issue a card that can help them access various facilities regarding travelling and visiting museums abroad (the ITIC card) are all present on the TUCEB teaching staff group. The students of TUCEB have their own such group, where they receive similar information regarding cards for students (ISIC), deadlines to bring some documents to the secretariat, to sign up for optional courses, to pay study fees, to pay student hostel fees, academic year structure, workshops, contests, fairs regarding possibilities to find jobs or trainings for various jobs in their domain, volunteering, and so on.

Otherwise, before the pandemic, teaching staff received administrative information by means of collective emails, and students had their own whatsapp group. Some teachers would create groups for communication regarding their course/ seminar using social media such as whatsapp and Facebook groups.

After the COVID-19 pandemic, the Microsoft platform is still usable, and students still receive their own institutional email addresses to access the platform for those courses and seminars that are still held online. This allows some teachers to choose to create a Microsoft Teams group where to add the students and to put in the files section all their teaching materials organized per courses and seminars. In this way, even if the respective seminar or course is still held usually face-to-face, it can benefit from having readily available materials in electronic format, instead of asking students to photocopy some pages, get them from a colleague, or take picture of them using their smartphones. It can often happen that not all the students manage to get the materials, or they may not know if they have them in order. Otherwise, they would be asked to go to the library to get the course support to photocopy and/ or the CD. This was valid before the pandemic before electronic resources platforms were supported by the university. Some courses/ seminars did not work based only on one single textbook, as teachers could collect materials from a variety of textbooks and adapt them according to the respective class' needs.

Communication between teachers and students was more efficient using electronic resources, since the Microsoft Teams platform allowed students to receive material to work on from the teacher, solve it and send it right away to the teacher to correct in cases where the student needed to work for a grade for an urgent make-up test.

Teachers could benefit generally from the online organization or hybrid organization of workshops and conferences, since they did not have to take the time and expenses to travel to on-site scientific events. In this way, they could present

their research before physical classes at the university, and then return to their usual teaching staff activity. Otherwise, another teacher had to be asked to replace the teacher going away abroad or to another city to take part in a scientific event. One of the disadvantages could be that less travelling was done, yet, at the same time, right after COVID-19 various flights were postponed and travelling was taking place in more difficult conditions.

The present paper has as an objective to present the experience of the author of the paper as a teaching staff member and researcher regarding these two areas of activity in the Technical University of Civil Engineering Bucharest following the changes after COVID-19 pandemic brought to the high education system. The experience presents an application to the particular case of a university in Romania, and to the opportunities offtered by the Microsoft Teams platform as well as other platforms used in the field of Humanities, for both teaching and research activity. This paper can be relevant to other university teachers dealing with using electronic platforms after the COVID-19 pandemic for the benefits of the students and teachers, regarding course/ seminar materials and possibilities of communication regarding both the curricula, tasks and final tests.

2. Materials and Methods

The digitalization of education has been a frequently discussed topic in the literature [3], [4]. It is, after all, what the experience of the teaching staff at the Technical University of Civil Engineering Bucharest is about. The online classes during the COVID-19 pandemic have created certain habits that are being maintained, including having the teaching staff and students group on Microsoft Teams that is still being used for information of the activities within the universities, as well as using Microsoft Teams groups for keeping in touch with the students of the taught subjects.

Starting with the 1960s, computers were used for classes in Europe [5]. This informatization process is nowadays continued by the digitalization process [6]. The digitalization process includes using "the virtual sphere, and expanding it with the possibilities of consolidating information and communication, mobile technologies and global information resources [6]" [3].

Teaching with technology has been encouraged, in particular for the domain of foreign languages. The fast pace of the inclusion and development of technology in the education process is what is new: "Integration of technology into teaching and learning is not new, but the rapid rate and pace of technological advancement is new, especially regarding new Internet, ICT and digital technologies." [7].

With the group on Microsoft Teams, everything is easier, since for listening activities all the teacher needs to upload is either an audio file or a link to a youtube video clip. The Department of Foreign Languages and Communication has kept in touch with technological devices to help students with foreign language resources since cassette players and recorders were frequently used. Among the teaching resources we can still find CDs, and DVDs used for video lessons. With the use of the Microsoft Teams platform, everything can be directly shared to students during

class. Nowadays students have various gadgets, such as smartphones, tablets and laptops and they can use their own during class. The teacher no longer needs to look for the availability of desktop computers and laptops labs and to fit their availability with the schedule of the students' and teachers' other classes.

From the point of view of students' needs, we could look a bit into their psychology, by starting from their interests. As a group, students are concerned with gadgets and technology, since at their age they have ease of using it. Besides, they are believed to belong to the generation of digital natives, a term that underlines "the significance and importance of new technologies within the lives of young people [8]" [9]. For any group of students, their preoccupations should always be taken into account by the teacher, even if it is just to briefly mention them here and there when addressing them. In this way, they can feel included in a group and feel that the teacher has shown concern for what they enjoy doing in their free time at least. From engineering students, any teacher would expect them to be interested in the latest technological developments, due to the inclusion of various technologies in their main field of activity. Therefore, the platform with its online teaching resources is a welcome addition to the foreign languages classroom, since the seminars are promising to become more and more attractive. From the observations of the author of the present paper, students were more interested in handing in their tasks, in the exercises themselves, and in being active when they were allowed to use their phones, tablets and even laptops in class to solve them. They also continued to enjoy participating in group or pair activities with other colleagues to solve some of the exercises together.

Since students nowadays are digital natives, their reactions to the use of Microsoft Teams platform can be explainable, since they find this environment familiar. Environmental psychology has focused on the benefits on the learning experience when a pleasant environment was available. In the past, the field trip was considered beneficial, especially due to the setting [10]. Social climate [11], [12], [13] as well as school design [14], [15] have shown how an environment that students enjoy or find familiar helps stimulate them to have good learning results.

The students in Translation and Interpretation need to be skillful with translation and interpretation software, since these can help them work fast. Various CAT (computer assisted technology) tools can be used for them to instruct a software programme with various terms from domains such as engineering, medicine, politics, and others so that the translations become more and more accurate. For EU institutions work, translators are expected to work with technology and correct the automated translations. Therefore, their needs are also related to the use of technology just as engineering students'. The European Union site offers all information about careers, citizens' rights, policies, etc., and students should know where various pieces of information they need are located. Therefore, the platform was useful since the teacher could share the screen and show them directly on the site where to look for. The links were also provided on the general chat of the teams group. At the same time, the files section includes graphics suggesting how the European Union institutions work together and how the EU is governed, as well as various research papers about EU institutions and about the EU itself, as a

supranational entity. The course on EU Institutions was decided to be held exclusively online by the university, at least for the academic year 2022-2023.

What is immediately noticeable is the interest of the students to attend the online course and seminars. The attendance is large, and students are also willing to do the tasks they are assigned. For the students in the Humanities seminar, the teacher has noticed how they have been paying attention to the suggestion to use the culture identity manifestation grid of analysis when they choose to present a culture, which includes symbols, values, traditions, rituals and practices, as well as heroes (universal examples of outstanding behaviour) or personalities (restricted to a domain of activity, such as science, innovation, sports). The teacher has written on the general chat of the team this grid of analysis for the students to see, imitating the use of the blackboard. However, unlike the blackboard, the general chat offers a lasting preserving of information and availability even after the class is over for further consultation. This grid offers students a means of sensitivizing them to cultural awareness, and to understanding the specific features of each culture. They can understand that cultures can be different by comparing these elements of culture identity manifestations. The students appreciated the possibilities offered by exploring different culture or by presenting their own culture if they were foreign students and also the possibilities offered by sharing a PowerPoint presentation on the platform for their colleagues and for the teacher to check. This seminar is held exclusively in online format for the current academic year, which makes it easier to use these resources. Knowing how to use a Powerpoint presentation efficiently is one of the skills that are appreciated for company presentations and academic events, so it is a good opportunity to practice this skill.

Besides audio and audiovisual material, as well as electronic resources which can be taken and used right away, other advantages may include the exercise with using technology to one's advantage, such as practicing PowerPoint presentations, which can be used for any occasion, both face-to-face and for online events. At the same time, in the online environment there can be more opportunities for visual learning. Not all lecture halls at the university are equipped with overhead projectors and screens, and not all students have a laptop or can group themselves around one during face-to-face classes if a computer lab is not available. After the class, especially if it is a foreign language class, students may not have the time to access additional visual material sent to them by email, whatsapp or in a Facebook group. Their time is limited for extra resources, especially if they are engineering students. Their curricula is quite charged regarding their main domain subjects.

Visual learning is prompted by the use of the digital environment. It is significant for engineering students according to the White Paper, and due to the following reasons, as the methods of visual learning can:

- "open up new ways of problem solving,
- provide new ways to think about science and engineering, and
- enhance the education and practice of science and engineering." [16].

These features and requirements should be, thus, kept in mind, as part of teaching foreign languages for specific purposes (ESP, when it comes to the English

language). The seminar for French as a foreign language is not so much tailored according to specific purposes since engineering students are mostly beginners. However, the platform allows for sending links to news sites for those more advanced students, and the teacher has proposed for them a news article that is also read in native accent about the profession of engineers and the need for engineers in France. At the same time, most materials for beginners are also visual, and include youtube available videos showing interaction in simple dialogues.

Some students, according to psychological learning theories, prefer to learn visually, using "graphs, diagrams, pictures", while others prefer to learn using "words, by reading or listening" [17]. Therefore, visual learning may be beneficial up to a point, and for certain students, regardless of the environment. At the same time, it depends on how it is used and to what extent, since "The visual environment is extremely rich and complex, producing information overload for the visual system." [18].

One of the advantages of using visual learning for online classes and not only could be due to the fact that the digital environment is often visual. This can be seen in the case of students used to gaming, or with using games to learn a foreign language. The internet also provides opportunities for rich use of media that includes visual and audiovisual files. Social media is also predominantly visual, therefore we could assume the visual aspect is often present in the lives of present-day students.

3. Results

The need for using technology and technological skills should be kept in mind as part of the needs of contemporary students, regarding any subject that is being taught. The visual materials could be seen as having more impact on these students since they are used to the images shared on social media. Nowadays, we can take with our smartphones pictures of anything around us. Therefore, it could be assumed that today's students should feel that the teachers are adapting their taught subjects to contemporary day reality and take into account their need for the visual aspect. To the author of the paper, the Microsoft Teams platform reminded of social media, especially Facebook and Facebook groups, since it allows for files storage and real time communication both publicly for the members of the group and for private messages. It also allows for likes. This is what makes, in the opinion of the author of the present paper, a familiar environment for students and teachers used with social media activity.

What is more, certain profession, such as that of engineer, can require scientific training and use of spatial geometry and skills, which inevitably lead to them needing visual skills. Therefore, visual learning could be regarded as being adapted to their needs and to their psychology as future engineers. They may also find it easier to learn visually, since if they have spatial skills that are more developed, which make them suitable for their future profession, then this could be considered their general learning style. This could differentiate them, therefore, from the students in Translation and Interpretation, whom could be expected to

have a more linguistic learning style, finding it easier to memorize by hearing spoken lectures, for example. At the same time, it depends on the materials used, and on the topic discussed. Sometimes, graphs and charts could help anyone, regardless of main learning style, to visualize information. Tables can sum up many pages of lectures, which can save time for any student, regardless of formation, skills and future domain of activity.

Extracurricular activities are also considered an important part of motivating students to learn more and to develop their skills. Such activities are easier in the online environment, and students at the Technical University of Civil Engineering Bucharest have taken part in various workshops regarding the way research should be done properly, in conferences based on the engineering domain, or in conferences and trainings organized by the European Union in the field of translation and interpretation.

For research, it is already a known fact that it is done easier and faster, finding out the main research already carried out in the domain of a paper we wish to write, by just a few clicks. Access provided to scientific literature by the university has helped teachers to develop in their field of research but also to help provide students with necessary material for the seminars and courses taught to them.

4. Discussion and Conclusion

Teaching and learning should lead to help learners adapt to their contemporary world, as far as their skills and future domain of activity are concerned. Since technology is such a big part of our lives, regardless of our domain of activity, education should consider helping students adapt to their times, but at the same time, it should also keep up with the reality we are all living nowadays. For instance, nowadays we can do many activities ourselves and no longer have to go to a desk to pay our conference fees, taxes requires by the state or by our mobile phone company. Even when we go shopping we can use electronic devices and we can even not go shopping at all physically. Instead, we can use an application and order what we want to buy.

Nowadays, if students want to learn a foreign language, they can use smartphone applications. Therefore, the role of the teacher is to offer them more. They can also download any textbook or dictionary from the internet, by paying for the ebook version. Therefore, if a teacher only uploads the resources for them it may not be enough. The teacher should guide the students through the available resources, make recommendations, allow them to use existing material for solving their tasks, and to help them interact among themselves. Skills such as online presentations and use of online resources are part of smart education. At the same time, the role of the teacher in their learning remains the same as in the past, as well as the role of the environment. Human relationships never change, and so will establishing rapport, or a beneficial teacher-student relationship never change, in spite of the advancement of technology, skills requires, resources available and available digital environment for teaching and learning activities.

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The Future of Education: Considerations on Technology and Peer Interaction in Facilitating the Learning Process for a Personalised Education

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Abstract

The Covid-19 pandemic led to an increase of technological usage into the educational process, at every level and it can be seen as a paradigm shift due to rapid changes. This paper gives a literature review on how technology helps and can bring self determination in students. While designing the next educational system we should strive to create an environment where students can find and cultivate their abilities, considering the theory of self-determination [1]. We should aim towards a system that can set growth goals in accordance with students' needs, and assure that the goals and aims are considered personally important. This paper wants to give an overview of these technology supported learning strategies and their effect, the current literature in the field, learning outcomes, student personalities and conscientiousness. Technology led to a more personalised education, thus systemic changes in the process might appear. Developing self-determination skills is vital for students in their future abilities and interactions. Personalised outcomes should come from complex peer interactions in the classroom and outside, which include negotiations that lead to understandings [2]. The present educational systems develop abilities, but we should also consider developing capabilities. All these strategies of peer to peer interactions, personalised educational technology are student focused, contributing to their learning independence, satisfying the need for autonomy.

Keywords: *self-determination theory, educational technologies, personalised learning, educational systems, feedback.*

1. Introduction

This paper offers an analysis over the characteristics of future learning, and trends for personalised learning as an outcome, using technology. New skills should be implemented to learners (pupils and students) to provide continuous sets of abilities for future societal upskilling, job market and social inclusion.

The notion of self-determination was noted and introduced by Ryan and Deci in their work in the year of 1985, a book entitled *"Self Determination and Intrinsic Motivation in Human Behaviour*". The syntagm self-determination speaks about a person's own ability to manage one's self, to make confident choices, and to think on their own [3]. Within self-determination theory (SDT) were identified three basic psychological needs: autonomy, competence, and relatedness [4], [5].

Personalised learning has been seen as a normal practice in the last years (2001-2022), from 2010 with a clear ascending trend [6],[7].

Technology is involved in the educational process, in initial phases of a lesson, such as linking old and new content, providing information [8] and especially in assessment [9] and feedback [10].

Alamri and his collaborators [11] brought up the importance of SDT and its connection to technology based learning in the paper termed *"The study is Using personalised learning as an instructional approach to motivate learners in online higher education: Learner self-determination and intrinsic motivation"* to engage students and stimulate their interest and cognitive and affective functioning [12].

Linked with the emerging technologies, the role of teachers is changing. Thus, from information providers and educational support givers, it shifts towards an educational guidance together with emotional support, through a cyber world, full of information and less human interaction [13]. So technology based personalised learning is also a stimulus towards an enhanced student-centred approach in education [14].

Various studies have shown that intrinsic motivation adds value to the *"engagement and optimal learning in different educational contexts*" [15]. While analysing how personalised learning should be implemented, it is essential to consider variables such as the pupils interests and abilities to identify the best learning style for each one of them [16].

As indicated in literature, the development of learning systems has meant a growing number of pupils which have been able to make use of personalised learning [17]. The integration of new technologies has the ability to enhance the effect of these methods. The usage of these innovative tools is giving us a valuable element to enable learning, namely the motivation. For instance, *"students using technological means familiar to them, can approach abstract concepts, like exploring with greater interest the new knowledge* [18].

Peer to peer interactions are a part of the educational process and their elimination from this process should be avoided, in the context of blended learning, as peer education is a complement, not a substitute for teacher-delivered education [19].

2. Objectives

Based on the self-determination theory of Ryan and Deci [4], [5], and the multiple ways of how technology can help to engage students [11], this paper gives a literature review on how technology helps and can bring self determination in students. It has the following objectives:

- to identity where technology can be implemented with good results in the educational process;
- to clarify how technology-enhanced instructional activities support student evaluation and feedback to promote self-determination based learning;
- to pinpoint the dynamics among factors that interfere and shape technology based personalised learning.

3. Prior Work

With technology making its way into the classroom, its effectiveness in aiding the learning process and its effects on education are considered future research topics.

This study looks at SDT [4], [1], and its relationship with technology based learning applications that help education providers to engage students [11]. It gives a literature examination of educational technologies that support the development of the psychological aspects needed to implement SDT in students, especially autonomy.

Ultimately, the use of technology is destined to enhance students' motivation, engagement in the topic, and satisfaction, factors identified by monitoring learning progress and characteristics [20]. For the long road, building community capacity is a desirable outcome, conducted naturally in a future personalised learning.

There are various factors that interfere and shape technology based personalised learning and educational activities. Some of the extrinsic factors are: technological developments in education applied to different educational systems, resistance to change in administration and educational institutions**,** human resource - teachers trained to use digital skills. Intrinsic factors that influence technology based personalised learning and educational processes are: prior knowledge, cognitive abilities, learning interests and affinity, learning goals and motivation [11].

3.1. Types of technology based personalised learning and SDT

While seeking to personalise education using technology, blended learning has been widely used. Blended learning is a learning model that combines online and face-to-face interaction, but it can require further training for teachers [18].

Besides blended learning, AI assisted learning (like Smart Content, Intelligent Tutoring Systems, Virtual Facilitators and Learning Environments) [21]**,** traditional face to face classroom learning assisted by technology [22], and interdisciplinary or transdisciplinary approaches were applied by educational providers [15], [23]. In

the last years, due to pandemics, previous types of technology assisted education and learning were tested and took a leap of faith to be widely used.

Technology is used in the learning process, through intelligent tutoring systems, mobile devices, AR applications. More technological strategies used in the educational process are: gamified learning, digital field trips, integrating social media, students feedback, digital content creation, shared online classroom calendar, incorporation of video and multimedia into lessons and presentations [21], [24].

Artificial machine learning has the ability to adapt, recognise and extrapolate new patterns. Thus, its incremental use in tailoring education using SDT is valid.

For online learning, relevant curriculum, interaction with instructors, interaction between students, personalised online discussion boards, and personalised learning (PL) as an instructional approach in an online learning environment [25], [26].

3.2. Assessment

The basis of educational assessment is represented by testing. In order to place educational assessment, and specifically testing, in the context of an educational system, considerations on the effects and the information obtained in the process.

Two fundamental types of assessment are: the formative one and the summative one. In literature, both of them are mentioned to be assisted by digital technologies in order to retrieve better results from students [27]. Regarding continuous assessment, it has been concluded that formative tests can have an amplifying effect on the learning process [28]. Technology helps assessment providers to readily implement formative assessment.

3.3. Feedback

Feedback represents an influencing factor of learning. A possible definition of feedback, present in literature is: "*information with which a learner can confirm, add to, overwrite, tune, or restructure information in memory, whether that information is domain knowledge, metacognitive knowledge, beliefs about self and tasks, or cognitive tactics and strategies*" [29]. This learner-centred definition indicates the aspect of highly-personalising the given feedback. Research suggests that feedback needs to be able to work at four levels: task level (the level of task fulfilment), process level (techniques required to fulfil the tasks), self-regulation level and self level (personal evaluation of the learner) [30]. Employing technology assures that a highly-personalised feedback, which satisfies the four levels of function can be readily given. Computer-based feedback delivers flexible individualised feedback on a large scale, which comes in opposition with physical, person-delivered feedback [33]. Computer-based feedback can be adapted using statistics of how the learner scored during testing, in order to reach a maximal level of tailoring of the feedback, given that the testing process is designed according to this directive. Furthermore,

research suggests that computer-mediated and computer-generated feedback environments stimulate feedback-seeking behaviour [31].

Feedback has been categorised in the literature and its effect on the learner studied. Our study of the current literature indicates that to reach maximal efficiency, a differentiated feedback system is to be developed, which will deliver an elaborated feedback (EF) to learners identified as to hold low prior knowledge of the content and knowledge of results (KR) or knowledge of correct response (KCR) feedback to learners identified as to hold high prior knowledge of the content [10], [32], [5], [33].

4. Approach

This paper wants to give an overview of these technology supported learning strategies and their effect, the current literature in the field, learning outcomes, student personalities and conscientiousness. To capture this literature research we used two main approaches, namely the SDT concept and technology assisted education. The first concept that we used was brought up by Ryan and Deci [1]. As for the second one, regarding technology based learning applications that help education providers to engage students, we focused on Alamri's study [11]. We present a literature examination of educational technologies that support the development of the psychological aspects needed to implement SDT in students, especially autonomy.

Ultimately, the use of technology is destined to enhance students' motivation, engagement in the topic, and satisfaction, factors identified by monitoring learning progress and characteristics [20]. For the long road, building community capacity is a desirable outcome, conducted naturally in a future personalised learning.

Technology led to a more personalised education, thus systemic changes in the process might appear. Developing self-determination skills is vital for students in their future abilities and interactions. Personalised outcomes should come from complex peer interactions in the classroom and outside, which include negotiations that lead to understandings [2].

Strategies like peer to peer interactions [19] and personalised educational technology are student focused, contributing to the learning independence, satisfying the need for autonomy [19]. Education is shaped like an organism that evolves together with technological developments and societal requirements, education reflets how society changes.

Various measures were taken by each country even before the COVID-19 pandemic. The Digital Education Action Plan (2018-2020) taken by the European Union, for example, aims to support the use of technology towards high-quality and inclusive digital education and training. It presents measures to help educational systems and institutions to look for opportunities offered by the digital era and to respond to the related challenges [34]. The plan has brought the question of AI in education to a transgovernmental level, together with 2021-2027 measures.

On the other side, we have to see to what degree we can extend technology based personalised learning involving self determination theory - SDT. Thus, an inevitable issue arises around the educational practitioners on how to take

advantage of technological opportunities to further nurture students' interest and autonomy.

At the same time, using technology in education is not necessarily without any harm, as Kollias and Kikis stated, "*technology is not an autonomous and revolutionary force which is inherently good*", and moderation is required [35].

5. Results

Technology-enhanced instructional activities support student evaluation and feedback to promote self-determination based learning. Consequently, we have designed a diagram reflecting the role of technology in assessment and providing feedback (Fig. 1).

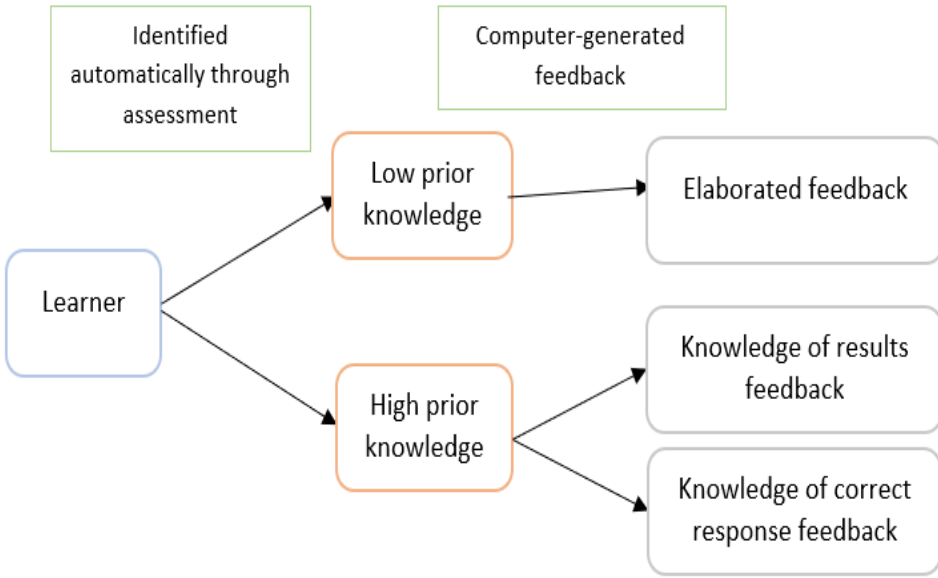

Fig. 1. Assessment and Feedback Relation with the Learner's Prior Knowledge

As a result of literature review, we have shown possible parts of the educational process, which can be assisted by technology. Although, we have to mention that prudence is advisable.

The factors that interfere and shape technology based personalised learning activities are extrinsic and intrinsic. Intrinsic factors play a major role when it comes to SDT as psychological needs that have an effect on motivation. Technology has its own part and its successful implementation relates with students' prior knowledge, cognitive abilities, learning interests and affinity, learning goals. Some relationships among factors that interfere and shape technology based personalised learning were identified, as shown in the second figure (Fig. 2).

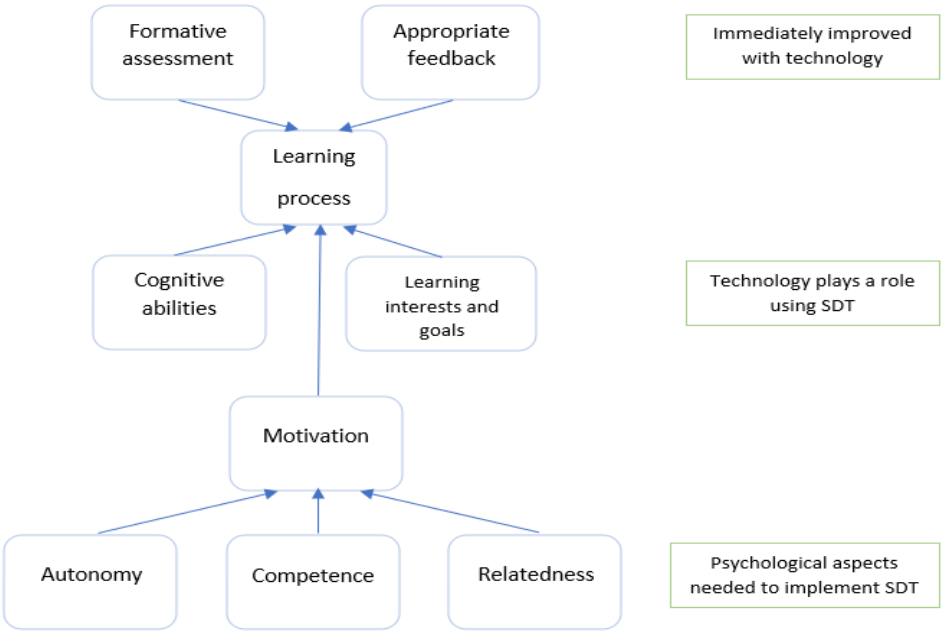

Fig 2. Relationship between technology and factors affecting the learning process including SDT principles

There is a need to clarify how far we can extend personalised learning based on technology related to SDT. Therefore, a question arises around educational providers about how to take advantage of technological developments to develop student interest and relatedness while advancing their competences.

6. Conclusions

While designing the future of education, it is clear that there is a need to create an environment where students relate to their background and educational technologies are helping them to find and cultivate their abilities, based on SDT.

In agreement with SDT's fundamental needs, autonomy, competence and relatedness, an educational system that is established in accordance with students' needs assures that the goals are considered personally important, so as to ensure the stimulation of motivation.

Technology has its own part and its successful implementation relates with students' prior knowledge, cognitive abilities, learning interests and affinity, learning goals. Utilising diverse technology-supported learning strategies (blended learning, AI assisted learning - such as smart content, intelligent tutoring systems, virtual facilitators and learning environments**,** traditional face to face classroom learning assisted by technology, and interdisciplinary or transdisciplinary approaches) combined with SDT core concepts, leads to a more personalised education.

Relationships among factors that interfere and shape technology based personalised learning were identified having a positive effect reflected upon learning outcomes, and they come from complex peer interactions in the classroom and outside of it. Developing self-determination skills is vital for students in their future abilities and interactions.

Personalisation of content and outcomes have a bigger impact on students' personal needs. Strategies of peer to peer interactions, personalised educational technology are student focused, contributing to their learning independence, satisfying the need for autonomy.

Sporadic empirical research has been conducted, and as a limitation of educational technologies usage, we have to see from an alternate point of view, that technology is not an autonomous, nor a revolutionary mean of approach. So, we should wonder what will happen when technology takes a social being out of its social environment.

This echoes the need for more extensive studies on this topic, to observe the long term impact on the future of education and how smart educational systems should be to overcome this switch.

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Sustainable architecture for smart people- a topic for lobbying activities

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Abstract

Sustainable architecture is a trans-disciplinary subject comprising a wide range of ideas and topics and has a multidimensional nature. The principles of sustainability propose a development that is more profitable in economic and social terms and bring a lot of benefits to the environment and to people who are living in this environment in the long term. We intend to analyze and explain the three pillars of sustainability: economy, equity and environment. Lobbying is a part of a healthy democracy and allows for various interest groups to present their views on public decisions that may come to affect them. Lobbying for sustainable architecture promotes the health of the building's occupants at the same time as reducing the negative effects of the construction process on the environment. Society must need and want development for it to be inclusive, but at the same time it must have cultural and historical relevance. In essence, all we need as humans is that balance given by more conductive environment and a more healthy democratic society. The real danger is not the fragility of the planet, but our own vulnerability resulting from our own actions or inactions in the environment. The paper's structure is three-folded: on one hand, the theoretical framework provides us with a holistic view of how sustainable architecture is understood, on the other hand, the mechanism of interference between sustainable architecture and how it can be more promoted through lobbying activities, and last but not least, the paper presents an analysis of the perspectives that sustainable architecture is no longer just a debated notion in the academic environment, but represent a need of the smart society. In terms of methodology, the paper uses qualitative research for the theoretical background needed to substantiate the argument of the entire research.

***Keywords*:** *smart people, sustainable architecture, lobby*.

1. Introduction

This article is divided into five chapters, because we have proposed that the first chapter represents by introduction, in the second section, we discussed about ″the sustainable architecture″ lobby, in which we included some ″general aspects″ and the pillars of sustainability in architecture. In the third chapter, we approached the subject of ″the advantages of sustainable architecture and its social impact″, in fourth chapter, we talked about ″sustainable architecture legislation″, and the last part is made up of conclusions.

First of all, we will begin by defining the notions of *lobbying* and *sustainable architecture* as we find it in the international context.

We wanted to talk about this topic, because ″climate change is a major challenge for our cities and our lives″ [1] and in the same time, lobbying is one of the levers that democracy provides for the representation of interests.

As in any scientific work, we need a hyphothesis: ″The better the lobbying for sustainable architecture is represented in a democratic state, the more new builds and existing builds already rehabilitated according to the Passive House Standard″.

The research question is: ″Can lobbying generate legislative measures that encourage sustainable architecture?″.

The research method used in the elaboration of this article is content analysis and comparative method by studying books, the content of some laws, online magazines, sites, integrated communications and specialized works.

Under the empire of what has been reported so far, we invite you to read this article for a more concrete perspective on the proposed topic.

2. The Sustainable Architecture Lobby

2.1. General aspects

We will begin by defining *sustainable architecture* is the type of architecture based on ″sustainable development that meets the needs of the present without compromising the ability of the future generations to meet their own needs″ [2]. From this acceptance, as Paola Sassi states in ″Strategies for Sustainable Architecture″ there are a few conditions for society become more sustainable*:* ″its rates of use of renewable resources do not exceed their rates of regeneration; its rates of use of non-renewable resources do not exceed the rate at which sustainable substitutes are developed and its rates of pollution emissions do not exceed the assimilative capacity of the environment″ [2].

We can say that sustainability, in our days, is not just an academic pursuit or even a professional activity: it is a way of thinking and living that can affect any aspect of our lives, both individually and collectively, or globally [2]. So, the construction of buildings have a significant impact on the entire social environment, because sustainable architecture can impose a sustainable way of life on people [2].

Huw Heywood argue that ″our decisions and actions as designers today will have an impact on the planet for future generations″, calling at the same time to ″make all decisions with future generations in mind″ [3]. We can easily observe the responsibility by which he understood his role, not only as a practitioner, but

especially as a human who can make a difference for the environment in which his contemporaries live, but also for the one in which posterity will live.

The notion of *lobbying* as we find it on the international context: ″lobbying is every activity carried out with the objective of directly or indirectly influencing the formulation or implementation of the policy and decision-making process regarding legislative or regulatory activities″ [4].

A lobbyist is ″any individual who acts to promote, advocate, influence or oppose matter pending before the General Assemble by direct communication with the General Assembly or any matter pending before State agency by direct communication with the State agency, and who in connection therewith either has received or is to receive compensation in whole or in part from any person, who is authorized to act as a representative of any person who has as a substantial purpose the influencing of legislative or administrative action and expends any funds during the calendar year for the type of expenditures″ [5].

The lobbying activity should be delimited from the advocacy activity that involves those types of actions organized in order to bring to the foreground, neglected and invisible issues, to influence the public attitude and the political actors [6]. The advocacy activity is ″the process by which organized citizens influence decision-makers in making a decision on a public interest topic″ [6].

Sustainable architecture, in addition to the two factors in the design of a bulding, form (the aspect of aesthetics) and function (the most aspect of building design) [7], try to combine the three fundamental factors: economy, equity and environment [3].

We belive that in order to understand why sustainable architecture is a topic for lobbying in our days, we need to understand what thinking behind sustainable architecture is based on.

2.2. The pillars of sustainability in architecture

In architecture, a good design to be sustainable must respect ″three Es″: economy, equity or ethical and environment [3]. Why are these principles so important? Because each of these principles have a plausible thinking behind it.

Fig.1. Three E′s of Sustainability
Source: http://statesustainabilityindex.com/three-es-of-sustainability/

The idea behind the principle of economics in architecture is that ″all society benefits from buildings that are affordable to procure and functional to operate, now and into the future″ [3].

The principle of equity is the belief that ″society must need and want development for it to be inclusive, it must have cultural and historical relevance and it must be joyful and useful to all″ [3]. The principle of equity is also sometimes seen labeled as ″social″ or ″ethical″ [8].

The third principle is related to the environment, because ″a good design is enduring, it always seeks to protect and enhance the environment and its ecosystems″ [3].

It′s important to understand that sustainable design represents a method, not just a style, because ″buildings and cities will only be sustainable if we set out intentionally to make them so″ [3]. For this to be real, it requires an interdisciplinary understanding that takes into account economic, social, environmental and technical values on which a sustainable building is based [3].

It is extremely important that these values comply with the standards and regulations in force on sustainability, because once a building has been designed, it is very difficult and too late to get it closer to the standards of a sustainable building or ″passive building″ [3].

A passive building must follow so-called ″principles of passive net zero energy building″ [9], which are ″the core concepts behind the holistic Phius passive building standard, creating structure that are better for people and planet″ [9].

The principles of passive net zero energy building are: thermal control, air control, radiation control and moisture control [9].

The principle of thermal control includes ″high-performance enclosure and thermal bridge elimination, which help keep the inside warmer when it′s cold outside, and cooler when it′s hot outside, to maximize comfort and energy efficency″ [9].

The principle of air control refers at airtightness and balanced ventilation with heat and moisture recovery, which help ″passive buildings achieve air control by air sealing the enclosure and then providing balanced, mechanical ventilation to achieve superior indoor air quality″ [9].

Radiation control is a principle that include high performane glazing, which means ″high-performance windows and doors with additional focus on proper solar heat gain and orientation in design″ [9], and shading and daylighting, an ″appropriate shading strategies exploit the sun′s energy in the cooling season and minimize overheating during the heating season″ [9].

The principle of moisture control means material moisture that must have ″high performance enclosures in passive buildings require attention to detail when it comes to appropriate vapor control design″ [9], and air humidity, a ″proper mechanical sustem selection and commissioning is critical to maintaining comfortable and safe moisture levels inside passive buildings″ [9].

What is important to understand is that what is better for the planet is always better for us.

3. The advantages of sustainable architecture and its social impact

3.1. The advantages of sustainable architecture

A sustanaible building or a ″passive house″ has many advantages for environment, our health and for our finances, because ″no matter the climate or geographical region, passive houses stay at a comportable temperature year with minimal energy inputs″ [10].

The advantages of a passive house are included: *sustainability*, *affordability, comfort,* and *versatility* [10].

The sustainability of a passive house implies that ″do not require heating or cooling systems on conventional scales, meaning that the money that would gone towards larger heating and cooling systems can be spent instead on better windows, thicker insultion and a ventilation systems- hallmarks of Passive House design″ [10].

In special, in light of the planet's dwindling non-renewable energy resources and the international crisis related to energy from conventional sources, it becomes clear that Passive House are a good investment, both for our wallet and our climate [10].

The affordability results from the fact that Passive Houses save money over the long term, especially in light of rising energy costs climate [10]. Despite of the fact that someone building a Passive House have more cost upfront than their conventional counterparts, in the long term, we can save a lot of money, because a passive building will sustain itself in terms of energy [10]. But today, financial support for Passive Houses is currently available in a number of countries, and for this, building a Passive House may be more affortable than building a conventional one [10].

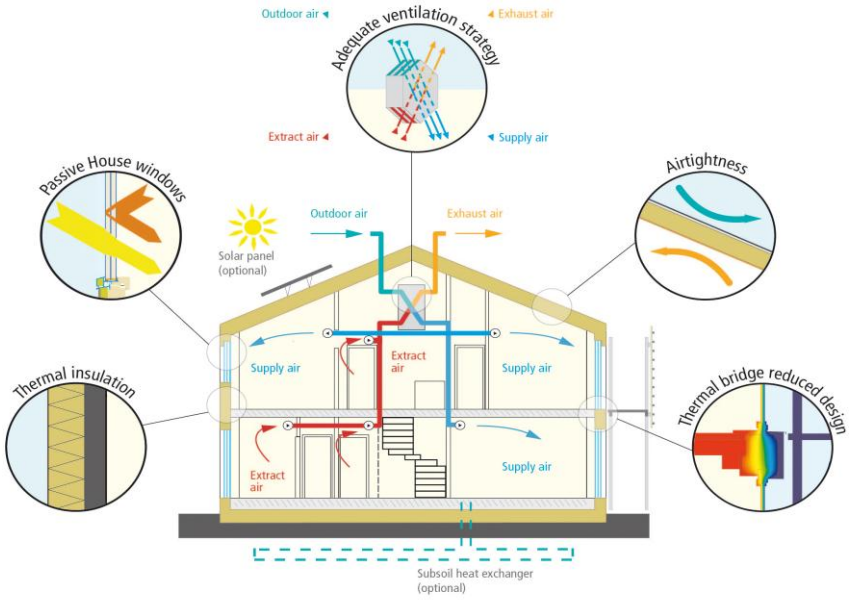

Fig. 2. The following five basic principles apply for the construction of Passive House
Source: https://passiv.de/en/02_informations/02_passive-house-requirements/02_passive-house-requirements.htm

The level of comfort that a Passive Houses offer for their residents are most appreciate, because when ″it is too hot outside, warm ambient air can be cooled before it enters the home in much the same way″ [10]. In addition, the ventilation systems consistently supply fresh air and making for superior indoor air quality, provide plentiful fresh, pollen-free and dust-free air [10].

The versatility of a Passive House Standard is in a quality standard, dictates no particular methods of construction, because architects can design Passive Houses depending on their own preferences or beneficiaries's preferences [10].

3.2. Social sustainability

The social impact of sustainable architecture is ″the least developed and conceptualized element compared to the triad of sustainable development and it has been considered an integral part of sustainability since the 21st century″ [11].

The social sustainability of a city, for example, can be defined as ″development that is compatible with harmonious evolution of civil society, fostering an environment conductive to the compatible cohabitation of culturally and socially diverse groups while at the same time encouraging social integration, with improvements in the quality of life for all segments of the population″ [11]. Also, social sustainability can be defined as ″a combination of social principles in which basic needs, viz housing and health, equality and social justice are realized, combined with new concepts such as a sense of place, happiness and quality of life″ [11].

We belive that ″a sustainable societies are those in which a sustainable community lives″ [11] and that community where people believe in democratic values, because the idea of democracy could help us to build much nicer cities [12]. Not only people believe in democracy principles, most architects do it too when it comes down to choosing a political leader, but they do not believe in it when it comes to choosing a good building, and that is not a good thinking [12], because architecture has many social implications, which a political candidate might know. For this, they must communicate and work together to create a society that is as equitable as possible.

We identified five social sustainability criteria in architecture as: social interaction, architectural identify, sense of security, flexibility and social participation [11].

Social interaction constitutes a human need that can be the key of increasing social capital [11].

Arhitectural identify represents the design of spaces depending on the culture and history of the places, the purpose is to bring it the fore a unique architectural feature that influences social sustainability [11].

Sense of security means that designing spaces must be protected and safe and will create a sense of security of the space in favour of the social sustainability and development [11].

Flexibility refers to the idea that ″the multifunctional use of spaces according to needs and lends to the architecture an adaptability and a long-term usability proportional to the changes in time″ [11].

Social participation implies involvement in social, cultural and recreational activities with the aim of participating in issues that arise within the community or

place of interest, and also means to increase the well-being of individuals and the possibility of socialization [11].

After all the things mentioned, we can say that ″sustainability is an inherent urban and architectural problem″ [11].

4. Sustainable Architecture Legislation

4.1. Policy tools- the results of effective lobbying

In this section, we tried to describe the legislative framework regarding the policy tools used to encourage the construction of passive houses. In this sense, the International Passive House Association and the Passive House Institute propose ″a variety of tools for policymakers and relevant actors″ [13].

Australia is a country that has imposed a number of measures to encourage the construction or buying of passive houses as: discount loans and financial assistance from the state [13]. In this context, the Bank of Australia Clean Energy Home Loan provide ″a 0.40% p.a. discount off the interest rate for up to five years, to all eligible buyers, builders, as well as for people planning sustainable upgrades of houses complying with the Passive House standard″ [13].

In New South Wales, on 27 November 2020, the Australian Passive House Association (APHA) declared that ″BASIX now recognizes the Passive House Standard as a pathway to meeting the thermal comfort requirements of the NSW State Environmental Planning Policy″ [13]. BASIX translates to *Building Sustainability Index* and is ″one of Australia's strongest sustainable planning measures and has been required in NSW since 2004 and requires all projects to meet requirements of energy, thermal comfort and water with the aim of encouraging sustainable residential development″[13].

In Austria, the State Parliament of Lower Austria managed to implement the *Passive House Standard* for all public buildings [13]. In the same time, the State Parliament of Lower Austria budgeted 130 milion euros to complete the construction measures which the adoptated directive provides for new builds and retrofit projects [13].

Also, in Vorarlberg, in october of 2007, many municipalities in the Austrian state of Vorarlberg decided to plan and contruct all new public buildings to the *Passive House Standard,* we mention here: Altach, Bregenz, Dornbirn, Frastanz, Götzis, Hörbranz, Krumbach, Langenegg, Mäder, Rankweil, Thüringen, Wolfurt and Zwischenwasser [13]. For instance, a passage from the Passive House legislation of the city Altach: ″The city of Altach resolves that all public new builds are to be built to the Passive House Standard. […] A specific heating demand of 15 kWh/m2 is to be demonstrated by means of the Passive House Planning Package (PHPP); the use of active cooling systems is to be avoided″ [13].

We can add here "Passive House Declaration" of 2008 from the city Wels, that ″ensure all new builds and future retrofit projects will include renewable energy and energy efficiency goals″ [13].

The legislation of Belgium includes *Energy Performance and Indoor Environment in Buildings Regulation* that has adopted by Brussels Capital Region in

order to comply with the European Energy Performance of Buildings Directive that calls for buildings to be Nearly-Zero Energy Buildings by the end of 2020 [13].

The administration of Antwerp city decided to apply the Passive House Standard in all public new builds and complete renovations [13].

In Canada, Passive House Canada members developed *Build Smart: Canada's Buildings Strategy* [13], which is a guide for strategies to build smart together to get minimal costs for living and to work in safe, comfortable spaces [14].

The central authorities have understood that all stakeholders need to work together, because they all want a lot of the same things: decision-makers, city-leaders, industry professionals, home owners, renters, building owners, and operators [14].

The Directory of Energy Efficiency and Alternative Energy Programs in Canada represents ″an on-line inventory programs to promote the efficient use or conservation of energy at the end-use level and/or the use of alternative energy in Canada″ [14]. This ″convers programs offered by the Government of Canada, provincial and territorial governments, major Canadian municipalities and major electric and gas utilities and companies″ [14].

Anothers examples for legislation in Canada are: *The B.C. Energy Step Code* and *B.C. Building Act, City of Toronto Green Standard* and *City of Vancouver's Zero Emissions Building Plan* [14].

The European Green Deal- Europe's Generation Agenda for Environmental Sustainability is ″a strong shift of policy priorities and a policy roadmap towards environmental sustainability labelled as the *European Green Deal″ [15].*

European Green Deal is aimed to preserve and enhance the EU's natural capital and the health and well-being of citizens from environment-related impacts, and for these, European Commision established ″a set of deeply transformative policies: *stepping up climate and energy policy; industial strategy for carbon-free circular economy; building and renovating in an energy and resource-efficent way; sustainable and smart mobility; greening common agricultural policy- from farm to fork; preserving and protecting biodiversity; a zero-pollution vision for a toxic-free environment; sustainable finance, budgeting and spending; public participation and active stakeholder engagement; the EU as a global leader ″* [15].

Due to the Covid-19 crisis, Green Deal policy had suffered a considerable loss of momentum mainly and the exhaustion of public and private capacities caused by the pandemic is likely to impede the green transformation for years to come [15]. We can see that ″even if the Green Deal succeeds only in part, it will certainly bring about manifold challenges in the making and enforcement of EU environmental law″ [15].

4.2. More lobbying, more sustainable architecture and more smart people

In this subchapter, we will focus on the importance of lobbying in terms of the legislative imposition of rules and regulations in the construction sector to encourage people want passive or more sustainable buildings.

After seeing some legislative models in the world to support new constructions and renovations respecting the *Passive House Standard,* we will go to highlight the lobbying activity in achieving these results.

At international level, the most well-known organization that conducts lobbying activities in the field of architecture is *The Architecture Lobby* or *TAL,* which is ″a grassroots organization if architectural workers advocating for just labor practitices and an equitable built environment″ [16].

The Architecture Lobby is ″a group of varied individuals- owners, workers, academics- active in the field of architecture″ [17]. Others drescribe the organization as being ″a new organization of architects wants to change the way the profession is structured″ [17].

The Architecture Lobby argues that architects should ″embrace decarbonization as a social justice issue that calls for a reconstruction of our way of life″ [18] and thinks that they ″must redefine sustainability to acknowledge the economic, social, racial, and class-based dimensions of the climate crisis″ [18].

In this regard, TAL has set out a number of principles for architects which could be the object for Green New Deal takes shape in this industry [18].

The Architecture Lobby supports arhitects ″to understand technology and innovation as design tools, to acknowledge the complex power structures inherent in their development and application″[18], but also ″to recognize that technology is not neutral″ and for that, they must work ″to implement passive and non-tech solutions alongside the high-tech in sustainable design″ [18].

In the same time, the American Insitute of Architects (AIA) has published in AIA contract documents that its role is to ″support businesses with reaching their sustainability goals and programming″ [19].

In 2019, AIA President William Bates supported the implementation of a policy package in the field of construction and architecture that would be based on values such as care for the environment and social justice [20]. In that sens, he adds ″upgrade all existing buildings, safety, affordability, comfort, and durability″ [20].

Of course, all of these new ways of rethinking architectural styles have to do with ″climate change, resilience and incentivizing energy efficient technologies″ [20].

In this context, we can agree on the fact that AIA is one of the most important lobbying organization in the world and its role is to persuade lawmakers of architecture′s values [21]. Lobbying is not only about influencing policy, but also an art of making friends who can help you to implement certain policies.

At European level, also, the lobbying activity is found in the provisions of 11 Article of the Treaty on European Union: ″the institutions shall, by appropriate means, give citizens and representative associations the opportunity to make known and publicly exchange their views in all areas of Union action″ and ″the institutions shall maintain and open, transparent and regular dialogue with representative society″ [22].

In 2011, the European Parliament together with European Commision created a public register called the Transparency Register, thus replacing the previous register that were separate [23]. The Transparency Register was born in order to to ″respond to essential questions- for example, what interest are pursued, by whom and with what budget″, while creating the right framework for European citizens to encourage them to participate actively in the democratic life of the European Union [24].

In 2018, the European Parliament, the European Commision and the Council decided to establish common rules to increase transparency in the activites of interest representatives at EU level [24].

The new agreement is debated between three European institutions and results in the full participation of the Council [24].

We know that lobbying involves possessing specific knowledge about complex areas of regulation [4], in our case, about architecture and building sector. Lobbyists play an important role by contributing with unique expertise and insight that often turns out to be essential for good regulations and legislation [4]. They are the voice of a category of people who are directly interested in a particular areas.

The interest groups at EU level for consultation must meet certain criteria to prove their official representativeness: ″to be part of a particular industry or to refer to specific sectors or categories and to be organized at European level; to be an integral part of the organization and to be recognized as partners of the social structures of the member states and to be able to negotiate agreements representatives of all EU member states, as far as possible; to present appropriate structures to ensure their effective participation in the consultation process″ [25].

At the level of the European Union, the phrase ″represented interests″ or ″representation of interest groups″ was often used in the term lobbying, because this term is often considered to have a negative connotation [26].

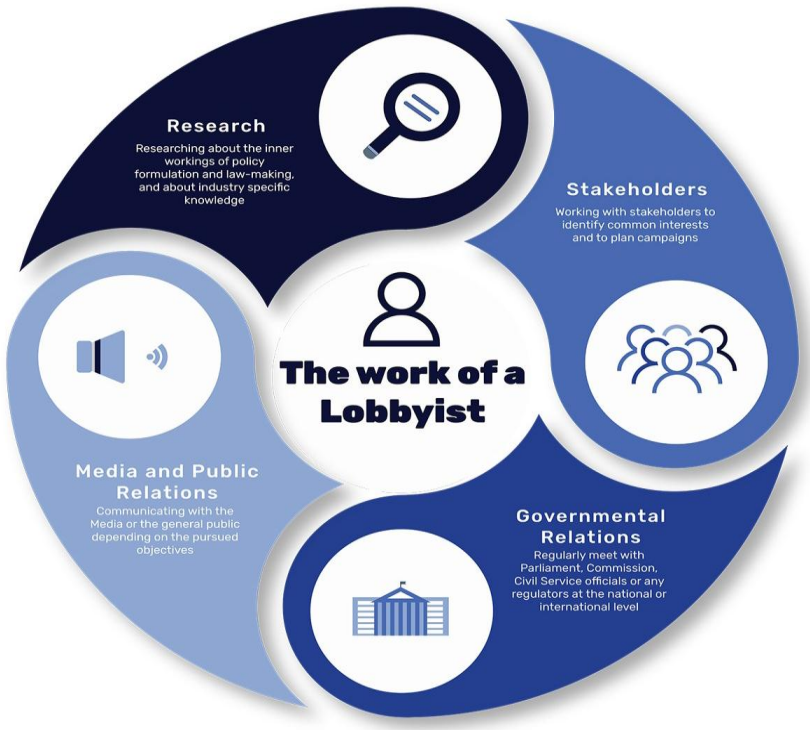

Fig.3. The functions of a lobbyist
Source: https://lobbyeurope.org/what-does-a-lobbyist-do/

Nevertheless, the European political landscape seems to offer openness to all of types of interest groups, nowadays [25]. Especially since the wording of the criteria set out above is quite vague, proof that a large number of organizations manage to pass the official representativeness test [25].

Even if the criteria provide a lax interpretation of transparency, it remains a fundamental principle in relation to lobbying activity, and if it is found that a group of interests repeatedly violate the provisions of the Code of conduct of the entities registered in this registry, those who have competence in this regard do not hesitate to delete them from the register and even to impose certain restrictions [24]. For example, a restriction would be the prohibition of the right to register for a certain period of time or for a certain number of years [24].

On the European level, lobbyists are offered the opportunity to carry out activities to influence policies that are advantageus for a particular field. We believe a good topic for such lobbying activity is to encourage sustainable architecture and the use of *Passive House Standard* for new buildings and the reusability of existing ones.

4.3. Romania- lobbying and sustainable architecture

When we talk about Romania, in terms of *lobbying* and *sustainable architecture,* it seems that we are moving very far away from the reality of other European Union member states.

We believe that this is happening, because Romania is still integrating at the level of these areas.

Unfortunately, we cannot talk about sustainable architecture as a topic of lobbying activity in Romania, because in Romania we do not have a legislative regulation of this activity.

Romania is not on the list of EU member states that do not have a legislation, a code of conduct or a register of lobbyists [27], and there are even some draft laws in this respect, which have not been adopted, but which we tried to mention in the content of this article: ″Legislative proposal on the organization of lobbying″ [28], ″Draft law on the regulation of lobbying activities in Romania″ [29], ″Draft law on transparency in the field of lobbying and representation of interests″ [30].

Draft law no. 129/2019 was rejected by the Deputy Chamber on 8 February 2022, which was the decision-making chamber, and the Government's point of view [31].

Despite all of these, we have an organization in Romania, the Association of the Romanian Lobby Registry, which is a legal entity governed by private, non-profit, non-governmental, autonomous and promotion of lobbying activities, considering it a multidisciplinary activity that requires legal, economic, sociological and communication knowledge [32].

The categories of interest groups present in the Romania society are associations, foundations, syndicates and employers' organizations [32]. The associations and foundations are subject to Government Ordinance no. 26/2000 on associations and foundations. It's also exist under the constitutional provisions by

respecting the right of association found in Article 40, paragraph 1, of the Romanian Constitution: citizens can freely associate themselves in political parties, trade unions, employers' organizations and other forms of association [33].

At the same time, the Romanian Order of Architects is a organization ″fully dedicated to the regulation of the profession of architect, stressing the importance of moral and ethical values, of good practices, of high expectations and creativity and, last but not least, of academic challenges″ [34].

The Order of Architects from Romania has ″the mission of creating the legislative, professional, and competitive environmental required for excellence in the multiple contexts of the profession of architect″ [34]. The organization ″aspires to developing a solid and responsible professional community, guided by its code of ethics, according to which the profession of architect is a liberal art in Romania″ [34].

The OAR policies are adherent to the status of architecture in Romania and in the world, but ″in terms of legislation, their policies are geared towards the practice of the profession, but also to activities that have an impact on the built environment, on planning, on heritage and landscape″ [34]. They have some strategic directions aim at the cooperation among the various construction professions and the dedicated institutions, at the opening of the communities at whom it is geared, at the explanation and extension of the role the architect have in the life inside, among and in relation to buildings [34].

According to OAR, education for architecture is ″open, through training, both to future architects and interns in architecture, and to those interested in continuous education throughout their entire career and education that leads to general knowledge about architecture″ [34].

The most important role of the Romanian Order of Architects, from our point of views, is that ″works towards communication policies among members, society, public institutions, and partners″ [34].

We believe that OAR is an important player in terms of representing the interests of the architects in Romania, but also in terms of promoting certain architectural trends, in accordance with climate change, energy and environmental policies, but also in terms of efficiency and economy, such as sustainable architecture.

The joint effort of all interested actors, from legislative to executive and continuing with the civil society, the Association of the Romanian Lobby Registry, together with the consultation of legal, economic and social professionals can represent an important step toward a clear regulation of the lobbying activity in Romania.

5. Conclusions

The stake of any article, from our point of view, is represented precisely by the conclusions formulated, because it certifies after an integral parsing of it that hypothesis of this article formulated at the beginning can be confirmed or not.

As for the hypothesis we formulated in the introduction part of this article ″The better the lobbying for sustainable architecture is represented in a democratic state, the more new builds and existing builds already rehabilitated according to the Passive House Standard″, we consider it to be a true one, because as we can see in the examples offered both at International, European and national level, in countries where the voice of organizations representing this professional category of architects is stronger, a number of sustainable architecture policies have been implemented. Moreover, in Australia, Austria, Belgium or Canada, and where the specialialists in the field have understood that they have to collaborate with the representatives of the public administration at central and local level, the results in the legislation governing the construction of new buildings and the renovation of existing ones respecting the *Passive House Standard* have not ceased to occur.

The answer to the research question ″can lobbying generate legislative measures that encourage sustainable architecture?″ is that it may represent a lever toward speeding up the adoption of these measures as we have seen in the examples provided in the content of this article.

In order for the European model to be integrated in Romania, we believe that a solution would be a legislative one by adopting a law regulating the lobbying activity and much more effective implementation rules for existing legislation in terms of *Passive House Standard.*

We have tried to pay particular attention to the subject in order to elaborate this article, by defining the concept of lobbying, but what should be remembered in the end is that in Romania, for every citizen or actor interested in lobbying to have a clear picture of its meaning, a law is needed.

This is why the discussion on the regulation of the Romanian lobbyists and sustainable architecture should be a priority on the public agenda, in order to identify the optimal solutions regarding the possibility of participation in public decision-making by defending various interests in compliance with codes of conduct and ethics.

In conclusion, through the literature of specialities, the analysed texts and the use of qualitative research, we have written an article that we hope will be a starting point for other papers or research in this field.

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Monitoring city water incidents via an Internet of Things-based sensor network

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Abstract

This research aims to prove that an inexpensive Internet of Things-based sensor network can be used to deliver information about current ground-level humidity & soil conductivity, as well as notifications about sudden changes in these measures, which would indicate flooding or soil erosion. The platform uses an open API, which can be accessed by both utility companies and NGOs and be a part of their decision-making process. This paper builds on previous research with water & electricity management in the free and open-source platform Home Assistant, which can be used in conjunction with a time series database such as InfluxDB & a visualization platform like Grafana to highlight sudden pattern changes in humidity and soil conductivity and notify interested parties via Telegram or any other such real-time alerting platforms. A case study was made, which set up an inexpensive combination of Bluetooth Low Energy sensors with Raspberry Pi local servers that transmitted their data to a central database. Data was collected both outdoors with results of normal rainfall, as well as in a lab environment with simulated flooding and soil movement caused by it. Results showed that sudden changes in humidity and soil conductivity correctly triggered real-time notifications via Telegram and that a backup battery and 4G internet connection for the local servers could mitigate the effects of potential blackouts and loss of internet access caused by severe weather events. Implications of the study for smart city practitioners are that authorities can be quickly notified of severe water & soil-related events so that measures can be taken, while long-term analytics can be used to predict (perhaps via an AI machine-learning model) when and where such events are most likely to occur in the future. The value of this paper is that it shows how a combination of open-source software and inexpensive sensors & servers

can be used at city level (especially in developing cities which do not have major infrastructure in this sense) to combat the effects of climate change and both react to and predict severe water & soil issues.

Keywords**:** *IoT, Water Incidents, Grafana.*

1. Introduction

Due to population growth and climate change, it has become an ever more important requirement to create smart, resilient cities that are well-prepared to deal with natural and man-made water and soil incidents.

Whereas in the past such analyses were the domain of complex infrastructure such as the Sentinel-1/2 satellites [1], nowadays local problems can be identified and acted upon with much more readily available hardware and software, due to the proliferation of inexpensive Internet of Things devices [2] and their easy scalability to cover large areas or numerous communities.

Such devices can be used for round-the-clock monitoring of key areas in the city, which are either prone to flooding or located near sensitive infrastructure or densely populated regions.

Custom soil humidity and conductivity monitoring sensors for specific projects were not overly complex to create in the past [3], but mass production of such sensors by companies like Xiaomi has enabled standardization and ever lower costs.

Meanwhile, an easily accessible open-source API for integration with centralized monitoring nodes (such as the one provided by Home Assistant) has allowed these systems to communicate more efficiently amongst each other and with other relevant parties, including interested members of the public or NGOs.

Sustainability is a key component of any smart city architecture [4] and legislation must take into account the social and infrastructure realities of the implementation space.

Thus, the lower the barrier to entry for such monitoring and analytics systems, the wider their scope can become, while communities which did not have access to their benefits before can quickly have such systems up and running, with minimal maintenance costs in future years.

Given that water scarcity is projected to affect 50% of urban dwellers by the year 2050 [5], it is more important than ever to properly manage the water cycle in large urban areas, which are also being affected by developments that increase land cover, thus not allowing natural soil permeability to be used properly and creating the potential for flash-flooding.

Smart water systems are considered to be one of the main drivers of smart city development [6] and incident monitoring and notifications are the logical endpoint of any public water management program.

2. Methodology

This case study used a combination of open-source software (Grafana, Home Assistant, InfluxDB), a commercial but free notification system (Telegram, also used for earthquake notifications for the general public by the Romanian National Institute for Earth Physics) and off-the-shelf hardware (a Raspberry Pi 4 server in a rugged case, Mi Flora Bluetooth Low Energy sensors, a ZTE MF833 4G USB modem and a VARTA Fast Energy backup power bank).

While initial setup is quite technical, post-implementation maintenance needs are low.

2.1. Case Study Hardware Setup

The sensors used for this case study are the Mi Flora Bluetooth Low Energy sensors from Xiaomi (Fig. 1), which provide soil moisture, soil nutrient, temperature and light monitoring.

The sensor also has an IPX-5 rating, which translates as being protected from a low-pressure water stream from any angle. Depending on the needs of its placement, more rugged models can be used, but this particular model provides good value and can work for a year before its battery needs to be replaced.

There is also the option of creating purpose-built sensors with boards like the ESP32 and associated software such as ESPHome.

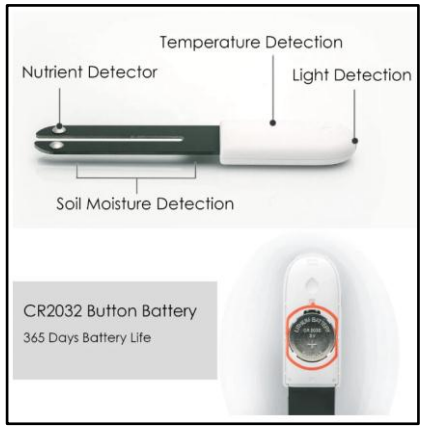

Fig. 1. Xiaomi Mi Flora sensor
Source: www.aliexpress.com

The Raspberry Pi 4 single-board-computer (Fig. 2) can be used as a local server for monitored points in the city, connecting via Bluetooth Low Energy to Mi Flora sensors up to 15m away and via WiFi or 4G to the wider Internet.

Other single-board computers can also be used for such purposes, but the Raspberry Pi 4 is unique in its level of software support and computing power available for its price, despite current supply chain issues which have limited its availability.

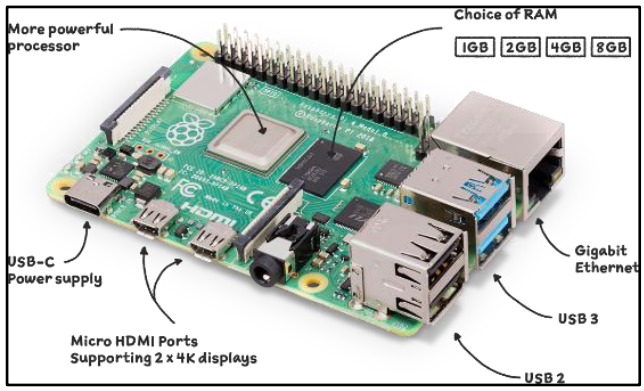

Fig. 2. Raspberry Pi 4 board layout
Source: www.raspberrypi.com

The case selected for the Raspberry Pi was an aluminum model from Flirc (Fig. 3), which provides shock protection as well as passive cooling (with no moving parts like fans, which can break in time).

Fig. 3. Raspberry Pi case
Source: www.flirc.tv

In the event of a loss of power or WiFi Internet access, the Raspberry Pi was outfitted with a 4G USB internet stick from ZTE & a 20000mAh backup power bank (Fig. 4), capable of providing the 5V/3A output required by the Pi.

The power bank can be used as a passthrough device and in the event of a power loss can keep the Raspberry Pi running for 12 hours or even more, depending on the performance load.

Fig. 4. Raspberry Pi backup Internet & power
Source: www.aliexpress.com & www.varta-ag.com

2.2. Case Study Software Setup

In terms of software setup, the sensors use the Home Assistant Bluetooth communications stack and Xiaomi integration to connect to the Raspberry Pi, which acts as a bridge device to the wider Internet.

The Raspberry Pi devices run Home Assistant OS (based on Linux) and each of the nodes can either stream their data to a centralized InfluxDB instance or, if power and traffic demands are such that this is impractical, the historical data can be sent in batches at less frequent intervals (every hour, or daily), with only emergency notifications having real-time priority.

The notifications can be automated to instantly transmit any of the sensor data attached to the Telegram notification message if certain thresholds are reached and there is also the possibility to have actionable notifications, which would allow authorities to deploy a one-click mitigation for certain issues.

For example, in the code in Fig. 5 the sensor is set to detect changes of greater than 10% in 10 samples over 5 minutes and, if this is the case, a notification is immediately sent to the operators notifying of a flood in that sensor's area. These parameters can be tweaked, in order not to generate false-positive notifications.

```
#Template for monitoring sudden shifts in Soil Humidity Sensor #1

  - platform: soil_humidity
    sensors:
      soil_humidity_1:
        max_samples: 10
        entity_id: sensor.soil_humidity_1
        sample_duration: 300
        min_gradient: 0.033333

#Notification after flood detection

alias: Soil Sensor 1 Flood
initial_state: "on"
trigger:
  - platform: state
    entity_id: sensor.soil_humidity_1
    to: "on"
action:
  - service: notify.telegram_operator
    data:
      title:
      message: Flooding is occurring in the area of Soil Sensor 1
```

Fig. 5. Sample code for detection of sudden humidity shifts and sending a notification
Source: author's testing

Further customization can be done to the notification text, which would map sensors to specific areas and make the notification more user-friendly, i.e. by mapping Soil Sensor 1 to the street it is on and sending a notification of the form "Flooding is occurring on _____ Street"

3. Results

3.1. Water incident monitoring results

As can be seen in Fig. 6 (which has been exported from a 6-month Grafana dashboard of one of the sensors), the highlighted sudden increase in soil humidity from less than 40% to more than 60% when flooding was simulated is an easy indicator of an incident which can trigger a notification.

By comparison, in the last third of the graph one can notice the much more gradual increase in humidity caused by autumn rains over a longer period of time, which would not trigger notifications.

Fig. 6. Flooding incident as registered in Grafana
Source: author's testing

3.2. Soil conductivity monitoring results

The electrolytic conductivity in the soil that is measured by the Mi Flora sensor is another interesting indicator of the effects of water and other factors and can be combined with soil type data to extrapolate salinity issues (Fig. 7).

This is an especially important factor given the modern salinization dangers to soil fertility and the costs involved in artificial fertilization.

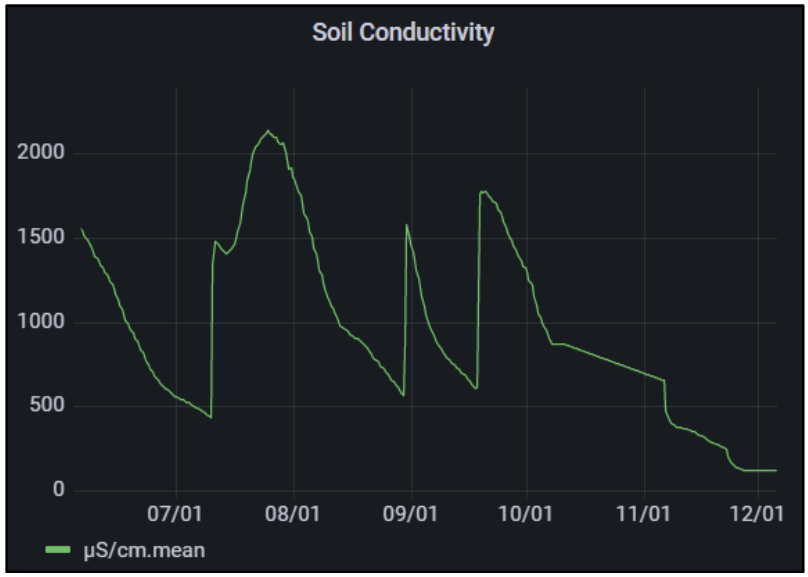

Fig. 7. Soil conductivity trends as registered in Grafana
Source: author's testing

4. Discussions

4.1 Applicability

The sensor network is able to monitor various locations within a city 24/7 and can automatically send notifications either via Telegram or through an accessible web socket to relevant emergency service human operators or APIs.

If other city service APIs are integrated with this network, automatic triggers can be created to enable the opening of runoff channels or the notification of nearby residents via the emergency SMS broadcast system. NGOs can also use the API information to create their own applications that make use of the provided data.

The cost of one entire monitoring node is less than 200 EUR (with one sensor, but it can accommodate multiple sensors within a 15-meter range), so scaling up such an infrastructure can be done in a very cost-effective manner.

Meanwhile, being in the coverage area of city-provided WiFi or at least a 4G mobile data connection negates the need for any hard-wired dedicated infrastructure except for an electricity source.

The low power consumption of the Raspberry Pi also means that it can be permanently connected to a solar power source, which would make it more useful in remote or low-infrastructure areas.

4.2. Limitations of case study

This case study was performed on a sample city street in Bucharest, Romania with both exterior and lab conditions, with reliability tested on wired, WiFi and 4G

networks, as well as with failover to 4G & portable power after simulated power grid & wired Internet access failures.

Charging the emergency battery power supply with a portable 10W solar panel was also attempted, which had satisfactory results in an environment with either enough daily sun or less than 12 hours of continuous power outage, although both of these limitations can be overcome with the added cost of a more powerful solar panel system and/or larger battery pack.

5. Conclusions

Flash-flooding, soil erosion & salinization are major problems for both cities and outlying areas at present. They endanger the fresh water supply, damage buildings and infrastructure and increase upkeep costs for urban green areas.

The case study has shown that with low cost and a high level of scalability, an IoT-based soil humidity & conductivity sensor network can immediately alert authorities of emergency events, as well as show trends over time which can then be included in a Machine Learning model for predictive analysis.

In the past year, usage of Home Assistant has risen from 500.000 to nearly 700.000 worldwide operators, with easily retainable long-term statistics for water, power & gas constituting one of its main drivers of growth. As a platform for both off-the-shelf and custom sensors, it can enable amateur and professional operators to gain access to real-time information and act upon it, either automatically or on demand.

Especially for developing areas, such early warning or proactive solutions can be the difference between an easily controllable incident and a large-scale problem which would require a much more complex reactive solution.

The experimental results have demonstrated that even a minimal implementation of such a sensor network can quickly reap benefits for the communities being monitored, thus achieving the objectives of the study.

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Azerbaijan's smart cities/villages concepts for Karabagh region. How real and doable to lead to success?

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Abstract

The past few years in Azerbaijan have been marked by growing government interest in using 'smart' solutions in urban and rural planning. The results of the Karabakh conflict pushed these aspirations even further, with 'smart' technologies being seen as the key instruments in the redevelopment of the de-occupied territories. Since cities are vital mechanisms for economic growth, it is generally believed that applying modern technologies in urban and regional planning can increase the economic performance of a nation while ensuring sustainability. This article will discuss Azerbaijan's existing experience in 'smart' development and examine the extent to which the role of public-private partnership as a tool that can possibly facilitate smart transformation of cities and regions ensuring wider range of prospects for various stakeholders including residents, business actors, authorities, educational institutions, NGOs and so on, as well as create a more sustainable economic and social environment. In the case of Azerbaijan. Special attention is given to the experience of the prominent smart communities in different part of the world, in terms of the applied models of private-public collaboration. The comprehensive SWOT-analysis of the PPP concept in smart cities is conducted based on which the conclusions regarding its collisions and potential are made. Considered on the recent trends in urban development the significance of searching for new approaches to the city governance, in order to cope with the challenges more efficiently and provide advance services for the citizens, is highlighted. The concepts of Smart Cities are viewed as powerful vehicles for fostering urban prosperity. This article also opens a general discussion about the concept of the 'smart city' and how it can be understood in the context of public-private partnership as a tool that can possibly facilitate smart transformation of cities and regions ensuring wider range of prospects for various stakeholders including residents, business actors, authorities, educational institutions, NGOs and so on, as well as create a more sustainable economic and social environment. Furthermore, it discusses the problems of conceptualisation and operation-allocation of smart city projects in Azerbaijan and elsewhere, and the ways in which they can lead to project failure or success. The article also addresses the problems of implementation of the smart city concept in

the country and discusses how to adapt general visions and global aspirations for smart and sustainable cities to the Azerbaijani context. Furthermore, the article suggests which metrics and policy domains the authorities should consider when translating the smart city visions into policy while applying PPP elements. The article also discusses the preconditions for success, and whether Azerbaijan has the necessary infrastructure and specialists for its implementation.

Keywords: *Smart cities, smart villages, smart governance, Karabagh, Azerbaijan.*

1. Introduction

Worldwide, the notion of smart city is getting more and more relevant for both academics and policy makers. Regardless of confusion about what a smart city is, as several similar terms are often used interchangeably, and the term is also used in ways that are not always consistent. According to [1], there is neither a single template of framing a smart city, nor a one-size-fits-all definition of it.

The growing urbanisation of the past years has led to increased vehicle traffic in Azerbaijan's cities, resulting in extra focus on traffic management and its improvement as a part of city planning. In this case, the improvement and efficiency of smart transportation or mobility has become one of the priorities of the Baku's 'smart city'plan. The question is what exactly 'smart transportation'is, and how it can make movement through cities more efficient. The 'Internet of Things (IoT) manages, evaluates, and monitors transportation systems to be effective, efficient, and safe [2]. The idea: smart sensors and controllers handle all the traffic management, only interfering when necessary. Thus, the importance of new technologies and their management is paramount in the implementation of a smart transportation system. Moreover, it is safer than traditional transportation system, as it involves machine learning and IoT.

This article will discuss the issues on how Smart Cities can be implemented in Azerbaijan, is that myth or reality? The potential challenges and obstacles which may come up through the implementation finally, opportunities for the country to bring this concept to life.

2. Literature Review

Defining Smart cities is a big subject. Many fields of research have shown an interest to study the concept of Smart City. They give birth to theories related to spatial planning [3], economic geography [4], knowledge economy [5], urban technology [6] and marketing [7]. Although these multitudinous studies, academic research is at an early stage and lacks a homogeneous and comprehensive definition [8]. However, the subject retains a constant interest since cities are receiving more and more residents who require living services of quality while financial and physical resources are getting scarce and scarce [9].

In the recent article, [10], asks the questions: Will the real smart city stand up? According to the Holland all the cities often claim to be a smart but do so without either defining what this means or offering any evidence to support such proclamations. [10] state that, validity of any claim to be smart must be based on something more than their use of information and communication technologies (ICTs). [10; pp315] claims that, to the state, smart cities, by definition, appear to be weird cities, although this cannot be the sole defining criteria due to progressively smart cities must seriously start with people and the human capital side of the equation, rather than blindly believing that IT itself can automatically transform and improve cities. Defining the smart solutions relevant to a city involves studying the actual interactions that citizens have with the city, leveraging the city's natural strengths, and co-creating the smart city vision and roadmap to align all constituents [11]. Cities around the world are increasingly experimenting with geographically concentrated innovation ecosystems as innovation testbeds and hubs for knowledge exchange [12]. A city only becomes truly "smart" when all citizens are ready for it. Cities risk excluding entire sections of their population from the smart city practice. Teaching people how to navigate the digital world is a critical aspect of a digital inclusion plan [13].

3. Understanding of smart city and it is significance

Through the past decade, the smart city concept has altered primarily in terms of the approaches that cities or communities have chosen for urban transformation. Driven by technology providers in the early years, governments as leaders of the smart city movement have later understood that technology is only the enabler for reaching governmental, economic and societal goals. Today, smart city strategies still consider technology as an enabler, but governments have learned that top-down initiatives or a master planned approach are not the determinants of success [14].

A simplistic understanding of the Smart City concept outlines it as applications and technologies which choose cities and communities as target groups, rapidly improve the way of living and working in the region, increase use of information and communication technologies (ICT), and at the same time achieve long term sustainability. For the following article, however, I will use the definition given by Infocomm Media Development Authority (IMDA), an entity which exclusively for supporting the Smart City concept in Singapore. IMDA also defines a Smart City as “a village, district, city, region or small country which takes a holistic approach to employ information technologies with real-time analysis that encourages sustainable economic development [15].

The first and foremost question that arises regarding the necessity of the Smart Cities. According to the United Nations Population Fund’s latest statistics illustrate, the vast majority of the world’s population reside in cities. However, this figure keeps increasing sharply and is expected to reach 70% by the year 2050 [16]. Enormous urbanization mostly leads to huge consumption of resources, which results in negative worries for the natural environment [17]. This rapid growth in

urban populations leads to a variety of technical and infrastructure-oriented problems, such as difficulty in waste management, scarcity of resources, air pollution, human health concerns, traffic congestion, and deteriorating infrastructure. Additionally, social problems such as health care, distribution of pensions, management of social services, education, and others became significantly more complex issues. To prevent the drawbacks of urbanization, cities need solutions that require the collaboration of government, community, city agencies, civil society unions, etc. Cities urgently need innovative organizational and institutional arrangements to solve emerging technical, physical, and social problems.

4. Concept and implementation of Smart City" and "Smart village" in the Azerbaijan context

As of the year 2021, there was not well defined concept and implementation plan for smart city and villages. Therefore, president has issued an order on the development of "Smart City" and "Smart village" concepts. According to the order, improvement of the quality, safety, and efficiency of services provided in cities and villages of the Republic of Azerbaijan, the application of information technology in these services, as well as ensuring the effective use and management of available resources for these services are one of the key priorities of the sustainable development in sustainable in urban and rural areas.

In the concept, it is mentioned that the use of modern telecommunications, sensors, big data, and other digital and artificial intelligence technologies, as well as innovation and knowledge, makes socio-economic relations more productive and efficient, creates new income opportunities in the value chain of the economy. Improving the quality of decision-making and management based on the formation, collection, storage, processing, and analysis of digital data using the abovementioned technologies in an integrated manner opens up a wide range of opportunities for effective and quality services. These opportunities pave the way for the transition to functional, large-scale "Smart City" and "Smart Village" services in the next stage of development of services provided in cities and villages [18].

Azerbaijan started to be seen among the list of countries attempting to develop the Smart City/Village approach. Right after the war with Armenia back in 2020 autumn and having succeed to gain control over those territories, serious task has set in front of Azerbaijan which is massive reconstruction and resettlement of the population are seen based on the Smart City/Village model. Government of Azerbaijan declared in January 2021 that "settlements recently liberated from Armenian occupation will be re-established based on the concept of smart city/village" [19]. But while in Karabakh region where territories liberated, the Smart city model will be applied to return refugees back once displaced during 1991-1994, provide sustainable and long term development for the territories, and resuscitate the region, in established cities in Azerbaijan the situation is entirely not same. The largest towns of Azerbaijan, particularly the capital city of Baku, have several ageing unsolved questions that need to be seriously tackled.

4.1. Rapid pace of urbanization: Azerbaijan which undergoing impressive urban growth at the rate of 1.5% annually that makes Azerbaijan the fastest urbanizing place in the South Caucasus comparing with its two other neighbours Armenia (0.3%) and Georgia (0.5%) [20]. However, the development of infrastructure and industries has not kept pace with the growth in urban population specifically in the capital city of Baku.

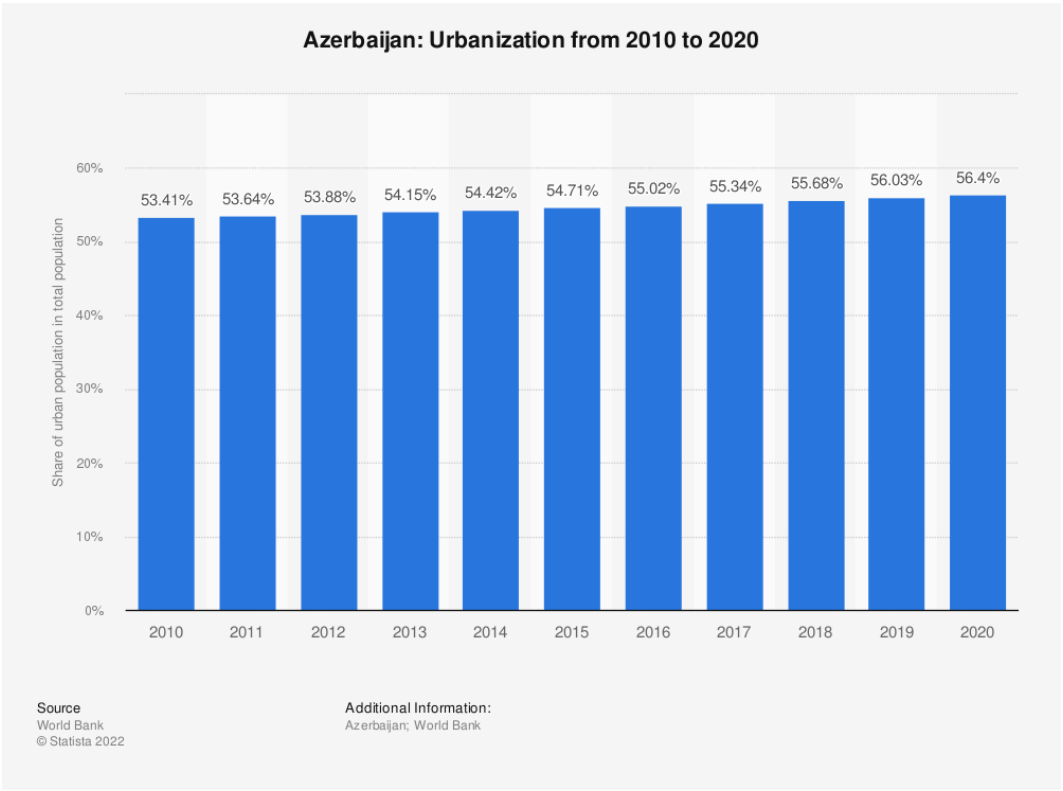


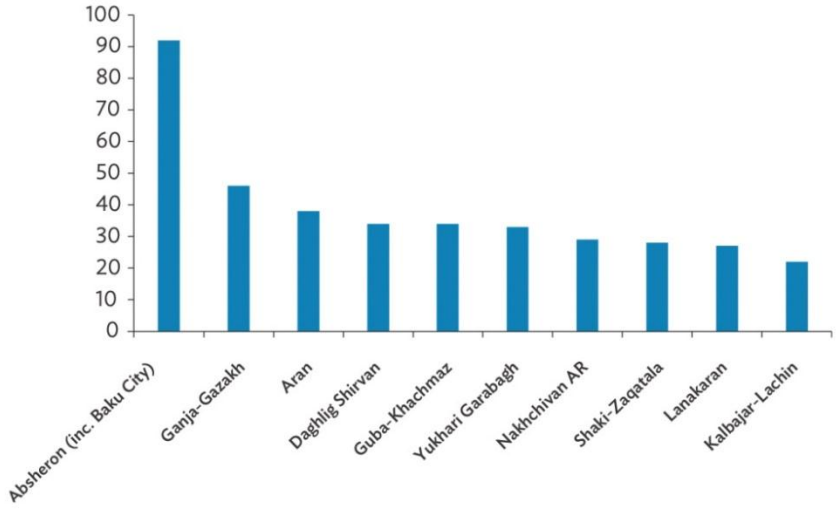
Fig. 1. Azerbaijan: Urbanization's indicators between 2010 to 2020
Source: Statista. (2022, January 22). Urbanization in Azerbaijan 2020. https://www.statista.com/statistics/455781/urbanization-in-azerbaijan/

Population of Azerbaijan reaching to 11 million already, and urbanization continues to increase. 56% of the total population lives in urban areas or cities [20], while unofficially this number could be higher. For example, Baku has around 2.4 million people, while the Baku Metropolitan Area (the territory where people come from the regions every day for work, study and leisure, encompassing Baku, Khirdalan, and Absheron) may have a population of more than 4 m. Currently, 35% of the labor force, or around 1.5 m people, live in rural areas. Meanwhile, for sustainable agriculture the country may need a much smaller number of people. It is expected that due to increased technological innovation in agriculture, the rural population's migration to urban areas will accelerate. With the high cost of the pandemic, it is expected that within a few years more than a million people will

migrate to urban areas and to Baku specifically. This will occur due to further technological advancement in agriculture, robotization, and the decreasing cost of labor in rural areas. The pandemic has accelerated the introduction of advanced technologies in society and especially in agriculture.

4.2. Economic inequality

Economic and social disparities among the cities of Azerbaijan are major significant issue. The capital city, Baku, accounts for 70% of GDP due to the oil and gas business sectors. Meanwhile, the lion's share of tax collection and investments are also generated by Baku. A lag in economic diversification and the absence of structural changes in the economy, combined with persistent human capital gaps between urban and rural populations [20], have led to this difficult situation. The disparity in income generating abilities between Baku and the rest of country is another problem that needs to be seriously dealt.



AR = Autonomous Republic.

Note: Data are from government statistics. By making any designation of or reference to a particular territory or geographic area, the Asian Development Bank does not intend tomake any judgments as to the legal or other status of any territory or area.

Source: State Statistical Committee of the Republic of Azerbaijan. 2015. *Statistical Yearbook*. Baku.

Fig. 2. Level of Urbanization by Economic Region, 2015(%)

The certain reports indicate that Tokyo with a population of 35 million people is much less polluted than Delhi with roughly 16 million. Indeed, albeit the twice of population, a better urban management has allowed the Japanese capital to be 4.3 less times polluted than Delhi.

Cities have also had a profound impact on the economic competitiveness of a country, performing much better than the national indicators average [21].

4.3. Increasing car ownership

In number of residents who owns car in the capital city can be considered one of the crucial problems of urban development. During the last two-decade, car ownership has increased from 55 to 143 per 1,000 residents [22]. Out of the 1.4m cars registered in Azerbaijan in 2019, we can assume that at least 1m enter and operate in Baku, contributing to environmental causes. At the same time, still developing transportation sector, mostly in the capital's area, has become one of the most vital issues in urbanization. Urban sprawl and the new settlements on the outskirts of Baku have triggered car usage in and around the area and led to a "domino effect" [23]. Since residents in this area prefer to use cars over public transportation to commute to work, schools, and other places which are mostly based in the metropolitan area of Baku, the number of cars is increasing exponentially. The huge amount of car ownership is a warning to government officials to consider its negative effects on the city's development and climate change as well. As an example, such widespread use of cars influences the city environment, increases CO_2 emissions, causes noise and pollution, and damages the air quality. Besides that, massive car usage leads to a number of accidents, creates traffic congestion, and takes people's time and energy.

4.4. Infrastructure

Despite government investment in regional development programs throughout the 2000s, rural-urban disparities in access to basic services remain significant. Access to drinking water and heating is almost universal in Baku and other urban areas, while in rural areas, only 76% of households have access to running water, and 82% to gas. Access rates are higher in Absheron and Baku and lower among poorer populations in Aran, Daghlig-Shirvan, Ganja, and Guba [24]. The recent drought in Neftchala, Salyan, and other areas shows that the non-rational usage of water has led to problems with water delivery in many regions. That affects not only agriculture but also the living standards of the people.

5. How can Smart City help the cities of Azerbaijan?

Based on best-case examples from various countries, we can predict where the Smart City/Village concept and technologies can make serious changes.

5.1. Urban Infrastructure

With increasing usage of utilities, smart usage of water, electricity, gas and waste management is becoming another necessity. The example of other cities shows that such solutions can be implemented in Baku. Thus, in 2015 smart waste bins were introduced in Singapore as part of a smart waste management program called Smartbin. The sensing monitors attached to bin lids collect information on contents and location and garbage teams are notified through a central server. This

helps the waste collection team to optimize their route planning and, at the same time, keep public spaces constantly clean.

NEWater is high-grade reclaimed water produced from treated used water that is further purified to become safe drinking water. In 2010, the largest NEWater plant was built and now this meets up to 30% of the nation's current water demands. It is expected that NEWater can meet up to 55% of the demand by 2060. The smart monitoring system that uses multi-functional water sensors allows water loss, or non-revenue water, to be kept at 4.6% in Singapore, one of the lowest levels in the world [25].

5.2. Urban Planning

Pedestrian-friendly areas facilitate cities becoming smart and sustainable. The Paris Model may be a good example to apply to the cities of Azerbaijan. The objective was to create a sustainable neighbourhood where people can reach everywhere within 15 minutes. The model also focuses on minimizing the number of cars to decrease CO_2 emissions and to prevent car accidents [25].

5.3. Land Mines in Karabagh region

The main and rather expected problem, at least for the next several years, is the issue of land mines. The Azerbaijani Mine Action Agency (ANAMA) which deal with the demining process, announced that it more than a decade needed in order fully demine liberated territories. Idris Ismayilova, who is head of the operation, stated that approximately seven hundred unexploded rockets as well as five thousand anti-personnel and two thousand anti-tank mines have thus far been removed in only a small area of Karabakh [26]. The preliminary estimated price for the reconstruction process given by Azerbaijani experts amounts to more than US $20 billion [27]. Meanwhile, some displaced people cannot wait to return to their homes and are willing to invest in this rebuilding and demining process. Next, the government should understand what kind of population it wants in smart villages. While it is it is not difficult to predict the interested strata in urban populations, i.e., mostly the young, the potential makeup of the rural smart village population is at this point impossible to anticipate. Most of Azerbaijan's rural population is involved in traditional agriculture including cattle ranching, farming, etc. It would take great efforts to educate these people on how to properly utilise data and make data-driven decisions. In this regard, the Korean model of training young people in smart agricultural technologies seems more feasible. The government could already at this point begin preparing the relevant plans with academic institutions and think tanks. Finally, smart villages in Karabakh may be the first example in the world where such concept will be introduced from scratch, and not to an already-existing village. The success of smart villages in Karabakh can shift paradigms not only in Azerbaijan, but in the greater region as well, helping breathe new life into countless dying villages.

6. Possible challenges to counter

6.1. Lack of digital literacy and ICT infrastructure

There is considerable digital infrastructure gap between the capital and regions. There is a 20-percentage point gap between rural and urban households in fixed internet penetration. This digital divide is mainly due to shortages of fixed infrastructure and lower levels of digital literacy in rural areas [28]. The country will also need to make broadband internet faster, cheaper, and more accessible. Although overall mobile broadband coverage and adoption is high, there is a significant digital divide between urban and rural areas in the quality/speed, use, and affordability of the internet [29]. According to household survey data on ICT use reported by AzStat, in 2018 only 15% of individuals used the internet to interact with authorities and avail themselves of public services, and 7% used it for education or learning activities. Beyond that, internet speed in Azerbaijan is the lowest in Europe, making it difficult to implement the Smart City concept [30]. Finally, Speed Test Global Index for June of 2021 ranked Azerbaijan 122nd out of 181 countries on speed of broadband internet with its 25.5 mbps of download speed. Azerbaijani internet speed is the worst in Europe, and in the former Soviet republics only Turkmenistan is worse. Nevertheless, mobile internet speed is ranked decently at 66th place. Information and Communication Technology (ICT) has become an integral part of our lifestyle. Without the internet and digital technology modern lifestyle is unimaginable. Whether it is transportation, telecommunications, healthcare, security, education, almost every segment of society is dependent on ICT.

6.2. Financial Weakness

The technology and user knowledge of e-commerce and e-payment systems is limited, and trust in such systems is low. Only one in 20 people in Azerbaijan (5%) purchased something online in 2017, compared to a worldwide average of almost one in four people (24%). Azerbaijan ranks 68 out of 144 countries on the B2C e-Commerce Index, due to low penetration of e-payments, including credit and debit cards, a shortage of domestic online shops, underdeveloped logistics, lack of trust by both buyers and sellers, and low digital literacy in general. Less than one-third of the population has a bank account, and only one quarter has a debit card, many of which are social insurance and salary cards. Mobile and internet-based digital payment tools are rarely used due to limits on the amount of a transaction and other restrictions. Another barrier is the high transaction fees associated with international credit card payment networks. In addition, there are many barriers in financial transactions that prevent the development of the financial markets [25].

6.3. Smart Public Safety

Smart streetlights with cameras, microphones, and sensors are using computer vision to gather intelligence about traffic, accidents, and crime. In a crisis, they can call for help and direct people to safety.

Smart traffic signals are improving urban mobility by analysing traffic conditions, changing their timing, and easing congestion. During emergencies, they can automatically give first responders the right of way. Smart intersections are capturing and analysing traffic patterns, detecting risks, and warning against imminent accidents, reducing crashes and injuries.

Smart emergency vehicles are capturing and sharing video, audio, and vehicle telemetry, giving dispatchers a real-time view of the field and invaluable data for training and planning. Smart buildings are monitoring access, reviewing video feeds, and running environmental systems. In an emergency, they can share camera feeds and building data with public safety officials.

According to Juniper Research, smart cities may see up to a 15 percent improvement in emergency response times and a 10 percent reduction in violent crime. Smart cities integrate these public safety IoT devices using a common framework and shared data pools. This gives every agency a single pane of glass and shared view of situations as they unfold. It also opens the doors to APIs that can connect public safety technology stacks to citizen data sources like social media, news feeds, even smart building systems [26].

7. Opportunities for Smart Cities in Azerbaijan

The emergence of the COVID-19 pandemic last year made both the public and private sectors move to digitalization, such as public health, education, commerce, and other public services. The recent situation forces the government and citizens to adapt to the changes with the help of technologies. The pandemic helped Azerbaijan to make a breakthrough in the digitization of society, and now more technologies should follow so as not to waste this opportunity [27].

Additionally, the 44-day war between Azerbaijan and Armenia accelerated the need to restore the cities and villages which have been liberated from occupation. Hence, to develop the Karabakh region in a sustainable way, the Smart City/ Smart Village concept is a primary item on the agenda. There is an urgent need to change the status quo and design a model which will improve all cities in an efficient and effective way and accelerate the economic situation at the same time. The positive side is that the government understands the need for Smart Cities and the president of Azerbaijan even announced the establishment of Smart Cities/Villages in Karabakh. In the aftermath of the war, the region requires concentration in terms of its economic, social, and environmental development. The whole territory is devastated, and there is no infrastructure now, therefore, it should be built from scratch, and certain types of innovations should be implemented. While doing this, the needs and demands of the population should be the primary consideration. In this sense, it might be more applicable and less expensive to the whole Karabakh region to implement the Smart Concept across the territory rather than focusing on one Smart Village. Examples for the area can be smart agriculture, such as agricultural hubs in the region, as well as smart water management, smart electricity, smart education, and more public services.

8. Conclusion and recommendations

Nowadays, there is urbanization boom in the south Caucasus. Government and policy makers might acknowledge the critical role that well-managed urbanization will play a critical role in realizing their ambitious national and global development goals and achieve sustainable development goals (SDGs). In this regard, Smart cities can aid the rapid urbanization of Azerbaijan and improve the quality of life of the new city dwellers, solving some of the biggest challenges of the urban environment, such as high-cost, low-quality, and inaccessible services. However, in order for the continent to reap the benefits, planners and policymakers must keep the big picture in mind when promoting smart cities, emphasizing well-implemented infrastructure and citizen needs. Obviously, developing a truly smart city is urges putting people at the heart of any city which requires a venture demanding immense scale, complexity, and commitment. However, lacks clarity in smart cities, undeveloped local governance system, poor urban planning and design practices, poor participation & the challenge of inclusion, mindset problem, lack of resources to finance urban infrastructure and undeveloped information technology system are among the numerous challenges that they are facing in smart city design and implementation. Despite all lacks clarity in smart cities, undeveloped local governance system, poor urban planning and design practices, poor participation & the challenge of inclusion, mindset problem, lack of resources to finance urban infrastructure and undeveloped information technology system, smart city design and implementation, the establishment of Smart Cities or Smart Villages in Azerbaijan is doable and possible. The state entities and the business sector can mutually provide all the necessary financial and technical capital for a very short period. What cannot be done within a short period of time is to train and give birth to new clusters of smart, creative people working in various creative industries. The government should put every effort into bringing and training these people since only hu

man capital can make the Smart City concept real.

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Transformarea societății românești în era talentelor digitale. Rolul resursei umane

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Abstract

Administrațiile „smart" nu se rezumă doar la digitalizare și trecerea către orașe inteligente și sisteme de e-guvernare, motiv pentru care obiectivul prezentei lucrări este de a evidenția rolul unei resurse umane care să facă față provocărilor lansate de noile tehnologii, cu precădere rolul talentelor digitale în susținerea demersurilor de transformare a administrației publice, cât și rolul cetățenilor, fiind beneficiarii direcți ai serviciilor oferite de administrațiile publice. Importanța acestora în sectorul public nu ar putea fi analizată fără a aduce în lumină și implicațiile asupra profesionalizării managementului resurselor umane. Utilizarea inteligenței artificiale și a noilor tehnologii se răsfrânge în mod direct asupra tuturor persoanelor implicate în proces, iar succesul implementării acestora depinde de capacitatea personalului și a cetățenilor deserviți de a le exploata întregul potențial și de a ține pasul cu evoluția acestora. Este necesară achiesarea României la valorile europene, în spiritul construirii unor comunități durabile, digitale și verzi, care să crească calitatea vieții beneficiarilor. Din această perspectivă prezintă semnificație analizarea situației din România, conferind o imagine de ansamblu a viitorului administrației publice, dar și a societății per ansamblu, în ceea ce privește rolul talentelor digitale și a unei populații educate digital în demersurile de transformare a societății în raport cu ultimele tehnologii. În detrimentul studiilor și cercetărilor constante în materie, tranziția către o administrație inteligentă reprezintă un subiect în expansiune, motiv pentru care studiile nu au fost epuizate, necesitând o constantă actualizare.

Cuvinte cheie: *competitivitate digitală; digitalizarea administrației publice; educație și formare digitală; evoluție tehnologică și socială; tendințe noi ale managementului public.*

1. Introducere

Reformarea administrației publice în ideea tranziției către o societate sustenabilă reprezintă un subiect de actualitate și de interes, fiind un domeniu cu care se confruntă toți cetățenii unui stat.

Într-o eră a schimbărilor şi a evoluţiei constante a tehnologiilor, administraţiile publice nu pot rămâne indiferente tendinţelor, fiind influenţate în mod direct. Din această perspectivă, acestea trebuie să fie receptive şi să aibă capacitatea de a inova pentru a face faţă provocărilor cu care se confruntă [1], mai ales în ceea ce priveşte resursele umane şi profesionalizarea managementului lor. Resursele umane reprezintă un element esenţial al funcţionării sistemului administrativ, direct afectat de digitalizare, iar de acestea depind buna funcţionare, performanţa şi încrederea conferită de către cetăţeni administraţiei în ansamblu. De asemenea, eforturile administraţiilor publice de a evolua în spiritul noilor tehnologii trebuie să fie susţinute de o resursă umană internă şi externă (beneficiarii) bine pregătită, care să poată valorifica întregul potenţial al digitalizării sistemului administrativ. [2]

În sens general, prin administraţie publică inteligentă se înţelege utilizarea tehnologiilor moderne pentru sporirea calităţii, eficienţei şi eficacităţii, însă chiar dacă aspectul tehnologic este cel mai adesea abordat în literatura de specialitate (digitalizarea serviciilor, oraşe inteligente, conceptul de e-guvernare), nu poate fi neglijat rolul resursele umane, atât din perspectiva capitalului uman al sistemului administrativ, cât şi din perspectiva cetăţenilor care formează comunitatea deservită, beneficiarii. Confluenţa celor două dimensiuni prezintă o deosebită importanţă pentru teoreticieni şi practicieni deoarece favorizează consolidarea sistemului administrativ şi creează premisele necesare dezvoltării unei societăţi sustenabile, calitativă şi verde. [3]

Educarea, formarea şi dezvoltarea resurselor umane este esenţială pentru viitoare societăţi durabile. Atragerea şi formarea talentelor digitale în administraţia publică este fundamentală pentru a face faţă provocărilor generate de digitalizare şi utilizarea inteligenţei artificiale, fiind un element cheie al dezvoltării sociale, economice şi a creşterii competitivităţii [4], iar odată cu acestea trebuie adaptat şi managementul resursei umane.

Astfel, literatura de specialitate lansează provocări pentru comunitatea ştiinţifică, mai precis identificarea rolului capitalului uman în conturarea unei administraţii inteligente şi exploatarea corelaţiei dintre educaţia digitală şi profesionalizarea managementului resurselor umane în transformarea societăţii.

Chiar dacă este un subiect actual, din ce în ce mai mult regăsit în strategiile şi măsurile prevăzute la nivel european, subiectul talentelor digitale în administraţia publică şi legătura acestora cu tranziţia verde pentru dezvoltarea unei societăţi sustenabile nu sunt foarte des analizate în literatura de specialitate, dat fiind faptul că reprezintă un concept relativ recent.

Obiective precum „educaţia de calitate", „oraşe şi comunităţi durabile", „pace, justiţie şi instituţii eficiente" se regăsesc printre cele 17 obiective de dezvoltare durabilă prevăzute de Agenda 2030 [5] şi trasează direcţii pe care administraţiile publice ar trebui să le aibă în vedere demersurile de evoluţie întreprinse astfel încât să răspundă nevoilor şi aşteptărilor curente ale cetăţenilor şi să conducă la o creştere a calităţii vieţii.

Digitalizarea şi utilizarea inteligenţei artificiale se răsfrânge asupra tuturor persoanelor implicate în proces, motiv pentru care este necesară determinarea

noilor tendinţe în materie de management al resursei umane şi identificarea rolului resurselor umane în reziliența comunităţilor.

Având în vedere orientarea pieţei muncii către digitalizare, termenul de talent digital va constitui punctul central al viitoarei forţe de muncă, însă dezvoltarea neuniformă a competenţelor digitale a condus la un decalaj la nivel mondial al talentelor digitale care trebuie combătut prin educare şi formare, astfel încât să fie identificaţi, formaţi şi susţinuţi oamenii talentaţi digital dintr-o ţară. Din acest considerent, acţiunile ar trebui întreprinse într-o strânsă colaborare între organizaţiile administraţiei publice, instituţiile de învăţământ şi mediul de business. [6]

Pentru a face faţă efectelor transformării digitale şi pentru a conduce la o maturitate digitală guvernamentală, *Cadrul OCDE pentru talent şi competenţe digitale în sectorul public* [7] subliniază importanţa de a genera medii de lucru potrivite şi de a dezvolta competenţele aferente. Acest subiect este abordat şi în alte documente generate la nivelul Uniunii Europene, precum *Noua Strategie a Comisiei Europene în materie de resurse umane şi înverzire* [8] document care poate reprezenta o sursă relevantă de inspiraţie şi bună practică la nivelul ţărilor europene, dar şi în documente naţionale precum *Planul Naţional de Redresare şi Reziliență* (PNRR) [9][10].

Regăsirea acestui subiect în numeroase documente naţionale şi internaţionale de strategie şi dezvoltare atrage atenţia asupra actualităţii subiectului şi a măsurilor ce trebuie întreprinse astfel încât să fie favorizată sustenabilitatea comunităţilor prin prisma talentelor digitale.

2. Tranziţia către administraţii inteligente şi rolul capitalului uman în cadrul acestora

Administraţia publică reprezintă un ansamblu format din organe administrative, specific societăţii moderne şi responsabil de dezvoltarea socio-economică şi politică a unei ţări [11]. În complexitatea sa, administraţia publică înglobează autorităţi, instituţii şi entităţi publice a căror obiectiv este îndeplinirea intereselor şi cerinţelor esenţiale ale membrilor societăţii, atât la nivel naţional, cât şi local. Acest ansamblu de organizaţii asigură continuitatea statului şi a colectivităţilor locale, fapt pentru care necesită o perfecţionare şi o adaptare constantă la realităţile sociale prezente. [12] De asemenea, administraţia publică poate fi privită din perspectiva unei entităţi care cuprinde toate resursele umane şi materiale, având scopul de a asigura executarea şi aplicarea legilor. Înzestrarea cu resurse materiale, umane şi informaţionale îi creează premisele necesare executării deciziilor puterii politice transpuse în lege. [13]

Dintr-o altă perspectivă, administraţia publică este privită drept o colectivitate umană a cărei activitate se desfăşoară în favoarea altor oameni, temei din care rezultă o deosebită importanţă elementul uman. Din acest considerent, eficacitatea administraţiei este direct influenţată de calitatea şi capacitatea tehnică a oamenilor care o compun, valoarea acestora reflectându-se în calitatea administraţiei care nu ar putea fi obţinută în lipsa unei formări adecvate şi a unei perfecţionări continue a întregii resurse umane care constituie sistemul administrativ. Dispunerea de mijloace materiale şi financiare de mare valoare nu poate compensa lipsa unor

funcţionari nepregătiţi profesional care nu şi-ar îndeplini sarcinile şi ar irosi resursele puse la dispoziţie. [14]

Rolul sectorului public şi a guvernelor este puternic influenţat de provocările generate de globalizare, mobilitatea crescută a oamenilor, tehnologie, schimbările societale, demografice şi climatice. Pentru a face faţă acestor schimbări sistemul administrativ trebuie să înglobeze autorităţi şi instituţii puternice, stabile, agile, flexibile şi deschise către schimbare, aflându-se mereu sub presiunea dezvoltării unor servicii publice centrate pe cetăţeni. [15]

Christopher Pollitt şi Geert Bouckaert au selectat cinci componente pe care le consideră fundamentale în raport cu ceea ce presupune reforma administrativă, acestea făcând referire la finanţe, personal, organizare şi măsurarea performanţei, transparenţă şi guvernare deschisă [16]. Preocuparea administraţiilor pentru reformarea managementului resurselor umane s-a manifestat preponderent de abia la finele secolului precedent, iar în rândul statelor membre ale Uniunii Europene direcţiile de acţiune au fost destul de diferite [17], însă în sens larg un mai bun management al resurselor umane presupune îmbunătăţirea climatului în care să îşi îndeplinească sarcinile, dezvoltarea unei atitudini proactive, pregătirea personalului şi buna colaborare, în vederea asigurării unei evoluţii constante şi permanente a sistemului administrativ [18].

O altă definiţie întâlnită în literatura română de specialitate este cea conform căreia „strategiile de reformă a administraţiei publice au drept scop identificarea măsurilor pentru asigurarea modernizării administraţiei publice în vederea optimizării procesului decizional, îmbunătăţirii managementului resurselor umane, al finanţelor publice, al calităţii serviciilor publice prin promovarea şi introducerea elementelor specifice managementului calităţii” [19].

Chiar dacă de cele mai multe ori regăsim în literatura de specialitate studii asupra administraţiei publice inteligente în raport cu aplicarea noilor tehnologii şi inovaţii care îi sporesc eficienţa, mai ales în raport cu oraşele inteligente, pentru a fi înţeleasă în complexitatea sa trebuie avute în vedere cinci dimensiuni pe care le înglobează: tehnologică, politică (dualismul dintre guvernare şi societate), juridică (în condiţiile legii şi în limitele acesteia), subiectivă şi structurală (văzută ca o reţea). Din perspectivă tehnologică, sistemele administrative apelează la soluţii moderne facilitate de noile tehnologii pentru a-şi îndeplini mai eficient şi eficace sarcinile, astfel încât să crească calitatea serviciilor oferite beneficiarilor. Dimensiunea subiectivă este formată din două elemente de bază, anume resursa umană din administraţia publică, privită drept element central, şi beneficiarii, indivizii care formează comunitatea deservită. [20]

3. Era talentelor digitale. Raportul dintre educaţia digitală şi profesionalizarea managementului resurselor umane în transformarea societăţii

Era digitală are un impact semnificativ asupra societăţii, producând schimbări majore în rândul instituţiilor şi organizaţiilor publice şi private. Cunoaşterea şi utilizarea tehnologiilor de informare şi comunicare (TIC) reprezintă o abilitate imperios necesară ce trebuie însuşită de întreaga populaţie, dată fiind utilizarea lor

pe scară largă în activităţile curente. Dezvoltarea sistemului administrativ în mod armonios nu ar putea fi realizată în lipsa consolidării componentei IT a acestuia şi instruirea tuturor părţilor implicate în proces, atât cetăţenii şi mediul de afaceri, cât şi angajaţii săi. [21]

Managementul resurselor umane, mai ales în sectorul public, va întâmpina provocări semnificative în viitor. Printre tendinţele identificate în doctrină putem remarca necesitatea de instruire a liderilor, formarea oamenilor în vederea creşterea angajabilităţii, reprofesionalizarea în vederea formării de profesionişti în domeniul resurse umane (HR). Astfel, investiţiile în resursa umană, precum formarea şi dezvoltarea lor permanentă, se prezumă că vor spori capacitatea de angajare şi vor răspunde nevoii de a dobândi mereu noi competenţe, raportate la realităţile curente. În ceea ce priveşte departamentele HR, acestea trebuie să fie formate din specialişti, astfel încât să reprezinte parteneri strategici ai managerilor în implementarea politicilor HR conforme tendinţelor actuale. [22]

Transformarea digitală modelează viitorul organizaţiilor din întreaga lume şi priveşte schimbările survenite datorită utilizării noilor tehnologii, având impact asupra modului de desfăşurare a activităţii în sectorul public şi privat, dar şi asupra aşteptărilor şi nevoilor clienţilor, partenerilor şi angajaţilor. În concordanţă cu schimbările constante ale erei digitale, structurile de HR au o poziţie esenţială în regândirea viitorului muncii, recrutarea şi păstrarea unei forţe de muncă care să dispună de cunoştinţe şi competenţe potrivite. Din acest considerent, există organizaţii care au creat o funcţie specifică sau au generat iniţiative de sprijin a transformării digitale. Păstrarea talentelor în organizaţie şi recrutarea unor noi talente este o preocupare curentă a angajatorilor, aceştia având obiectivul de a identifica şi angaja resursă umană care să dispună de abilităţile necesare pentru a face faţă următorului deceniu. [23]

Digitalizarea administraţiei publice prezintă o multitudine de oportunităţi ce ar trebui fructificate în demersurile strategice instituţionale şi promovate de către liderii acesteia, generând avantaje prin formarea unor instituţii ce au capacitatea de a livra beneficiarilor servicii şi produse inovative. Digitalizarea conferă un cadru optim de stabilire a unei relaţii directe şi dinamice între sistemul administrativ şi cetăţeni, dezvoltând administraţii care pot răspunde în concordanţă cu aşteptările reale ale acestora, sporindu-le astfel încrederea. Transformarea digitală presupune servicii digitale descentralizate şi integrate care încurajează această interacţiune să fie una eficientă. În detrimentul preconcepţiei că procesul de digitalizare ar conduce la înlocuirea în totalitate a serviciilor publice clasice cu servicii fără interacţiune sau cu forme de servicii personalizate operate electronic, acest proces nu minimizează rolul resursei umane, ci are în vedere dezvoltarea de noi aptitudini, competenţe şi abilităţi necesare pentru a oferi răspunsuri adaptate noii paradigme digitale. Procesul de schimbare şi transformare nu ar putea avea loc în lipsa unui amplu proces de dezvoltare a competenţelor şi a abilităţilor digitale în sectorul public, dar şi de educare a populaţiei. Tocmai din acest considerent Comisia Europeană întreprinde demersuri de sporire a numărului de cetăţeni cu acces la medii digitale,

de creştere a numărului de persoane cu abilităţi digitale şi de a valorifica potenţialul strategic al instituţiilor în vederea transformării digitale. [24]

Cu toate acestea, statele membre Uniunii Europene se confruntă cu provocări precum atragerea talentelor digitale, numărul redus de campioni digitali, lipsa pregătirii pentru securitatea cibernetică, încrederea alocată transformării digitale, lipsa investiţiilor. Managementul resurselor umane trebuie să se adapteze astfel încât să se concentreze pe leadership pentru a stimula talentul şi pentru a genera o cultură a inovaţiei. Un deficit de competenţe va influenţa atât organizaţiile publice, cât şi private, şi va perturba economia globală. [25]

Pentru a face faţă efectelor transformării digitale şi pentru a conduce la o maturitate digitală guvernamentală, *Cadrul OCDE pentru talent şi competenţe digitale în sectorul public* înglobează idei referitoare la necesitatea digitalizării în societatea curentă şi la abilităţile specifice pe care le impune digitalizarea, subliniază care este mediul potrivit pentru a încuraja transformarea digitală şi trasează calea către o forţă de muncă digitală care să atragă, dezvolte şi menţină talentele. Pentru a fructifica transformarea digitală nu trebuie aşteptat să se resimtă impactul acesteia asupra resursei umane şi de abia ulterior să fie luate măsurile potrivite, ci trebuie avută în vedere o abordare proactivă a investiţiilor în competenţe, formare şi educaţie. [26]

Toate aceste transformări trebuie să fie întreprinse în concordanţă cu respectarea unor principii, valori şi norme comune, eliminând riscul de a aduce atingere drepturilor omului. Guvernele trebuie să ofere servicii accesibile tuturor, fără discriminare. Astfel, formarea şi încurajarea formării profesionale în raport cu noile tehnologii are scopul de a creşte accesibilitatea şi de a crea noi perspective pe piaţa muncii, fără a le aduce prejudicii. [27]

4. Transformarea societăţii româneşti în era talentelor digitale

Aşa cum se poate observa în Figura 1, un studiu din anul 2021 [28] plasează România la finele clasamentului european în ceea ce priveşte competenţele digitale pentru intervalul de vârstă 16-74 ani, situaţie deloc favorabilă, având un procentaj de 28%, faţă de 54% media Uniunii Europene. Indicatorii competenţelor digitale fac parte dintre indicatorii cheie de performanţă în contextul deceniului digital al Europei şi al „busolei pentru dimensiunea digitală" a UE în care se prevede ca până în 2030 să existe peste 20 de milioane de specialişti TIC (convergenţă de gen), minimum 80% din populaţie să deţină competenţe digitale de bază şi o digitalizare a serviciilor publice (100% online serviciile publice cheie, 100% dintre cetăţeni să aibă acces la dosarele medicale şi 80% dintre cetăţeni să deţină şi utilizeze identitatea digitală). [29]

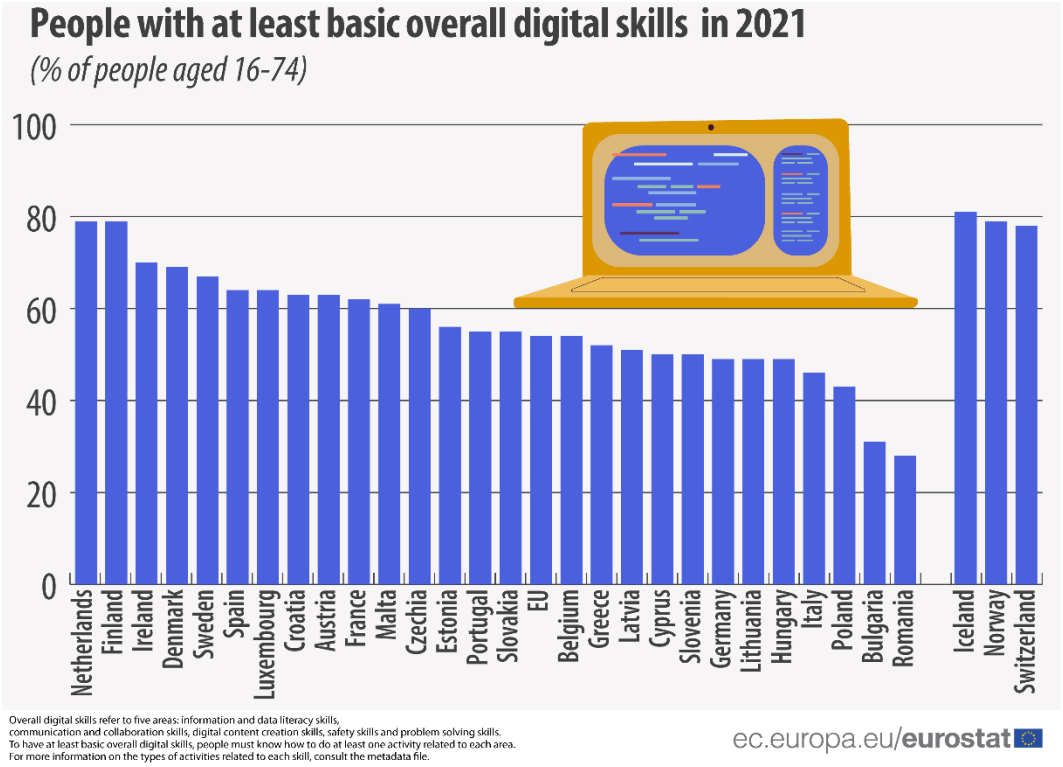

Fig. 1. Ponderea adulților care au cel puțin abilități digitale de bază, în funcție de țară, 2021
Sursă: Eurostat, 2021 [30]

Tot din perspectivă europeană, România se află la capătul clasamentului aferent datelor din anul 2021 (așa cum se poate observa în Figura 2) și în ceea ce privește *Indicele economiei și societății digitale (DESI)*. Rapoartele DESI se bazează pe indicatorii privind performanța digitală a Europei și au în vedere progresele pe care le înregistrează statele membre ale UE în domeniul digital, incluzând profiluri de țară care le sprijină pe acestea în a identifica domeniile în care este necesară o acțiune prioritară. [31]

Cu un punctaj de 30,6, față de punctajul Uniunii Europene de 52,3, situația din România indică necesitatea îmbunătățirii capitalului uman, având un nivel scăzut de competențe digitale de bază. „România își mențione poziţiile fruntașe în ceea ce privește proporția femeilor specialiste în domeniul TIC din forța de muncă (locul 2) și în ceea ce privește numărul absolvenților în domeniul TIC, iar pentru conectivitate obține cel mai bun punctaj". Cu toate acestea, România nu excelează în integrarea tehnologiilor digitale și a serviciilor publice digitale. Având în vedere aceste aspecte, în spațiul românesc este imperios necesară o schimbare majoră a ritmului de pregătire referitor la competențele digitale. [33]

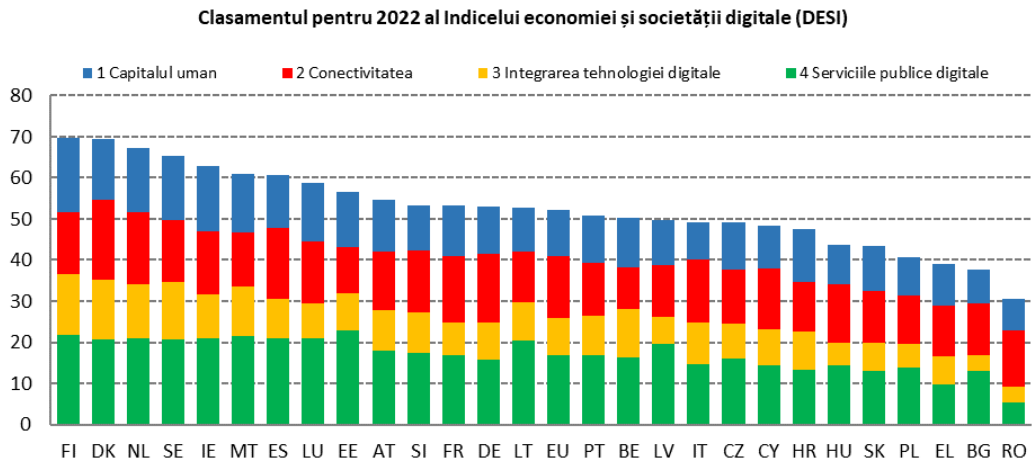

Fig. 2. Clasamentul pentru 2022 al Indicelui economiei și societății digitale (DESI)
Sursă: Comisia Europeană, 2022 [32]

Având în vedere ambele clasamente, prin raportare la țările aflate în topul acestora, pot fi identificate bune practici care ar putea fi preluate și adaptate contextului național astfel încât să permită o evoluție a societății digitale românești.

Perspectivele de viitor ale administrației românești se conturează în acest domeniu în jurul măsurilor prevăzute în PNRR, mai ales în ceea ce privește componentele referitoare la educație, buna guvernanță și transformare digitală. Evoluția sistemului educațional are în vedere corelarea cu nevoile prezente și viitoare ale pieței forței de muncă, asigurând un proces educațional calitativ, modern și incluziv. Îmbunătățirea guvernanței își propune să conducă la furnizarea de servicii publice de calitate, de către un corp de funcționari publici profesioniști și bine pregătiți, care au capacitatea de a răspunde adecvat provocărilor, nevoilor și așteptărilor cetățenilor, consolidând astfel reziliența și capacitatea de adaptare la tranziția verde și digitală. Prin prisma acestor deziderate se impune și un management performant al resurselor umane în sectorul public, care să prevadă profesionalizarea prin dezvoltarea competențelor digitale, de leadership și de talent management/recrutare. O provocare curentă a administrației publice din România este atragerea talentelor către funcția publică, mai ales pentru posturile de debutant. Transformarea digitală a sistemului administrativ necesită o infrastructură digitală coerentă și integrată, care să ofere servicii digitale de înaltă calitate tuturor beneficiarilor. Creșterea implementării soluțiilor digitale în România va contribui la creșterea gradului de transparentizare a activității sectorului public, reducerea birocrației, realizarea obiectivelor de dezvoltare durabilă și, concomitent, la creșterea numărului de cetățeni și companii care vor putea beneficia și fructifica oportunitățile oferite de digitalizare. [34] Aceste componente prevăzute în PNRR se află într-un raport de interdependență și necesită o abordare integrată astfel încât să poată fi întreprinsă o schimbare sustenabilă a societății românești.

5. Concluzii şi consideraţii finale

Având în vedere necesitatea unor administraţii publice inteligente sustenabile prin raportare la tendinţele generate de talentele digitale, rolul educaţiei, formării şi dezvoltării capitalului uman este unul primordiat în transformarea societăţii. Stabilirea obiectivelor în procesul de evoluţie trebuie să aibă loc în concordanţă cu o înţelegere deplină a conceptului de „smart administration", în complexitatea sa.

Adaptarea organizaţională la noile inovaţii este esenţială pentru reziliența acesteia, mai ales în raport cu aşteptările şi nevoile resursei umane. În acest sens, mediile de lucru trebuie să fie din ce în ce mai atractive. Noile tendinţele în materie de resurse umane se focusează pe creşterea autonomiei, stimularea creativităţii şi includerea talentelor digitale. [35] Aceste schimbări presupun, concomitent, şi necesitatea unui „leadership inteligent" care să înţeleagă noile realităţi şi să acţioneze în raport cu acestea [36].

Raportul dintre educaţia digitală şi profesionalizarea managementului resurselor umane în transformarea societăţii trebuie analizat luând în considerare rolul resursei umane în reziliența comunităţilor şi impactul utilizării inteligenţei artificiale şi a includerii noilor tehnologii de informare şi comunicare asupra persoanelor implicate în proces. Tranziţia către o administraţie inteligentă nu ar putea fi întreprinsă în lipsa talentelor digitale.

De asemenea, cu cât se va investi mai mult în educarea, formarea şi dezvoltarea capitalului uman, cu atât va creşte sustenabilitatea unei administraţii. Transformarea societăţii nu s-ar putea realiza independent de creşterea gradului de educaţie digitală, având impact direct asupra pieţei muncii şi asupra profesionalizării managementului resurselor umane în transformarea societăţii.

Astfel, cu cât mai mult vor fi exploatate talentele digitale, cu atât mai mult va creşte sustenabilitatea administraţiilor inteligente.

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Transforming Romanian society in the age of digital talent. The role of human resources.

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Abstract

Smart administrations are not only about digitization and the move towards smart cities and e-government systems, which is why the objective of this paper is to highlight the role of a human resource to face the challenges of new technologies, especially the role of digital talent in supporting the transformation of public administration, as well as the role of citizens as direct beneficiaries of the services offered by public administrations. Their importance in the public sector cannot be analysed without also highlighting the implications for the professionalisation of human resource management. The use of artificial intelligence and new technologies has a direct impact on all those involved in the process, and their successful implementation depends on the ability of the staff and citizens served to exploit their full potential and keep pace with developments. It is necessary for Romania to adhere to European values, in the spirit of building sustainable, digital and green communities that increase the quality of life of the beneficiaries. From this perspective, it is significant to analyse the situation in Romania, giving an overview of the future of public administration, but also of society as a whole, in terms of the role of digital talent and a digitally educated population in the transformation of society in relation to the latest technologies. To the detriment of ongoing studies and research on the subject, the transition to smart government is an expanding topic, which is why studies have not been exhausted and require constant updating.

Keywords: *digital competitiveness; digitalisation of public administration; digital education and training; technological and social evolution; new trends in public management.*

1. Introduction

The reform of public administration with a view to the transition to a sustainable society is a topical and interesting subject, as it is an area that faces all citizens of a state.

In an era of constant change and evolution of technologies, public administrations cannot show indifference towards trends and be directly influenced by them. From this perspective, they must be responsive and have the capacity to innovate with the purpose of meeting the challenges they face [1], especially in terms of human resources and the professionalisation of their management. Human resources are an essential element of the functioning of the administrative system, directly affected by digitisation, smooth functioning, performance and trust of citizens in the administration as a whole being highly reliant on them. Also, the efforts of public administrations to evolve in the spirit of new technologies need to be supported by a well-trained internal and external human resource (beneficiaries) that can harness the full potential of the digitisation of the administrative system. [2]

In a general perspective, smart public administration means the use of modern technologies to increase quality, efficiency and effectiveness, but even if the technological aspect is most often addressed in the literature (digitization of services, smart cities, e-government concept), the role of human resources cannot be neglected, both from the perspective of the human capital of the administrative system and from the perspective of the citizens who form the community served, the beneficiaries. The convergence of these two dimensions is of particular importance for theorists and practitioners because it fosters the strengthening of the administrative system and creates the prerequisites for the development of a sustainable, qualitative and green society. [3]

Education, training and development of human resources is essential for future sustainable societies. Attracting and training digital talent in public administration is fundamental to meeting the challenges of digitisation and the use of artificial intelligence, and is a key element of social and economic development and increased competitiveness [4], and with them human resource management must be adapted.

Thus, the literature poses challenges for the scientific community, namely identifying the role of human capital in shaping smart government and exploiting the correlation between digital literacy and the professionalization of human resource management in the transformation of society.

Even if it is a topical subject, increasingly found in the strategies and measures envisaged at European level, the subject of digital talent in public administration and its link to the green transition for the development of a sustainable society is not very often analysed in the literature, as it is a relatively recent concept.

Goals such as "quality education", "sustainable cities and communities", "peace, justice and effective institutions" are among the 17 Sustainable Development Goals of the 2030 Agenda [5] and outlines directions that public administrations should consider taking in order to meet the current needs and expectations of citizens and lead to an increased quality of life.

Digitisation and the use of artificial intelligence impact everyone involved in the process, which is why it is necessary to determine new trends in human resource management and identify the role of human resources in community resilience.

With the labour market moving towards digitisation, the term digital talent will be the focus of the future workforce, but the uneven development of digital skills has led to a global digital talent gap that needs to be addressed through education and training so that digitally talented people in a country are identified, trained and supported. For this reason, action should be taken in close cooperation between public administration organisations, educational institutions and business. [6]

To cope with the effects of digital transformation and drive government digital maturity, the *OECD Framework for Digital Talent and Skills in the Public Sector* [7] emphasises the importance of creating suitable working environments and developing the related skills. This topic is also addressed in other documents generated at EU level, such as the *European Commission's New Human Resources and Greening Strategy* [8], a document that can be a relevant source of inspiration and good practice in European countries, but also in national documents such as the *National Recovery and Resilience Plan* (PNRR) [9][10].

The inclusion of this topic in numerous national and international strategy and development documents draws attention to the topicality of the subject and the measures to be taken in order to foster the sustainability of communities through digital talent.

2. The transition to smart government and the role of human capital

Public administration is a set of administrative bodies, specific to modern society and responsible for the socio-economic and political development of a country [11]. In its complexity, public administration encompasses public authorities, institutions and entities whose objective is to meet the essential interests and requirements of members of society at both national and local level. This set of organisations ensures the continuity of the state and local communities, which is why it requires constant improvement and adaptation to current social realities. [12] Public administration can also be seen as an entity comprising all human and material resources, with the purpose of ensuring the execution and enforcement of laws. Its endowment with material, human and informational resources creates the necessary prerequisites for the execution of the decisions of the political authorities as translated into law. [13]

From another perspective, public administration is seen as a human collectivity whose activity is carried out for the benefit of other people, a theme from which the human element is particularly important. The effectiveness of the administration is therefore directly influenced by the quality and technical capacity of the people who make it up, the value of which is reflected in the quality of the administration, which could not be achieved without adequate training and continuous improvement of the entire human resource that makes up the administrative system. The availability of valuable material and financial resources cannot compensate for the lack of professionally unprepared officials who would not perform their duties and would waste the resources made available. [14]

The role of the public sector and governments is strongly influenced by the challenges of globalisation, increased mobility of people, technology, societal,

demographic and climate change. To cope with these changes, the administrative system needs to encompass authorities and institutions that are strong, stable, agile, flexible and open to change, and is under constant pressure to develop citizen-centred public services. [15]

Christopher Pollitt and Geert Bouckaert have selected five components that they see as fundamental to what administrative reform entails, relating to finance, personnel, organisation and performance measurement, transparency and open government [16]. The preoccupation of administrations with the reform of human resource management has only become predominant at the end of the previous century, and among the Member States of the European Union the directions of action have been quite different [17], but in a broader sense, better management of human resources means improving the climate in which they carry out their tasks, developing a proactive attitude, training staff and ensuring good collaboration in order to ensure constant and permanent development of the administrative system [18].

Another definition found in the Romanian literature is that "public administration reform strategies aim to identify measures to ensure the modernization of public administration in order to optimize the decision-making process, improve the management of human resources, public finances and the quality of public services by promoting and introducing specific elements of quality management". [19].

Even though academic studies show that the relation between smart public administration and the application of new technologies and innovation, with regards to smart cities, bolster its efficiency, in order for it to be understood in its complexity we must consider the five dimensions that it encompasses: technological, political (the dualism between government and society), legal (within the law and its limits), subjective and structural (seen as a network). From a technological perspective, administrative systems are using modern solutions facilitated by new technologies to perform their tasks more efficiently and effectively so as to increase the quality of services provided to beneficiaries. The subjective dimension is made up of two basic elements, namely the human resource in public administration, seen as the central element, and the beneficiaries, the individuals who make up the community served. [20]

3. The age of digital talent. The relationship between digital education and the professionalization of human resource management in the transformation of society

The digital age is having a significant impact on society, bringing major changes to public and private institutions and organisations. Knowledge and use of information and communication technologies (ICTs) is a much-needed skill to be acquired by the whole population, given their widespread use in everyday activities. A harmonious development of the administrative system could not be achieved without strengthening its IT component and training all parties involved in the process, both citizens and the business environment and its employees. [21]

Human resource management, especially in the public sector, will face significant challenges in the future. Among the trends identified in the doctrine we

can note the need to train leaders, train people in order to increase employability, reprofessionalisation in order to train human resource (HR) professionals. Thus, investments in human resources, such as their training and continuous development, are expected to increase employability and respond to the need to constantly acquire new skills in relation to current realities. As for HR departments, they need to be made up of specialists so that they are strategic partners of managers in implementing HR policies in line with current trends. [22]

Digital transformation is shaping the future of organisations around the world and looks at the changes brought about by the use of new technologies, impacting the way business is done in the public and private sector, as well as the expectations and needs of customers, partners and employees. In line with the constant changes of the digital age, HR structures have a key position in rethinking the future of work, recruiting and retaining a workforce with the right knowledge and skills. For this reason, some organisations have created a specific function or generated initiatives to support digital transformation. Retaining talent in the organisation and recruiting new talent is a common concern for employers, as they aim to identify and hire the human resource with the skills needed to face the next decade. [23]

The digitisation of public administration presents a multitude of opportunities that should be exploited in institutional strategic approaches and promoted by its leaders, generating advantages by forming institutions that have the capacity to deliver innovative services and products to beneficiaries. Digitisation provides an optimal framework for establishing a direct and dynamic relationship between the administrative system and citizens, developing administrations that can respond in line with their real expectations, thus increasing their trust. Digital transformation requires decentralised and integrated digital services that encourage this interaction to be effective. Contrary to the preconception that the digitisation process would lead to the total replacement of traditional public services by non-interactive services or electronically operated forms of personalised services, this process does not minimise the role of human resources but aims to develop new skills, competences and abilities needed to provide responses adapted to the new digital paradigm. The process of change and transformation could not take place without a broad process of developing digital competences and skills in the public sector and educating the population. This is precisely why the European Commission is taking steps to increase the number of citizens with access to digital environments, to increase the number of people with digital skills and to harness the strategic potential of institutions for digital transformation. [24]

However, EU Member States face challenges such as attracting digital talent, low number of digital prodigies, lack of cybersecurity readiness, trust in digital transformation and the lack of investment. Human resource management needs to adapt to focus on leadership to foster talent and generate a culture of innovation. A skills shortage will impact both public and private organisations and disrupt the global economy. [25]

To address the effects of digital transformation and drive government digital maturity, the *OECD Framework for Digital Talent and Skills in the Public Sector* incorporates ideas on the need for digitisation in today's society and the specific

skills that digitisation requires, outlines the right environment to foster digital transformation, and charts the path to a digital workforce that attracts, develops and retains talent. To make a success of digital transformation, one should not wait for its impact on human resources to be felt and only then take appropriate action, but consider a proactive approach to investing in skills, training and education. [26]

All these transformations must be undertaken in line with respect for common principles, values and rules, eliminating the risk of infringing human rights. Governments must provide services accessible to all without discrimination. Thus, training and encouraging vocational training in relation to new technologies aims to increase accessibility and create new prospects in the labour market, without harming them. [27]

4. Transforming Romanian society in the age of digital talent

As can be seen in Figure 1, a study in 2021 [28] places Romania at the bottom of the European rankings in terms of digital skills for the 16-74 age group, which is not at all favourable, with a percentage of 28%, compared to the EU average of 54%. Digital skills indicators are part of the key performance indicators in the context of Europe's Digital Decade and the EU's "Digital Compass" which foresees more than 20 million ICT specialists by 2030 (gender convergence), at least 80% of the population having basic digital skills and a digitisation of public services (100% online key public services, 100% of citizens having access to health records and 80% of citizens having and using digital identity). [29]

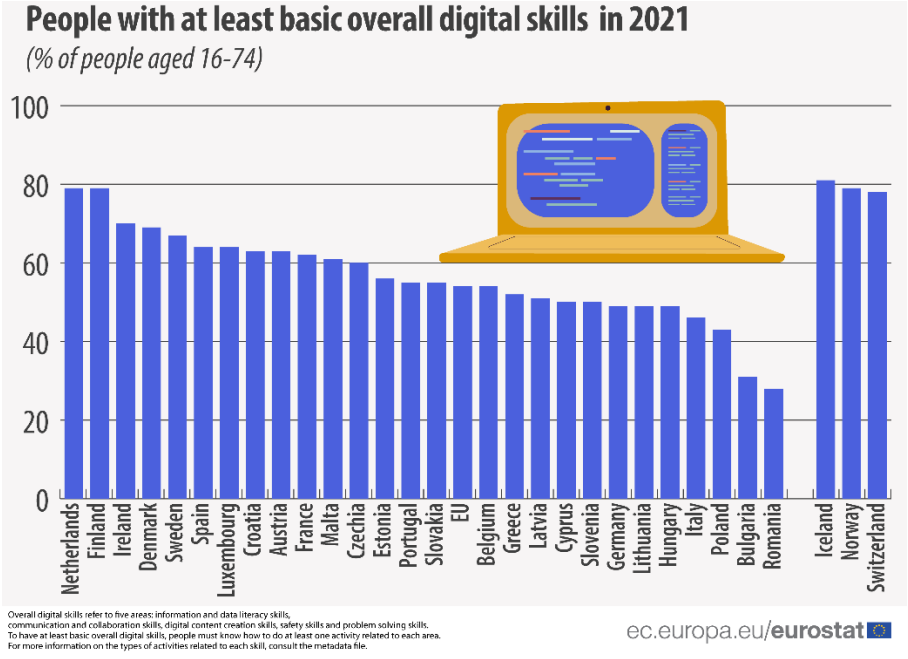

Fig. 1. People with at least basic overall digital skills, by country, 2021
Source: Eurostat, 2021 [30]

Also from a European perspective, Romania is at the bottom of the ranking for 2021 data (as can be seen in Figure 2) and in terms of the *Digital Economy and Society Index* (DESI). DESI reports are based on Europe's Digital Performance Indicators and look at the progress EU Member States are making in the digital domain, including country profiles to help them identify areas where priority action is needed. [31]

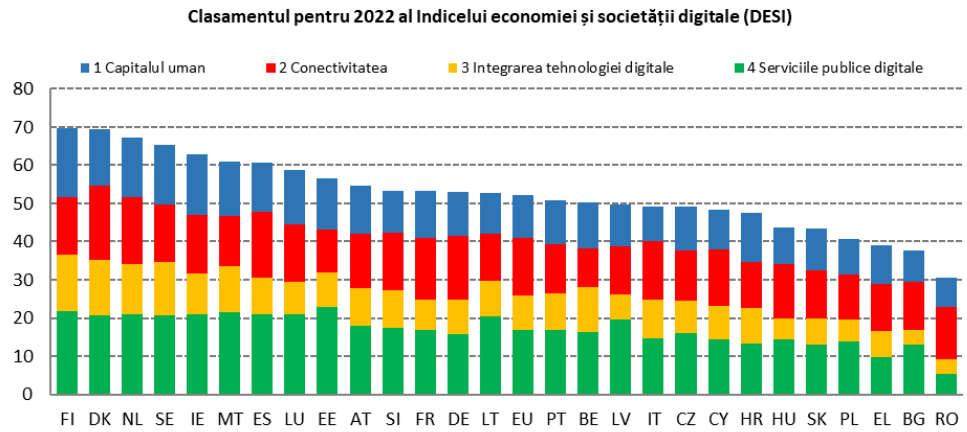

Fig. 2. Digital Economy and Society Index (DESI) rankings for 2022
Source: European Commission, 2022 [32]

With a score of 30.6, compared to the EU score of 52.3, the situation in Romania indicates the need to improve human capital, with a low level of basic digital skills. "Romania maintains its leading positions in terms of the proportion of female ICT specialists in the workforce (2nd place) and in terms of the number of ICT graduates, and it scores best for connectivity". However, Romania does not excel in the integration of digital technologies and digital public services. In view of this, a major change in the pace of digital skills training is urgently needed in Romania. [33]

Taking into account both rankings, by referring to the countries at the top, good practices can be identified that could be incorporated and adapted to the national context so as to allow an evolution of the Romanian digital society.

The future prospects of the Romanian administration in this area are shaped around the measures foreseen in the NPRR, especially in terms of the components related to education, good governance and digital transformation. The evolution of the education system is designed to correlate with the present and future needs of the labour market, ensuring a qualitative, modern and inclusive education process. Improved governance aims to lead to the delivery of quality public services by a professional and well-trained civil service that is able to respond adequately to the challenges, needs and expectations of citizens, thus strengthening resilience and adaptability to the green and digital transition. In the light of these challenges, there is also a need for effective human resource management in the public sector, including professionalisation through the development of digital, leadership and talent management/recruitment skills. A current challenge for public administration

in Romania is attracting talent to the civil service, especially for entry-level positions. The digital transformation of the administrative system requires a coherent and integrated digital infrastructure that delivers high-quality digital services to all beneficiaries. Increasing the implementation of digital solutions in Romania will contribute to increasing the transparency of public sector activity, reducing bureaucracy, achieving sustainable development goals and, at the same time, increasing the number of citizens and companies that will be able to benefit and take advantage of the opportunities offered by digitisation. [34] These components of the PNRR are interdependent and require an integrated approach so that a sustainable change in Romanian society can be undertaken.

5. Conclusions and final considerations

Given the need for sustainable smart public administrations in relation to digital talent trends, the role of education, training and human capital development is paramount in transforming society. The setting of targets in the evolution process must be consistent with a full understanding of the concept of smart administration in its complexity.

Organisational adaptation to new innovations is essential for organisational resilience, especially in relation to human resource expectations and needs. To this end, working environments need to be increasingly attractive. New HR trends focus on increasing autonomy, fostering creativity and including digital talent. [35] At the same time, these changes require "intelligent leadership" that understands and acts on the new realities. [36].

The relationship between digital education and the professionalization of human resource management in the transformation of society needs to be examined taking into account the role of human resources in the resilience of communities and the impact of the use of artificial intelligence and the inclusion of new information and communication technologies on the people involved in the process. The transition to smart government could not be undertaken without digital talent.

Also, the more that is invested in education, training and human capital development, the more sustainable an administration will become. The transformation of society could not be achieved independently of increasing digital literacy, with a direct impact on the labour market and on the professionalisation of human resource management in the transformation of society.

Thus, the more digital talent is harnessed, the more the sustainability of smart governments will increase.

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Knowledge dynamics for smart leaders and smart cities

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Abstract

The studies in the current literature bring to our attention important knowledge as the intangible resource that can dictate the development direction of some institutions or companies at a critical moment. Thus, the application of knowledge management in the decision-making process is increasingly important. But is the knowledge sufficient to face a complex environment, determined by infinite and changing characteristics in directions that are increasingly difficult to anticipate? In such a context, in addition to knowledge management, our specific way of thinking and the way we perceive and use knowledge is the prime reason for failure or success in negotiations, business, management, administration, or governance. The dynamism and speed of movement of things in the current era influence our every field of activity, in such a context the main factor that determines certain people, businesses, or management styles to be more successful than others is the way of thinking. Successful people think smart and use effective strategies to achieve their outcomes. In order to face the current challenges, leaders and managers must find out-of-the-box solutions, and make connections and causal maps that will not only help them overcome the current situation but offer them a sustainable recovery and management of the company's resources and human capital. Such a system involves not only strategic thinking and dynamic thinking. Current studies show that Dynamic Thinking skills enable you to trace your issue or challenge as a trajectory of performance over time. The trajectory should have a historical segment, a current state, and one or more future paths. Dynamic Thinking thus puts a current situation in the context of where you came from and where you are going. Thus, in the present context, dynamic thinking is the main element and the main characteristic of the development and application of a sustainable system of strategic thinking The present article's purpose is to highlight how dynamic thinking applied at the managerial level causes leaders to turn to innovative ideas for solving problems and building a smart management system.

Keywords: *thinking patterns; smart leadership; innovation; knowledge management; strategic thinking.*

1. Introduction

The present society is based on a complex ecosystem that involves challenges at social, economic, political, environmental, and cultural levels, etc. All these dynamic challenges in these areas that we depend on personally and professionally generate significant changes in managerial and leadership processes. Leaders and managers who aim for the proper functioning of public and private systems face the dynamism of the current environment that constantly tests their resilience. But the human mind through the way it is conceived and developed at the level of thought can make a fantastic switch between challenges and opportunities. Adapting to the changing environment time and again, leaders have proven an exceptional power of transformation and innovation, but knowledge and thought processes are at the base of all this.

This article starts from the current studies in the field of knowledge management, strategic thinking, and leadership and projects the defining characteristics of the leader and leadership mechanisms dedicated to the construction and sustainability of the Smart City. The development of this article is based on an essential curiosity for future development, namely, what are the characteristics that define the leader of the future? Knowing the way that the meaning, definition, and practice of leadership change over time, and having in mind the continuously changing global environment, this article tries to delimitate the influence of knowledge, and time in the development of future leaders' skills. Leaders who can manage change and make it sustainable in accordance with all environmental characteristics. A leader who lives up to expectations, has innate leadership characteristics, but educates the way of thinking and exercises a way of leadership beneficial to the spread and development of knowledge, innovation, and smart solutions. In this research, we took into account two essential characteristics of any kind of development, time and knowledge. According to the initial premise, these two variables influence in different ways any future change.

Current studies show that using strategic thinking skills enables you to trace your issue or challenge as a trajectory of performance over time. Any development trajectory should have a historical segment, a current state, and one or more future paths. Thus, in this paper we will highlight how Dynamic Thinking can design the Smart City and how it contributes to its sustainability, starting from the characteristics of time. We will highlight how the dynamics of knowledge and strategic thinking pave the way to the smart city, but also how the projection overtime on the three directions past, present, and future creates strategies for delimiting opportunities and challenges and vice versa.

We start from the idea that Smart Cities bring to the fore the concerns of ensuring an adaptable, inclusive, productive, sustainable, and resilient future for humanity. But in an environment described in this way, the mechanisms of leadership and governance play different roles than those in the present reality.

Smart City governance mechanisms have a key role in leading and directing development projects and actively contributing through development funds. Exploring the different ways in which digital technology can be integrated, and knowledge with traditional activities raises substantial challenges. In this sense, the emergence of intelligent leadership is necessary. This way of leadership must consider ensuring a balance between innovation and sustainability, in this sense strategic thinking and foresight are important to help manage complexity. Therefore, Smart Cities will not succeed without intelligent leadership development. The present article aims to draw some directions on which this type of leadership must develop, but also some characteristics on which it must be based.

2. Literature review

Smart City does not have an exact, clear, and universally valid definition that bases the development of the whole concept, but Smart City must certainly generate a climate of prosperous and balanced existence with the environment. But the success of a smart city does not only involve the development of smart, eco-friendly technologies, nor the simple increase in economic prosperity or confident and progressive development plans. The success of a Smart City is based on people, ideas, knowledge and knowledge dynamics, and good management.

If we support the idea that the main purpose of a Smart City is to optimize city functions and promote economic growth while improving the quality of life, we must recognize that without cultivating a knowledge system and a thinking model which is in balance with all these ideas, not only at the leadership level but also at the universally valid individual level, building a sustainable Smart City is doomed to failure. In this vein of ideas, this article brings to the attention of the public the importance of the dynamics of knowledge and the development of systems of thought necessary for the evolution and prosperity of the Smart City.

For the sustainable, concrete, and correct development of the necessary mechanisms for Smart Cities, the first phase must develop the thinking of individuals in a direction that develops Smart Leaders. People are the basis of all innovations, development, and evolution of the environment in which they live, and thinking and knowledge are the main tools and mechanisms that lead to the construction of Smart Cities.

Causally and deterministically we must understand that without "Smart Thinking" there can be no "Smart Leaders" and even fewer "Smart Cities." However, biologically as well as psychologically, the human mind is limited, our capacities to know, learn, develop and create are limited. A single person cannot be the basis of the entire human development, which highlights the need for knowledge transfer, moreover, this cruel reality of human limitation put in confrontation with the infinity of existing changes brings to the attention of researchers the need to base the system of taking decisions on patterns of thinking and thinking models.

These patterns of thinking are important constituents of intellectual organizational capital [1]. Studies in this direction have also shown how the development of thinking patterns at the individual level contributes to the

generation and creation of organizational knowledge [2]. In this way, we humanize the organizational organism, and we consider that human limitations are transposed to the level of organisms, like individuals, the evolutionary course of organizational organisms is determined by the way of thinking, the knowledge held, and the decision-making processes. Moreover, the metaphor is also supported by the presence of tacit and explicit knowledge, i.e. those bits of knowledge that the organization knows it possesses and the pieces of knowledge that it possesses but is not aware of their presence. As Albrecht notes "*we often describe human beings as doing their thinking with both conscious mind and unconscious mind. An organization also has both a conscious mind and an unconscious mind* [3]." Thus, the ecosystem built at the organization level of leader, manager, and employees are created from their knowledge and the transfer of knowledge is an essential characteristic for creating the leaders of the future and the organizations of the future.

Thought patterns are not simple interferences of our mind with the environment, these patterns are the result of more complex processes of interdependence and influence of our mind and life. Practically, these models are influenced by numerous factors from the external environment, such as culture, religion, customs, politics, etc. which sculpt thought and perception processes in our minds that help us both to understand the world and the universe in which we live but also to make decisions to act in one way or another. These processes are rooted in our minds from the early stages of our development as they have continuously developed under the action of educational factors from family, school, community, church, and personal effort, but they are not immutable norms or rules in the future, they can be processed, educated and developed towards one form of thinking or another. It is important to remember this emphasis, that mental models have the role not only of helping us in understanding the universe in which we live but also in making decisions and acting in the sense of their implementation [4].

Having said that, the leader's thinking model can represent an institutional body at a given moment the decisive point regarding its failure or success. Thus we emphasize the fact that thinking patterns are composed of functional structures, a knowledge basis, a set of inferences, rules, and a set of fundamental reference values, [3] three elements are the basis of the formation of our thinking processes, either that we are talking about inertial thinking, dynamic thinking or entropic thinking.

Moreover, it is necessary to emphasize an essential element. At the base of all our actions, whether we are discussing the changes and challenges we face in the social economic environment, or whether we are discussing developments at an individual or professional level, there are two infinite constants, undefined and variable, but on which our entire evolutionary process is based, knowledge and time. All changes occur over time, whether we are talking about beneficial changes or not, and our way of responding, acting, and deciding, has its response over time. But our actions, decisions, and adopted strategies are based on the knowledge we have in the memory of our decision. This constant dynamic between time and knowledge is constantly changing and is essential to human evolution itself, both in

the private and public spheres. Not infrequently, timely knowledge has proven critical to the success or failure of a development or turnaround plan.

Placing the focus on the analysis of the two elements as resources, we highlight the fact that, even if time is infinite in its passage and pursuit when it is perceived as a resource, time becomes a finite resource in that any activity, process, or objective to be achieved must be perceived being achievable in a certain period of time so that it can be calculated in profit and loss and can be expressed in currency. In this line of ideas, any exceeding of the time allotted for the achievement of an objective is the equivalent of a consumed resource and can be perceived as a loss. When we think about knowledge in terms of resources, we highlight the fact that organizations increasingly recognize the role of knowledge as a strategic resource and its importance in achieving a competitive advantage and sustainable development [5]. However, people as well as organizations, at the individual level, are limited and finite in their knowledge and mental capacities, however, thought at a collective level, the capacities can be substantially expanded.

3. Knowledge dynamics for Smart leaders

Modern society is based on knowledge and any form of building and developing a future society must be based on knowledge. More precisely, on a dynamic of knowledge and an understanding of it based on a past, present, and future timeline. Today, "knowledge" is the most sought-after resource, considered an organization's most valuable asset and a means of competitive advantage. Knowledge is the driving force that stabilizes the efficient use of all other resources within the organization so that they are used to achieve the organization's goals and ultimate purpose. Knowledge is the only resource that does not diminish through sharing; instead, by using and sharing it, on the contrary, they expand [6]. However, knowledge must be managed, its transfer facilitated, and sorted according to the strategic plan.

However, regardless of their importance, knowledge cannot single-handedly represent the engine of change for the Smart City. The real fruition of knowledge is done by the leaders of organizations and the main role of Smart Leaders should be to facilitate the management of knowledge and the dynamics of knowledge at the level of the organization that leads to change. Leaders should encourage knowledge management actions. If leaders do not directly support, at all organizational levels, the transfer of knowledge and its dynamics, it is difficult for knowledge management actions to reach the desired performance level [7]. The role of smart leadership is reflected in the recognition of knowledge management practices as crucial for the implementation of future strategies. Studies show that both the effectiveness of leaders and the organization-wide cultivation of knowledge transfer behavior are critical elements that influence the workplace performance of employees within an organization [8]. Contemporary management researchers repeatedly emphasize the importance of the acquisition, development, transfer, and correct use of knowledge at the organizational level believe that organizational transfers depend on the organization's ability to acquire new skills, but also on the ability of the leader to

attract new knowledge that allows him to transform the organization concerning the changing social climate [9].

Therefore, knowledge management is considered to be more important than knowledge itself, and organizations seek to clarify how individual and organizational information and knowledge are transformed into individual and group knowledge and skills. The main goal of smart leaders should be to focus on organizational and social development towards an environment free of fear and based on trust so that its members are willing to share knowledge with each other, an environment that maximizes knowledge creation and drives knowledge to innovation [10]. In fact, knowledge management is considered a way to improve innovation capabilities, which can be translated through an additional effort from the level of companies to the macro level of societies [11].

According to studies developed by Nonaka and his colleagues, both we as individuals and the organization as a unitary humanism possess two types of knowledge, explicit knowledge, and tacit knowledge. Both categories of knowledge are important for our evolution and even more so for innovation. In order to understand the specific nature of the two categories, we must perceive our explicit knowledge as that knowledge that can be expressed through language, be it formal or systematic, and can be recorded and documented. This knowledge can be published and shared as primary or secondary sources of knowledge and information, it can be transmitted, transferred and available to the general public, it can be captured, coded, decoded, and presented. On the other hand, tacit knowledge is that knowledge that people do not possess mentally, including personal perspectives, perceptions, skills, techniques, experiences or opinions, and expertise. This tacit knowledge is purely personal, it cannot be put into writing and it cannot be shared through language alone. This knowledge is very useful but is hidden from the individual and not easily transmitted [5]. The transfer of tacit knowledge is based on transparent and trusting relationships. Trust is essential when different groups who believe in the power of knowledge come together to share or create knowledge [12].

Therefore, the transfer of knowledge represents an essential strategy and a mode of action for smart leaders, it must be cultivated and promoted both to facilitate the development of solutions and innovations for Smar City and to facilitate the sustainability of these types of communities. In light of the above, it is necessary to develop communities around the Smart City idea that facilitate the growth, application, and stability of these communities.

The creation of such a culture is centered on smart leaders, who are able to facilitate a climate of knowledge management and dynamic knowledge. This environment of knowledge transfer can only be achieved by understanding and applying knowledge dynamics by leaders. An essential contribution to the development of the concept was made by Nonaka (1991; 1994), then Nonaka and Takeuchi (1995), who made a significant discovery by developing the concept of knowledge dynamics, which means the possibility of transforming a form of knowledge in the other form [5]. Nonaka and his colleagues developed the concept through the creation of a space for the continuous transformation of knowledge, the

model developed by Nonaka involve four basic processes: socialization, externalization, combination, and internalization, a famous model in the specialized literature and the SECI model [5]. This achievement created the opportunity to discover new aspects of the semantic spectrum of the concept of knowledge and the understanding of its intrinsic dynamics.

We have talked so far about the existence of tacit and explicit knowledge and highlighted how important their transfer at the individual level is for innovation and the development of the future society. The SECI model was originally developed for the corporate environment and is designed for the development of automotive manufacturing in the Japanese industry. However, the working principles of this system can represent a stable working basis for future societies. The SECI model views knowledge as a dynamic flow of activities that facilitate the generation, transfer, and application of knowledge, all of which are accomplished through the four quadrants. Instead, it is important to remember that this dynamic must be perceived as a spiral of knowledge that covers the 4 quadrants and expands with each working cycle of the spiral. As exemplified in figure 1.

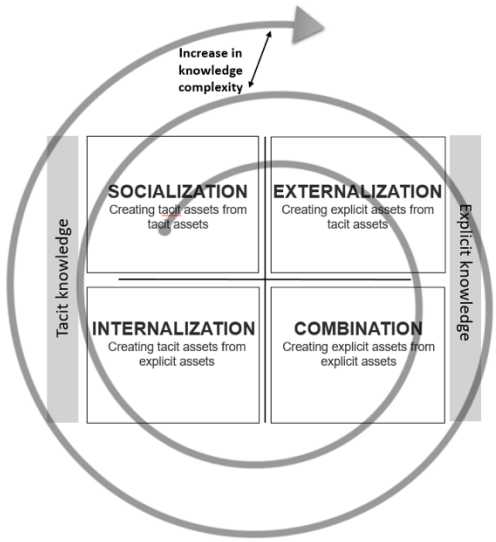

Fig. 1. SECI Model of Dynamic Knowledge Creation. Adapted from: (Nonaka, 1994).

These activities include socializing (from tacit to tacit); outsourcing (from tacit to explicit); combination (from explicit to explicit) and internalization (from tacit to explicit) are processes that are repeated innumerable times, and each repetitive cycle constitutes a new increase in the complexity of knowledge and an expansion of it. As an environment facilitates the creation of this transfer of knowledge through the circuit exemplified by these quadrants an increase in the complexity of the knowledge in the cycle is achieved to the same extent.

This model of knowledge dynamics may seem idealistic, but numerous studies highlight the idealism of this model and constantly discuss the reality of its application at the management level. A significant addition to the SECI model was

made by Bratianu C. through the association made between the dynamics of knowledge with the laws of thermodynamics, thus Bratianu emphasizes the fact that without an external power that moves the spiral of knowledge it will not have a continuous flow of development "*Thus, knowledge conversion processes postulated by Nonaka and his co-workers cannot be realized by themselves without any production or consumption of cognitive work* [3]."

What Nonaka's model of knowledge dynamics highlights is the need for a culture of knowledge transfer at the level of any company or organization. The need to create a constant climate of learning and innovation within an organization is obvious, and even more so when we discuss Smart leadership. The facilitation of new experiences at the organizational level that creates a blurring of the traditional way of working and facilitates innovation, and technological development, can only be achieved through the dynamics of knowledge. The evolution of Smar City is based on knowledge, and without the dynamics of knowledge, this would remain unvalued, be it tacit or explicit, the creation of a working environment in groups that allows storytelling and experience sharing, these practices, to everyone's surprise, tend to not be a component of many organizational training regimes.

We subtract from the mentioned two essential ideas. Smart leaders must emphasize the development of knowledge management at the organizational level by creating a work environment that facilitates the transfer of knowledge. The lack of such a culture will not only make the Smart City development process difficult but will destabilize the whole process. Thus, I believe that Smart City cannot be sustainable without much thinking and the cultivation of this transfer, consciously to the leaders of the future.

Leaders' approaches regarding the development and management of smart cities must be oriented towards facilitating the environment for the transfer of knowledge and knowledge transformation so that this environment in turn facilitates the delivery of innovations. A smart city development project that is based on a climate that generates new knowledge and facilitates the transfer of knowledge is the main premise that leads to the creation of a prosperous social and economic environment, the development of the local economy, and the increase of the welfare of society. This knowledge dynamic represents a key way to fill the existing gaps in our understanding of how smart cities can function at their true potential.

The second resource discussed at the beginning of this chapter, namely, time, has an essential influence on the development of knowledge dynamics. By adding the time segment to a planar dimension of knowledge dynamics we can perceive knowledge as being, past knowledge, present knowledge, and future knowledge. It is directly influenced by the environment in which the dynamics of knowledge development, but also by the external events that guide our daily activity. This means that any person or organizational body is put in a position where every decision made is based on limited resources. Limited in knowledge and limited in time, the leaders of the future must find systems to overcome these limitations, and a primary way this can be achieved is by implementing a culture of knowledge transfer between valuable people with different experiences and expertise.

4. Thinking models for Smart leaders

Knowledge dynamics become a key element in decision-making processes. From this perspective, knowledge is considered to be a cognitive structure that can be processed by our thinking patterns to generate new structures, and knowledge can change into actions, as a result of the decision-making process, but this transformation is closely related to the performance of the model of thought used and the cognitive experience of the manager.

Thus, based on a system of comprehensive understanding of the organizational climate and easy knowledge management, the next step for Smart Leaders is to properly combine the knowledge and skill sets necessary to lead change. Therefore, it is the duty of leaders to understand their leadership roles and responsibilities. Leadership is itself a scientific revolution that evolves from born leaders, according to the great man theory, to transformational leaders and a multitude of styles in between. It is certain that in order to produce change, innate leadership skills must be educated so that they evolve both in the direction of knowledge dynamics and in the direction of strategic thinking.

To understand the process of change, it is necessary to introduce the concept of time as a resource in the analysis. Not infrequently, time as a resource has been ignored, although at the level of organizations it has a special significance in everyday activity. All activities, both professional and personal, are perceived as unfolding over time. Even though time in sound is immeasurable it provides a measure of how the organization organizes its activities. Time is the main driver of evolution, whether we are talking about technological developments or knowledge, everything takes time to develop and everything develops over time.

The inclusion of time resources in the development of thinking models has generated a new way of perceiving them and implicitly a new thinking model, which the researchers call dynamic thinking. This model is considered superior to the inertial model (the one resistant to change) because it presents the ability to represent reality in its dynamics, to perceive the evolution of time, and to act in accordance with the adaptation to a new reality. Dynamic thinking constitutes the thinking model capable of representing change, by incorporating time as a fundamental variable. Dynamic thinking is based on the assumption that changes are reversible processes or dynamic equilibrium processes [13].

The need for dynamic thinking is therefore more relevant in contemporary times than it used to be. Dynamic thinking is no longer a choice or a variable left to fate towards development, the leaders of the future must deliberately and educated lean towards dynamic thinking to stand out in a fiercely competitive environment, especially in the context of prevailing economic instability and flux [14]. Thus dynamic thinking is necessary to face existing challenges being imperative for modern organizational success. The path to success is full of uncertainties and turbulence, so leaders must look for ways that generate business intelligence that creates value that deliberately advances business performance.

Let's take for example the case of the crisis generated by COVID-19, which has put the business environment as well as the administrative environment in front of new and unprecedented challenges, from the establishment of the character and the

limitation of movement mobility to substantial economic challenges [15]. Companies that have weathered the crisis by maintaining their entire staff have found novel ways to adapt and grow. A McKinsey study highlights the fact that most managers who made these changes did not believe they could be implemented in such a short time. This example highlights the importance of dynamic thinking in the decision-making process, that out-of-the-box thinking that allows a substantial degree of innovation and adaptation to the new references existing in the social economic environment. Not all companies have taken similar measures, but those among the leaders who have proven adaptability are the most profitable. There are several routes to reach a crisis point, each of which is specific to each business until the moment of crisis. With its appearance, the internal processes of the company are destabilized, being affected by the very activity and the ability to produce a profit. The major destabilization of companies at the moment of crisis can only be overcome by actions calculated based on risk and based on innovative ideas relevant to the new socio-economic climate.

Figure 2 exemplifies the thinking patterns following the critical, crisis point. Each of the 3 thinking models, inertial, entropic, and dynamic, have a specific form of action, the desired final point being the equilibrium state.

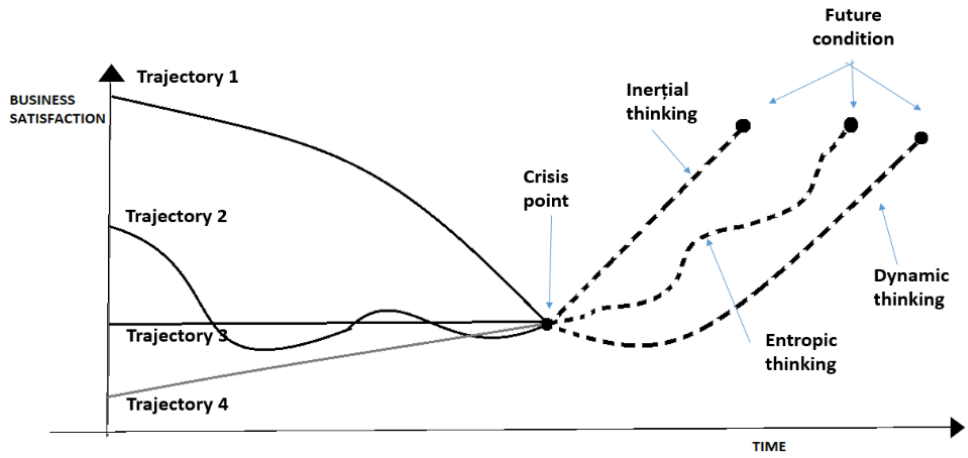

Fig. 2. Thinking patterns

From the point of view of inertial thinking, applying the same methods until now will generate stability, this type of thinking is based on the idea that if something has brought success in the past the process must be repeated without changing because the result will be the same. Entrepreneurs who refused during the pandemic to make changes in the way they operate their business, being convinced that the situation is temporary and will not last long enough to substantially affect the business profit, are placed in this thinking model. To their surprise, the mods spanned 2 years, and those businesses either had to make bigger investments to get back on their feet or died. For the most part, taking this specific case, the entrepreneurs who showed this way of thinking were those who refused to digitize their work processes, either out of the desire to keep human contact with customers

or out of the desire to avoid additional expenses with implementing technological solutions. However, the result is the same.

Dynamic thinking is that thinking that allows the formation of a performance trajectory over time, it has a historical segment, a current state, and several future paths, thus dynamic thinking emphasizes the current situation through the prism of the past situation and the point where you want to reach. So, applying the new variables and making decisions produces a new state of equilibrium. According to this model, changes are reversible processes or dynamic equilibrium processes, [16] so these systems allow passage through time and evolution during change so that they reach the same state of equilibrium. In other words, in the case of the evolution of the COVID crisis, dynamic systems are those systems that have gone through the crisis, adapted at the methodological level to change, and managed to maintain themselves in a state of equilibrium. There are those companies that quickly implemented work-from-home solutions, through digital forms of project management and a system of working with employees in teams, including online meetings and time planning of tasks. These companies have given up the old ways of working, they have adapted their daily activity to the online environment, some of them to optimize costs have given up office spaces but put the emphasis on people, keeping the integrity of the teams, strengthening communication between their members and increasing the channels of teamwork.

The perception of changes must be related to the moment of time, past, present, and future, which takes us into the field of entropic thinking. The entropic and most complex thinking in question is that long-term thinking confirms it the future is made up of more or less probable events making its nature essentially probabilistic, an action or a decision taken can have several courses of action and not just a safe and linear one. Entropic thinking implies that style of thinking that has the ability to anticipate probable scenarios for the future, which allows preparation for it and the possibility of programming future actions in accordance with the evolution of the situation [17]. This way of thinking, about the example taken, involves those companies that have made decisions to optimize their activity and adapt to the novelties of the environment with the evolution of the crisis. They focused their strategic thinking on the accumulation of knowledge from the external environment, they understood that the dynamism of the socio-economic environment is much too unpredictable for a single decision to be sufficient to achieve the proposed objectives and they created a working scenario to maintain the state of equilibrium and creating a beneficial future state.

We thus emphasize the need for the development of strategic thinking, based on the causal relationship present in entropic thinking must be a characteristic of the future leaders of Smart City. For the leaders of the future to engage in the kind of initiative that can successfully achieve change from a system in its current state to a desired future state, they must investigate the nature of the relationships that have driven the system to the present point but also which they are the characteristics that deeply define its current state. In this context, dynamic thinking encourages people to use the historical trajectory to stimulate and guide inquiry into the underlying relationships that produced it. Insights from such an inquiry can help us

design an initiative that will successfully leverage the desired change in performance. At this point in the analysis, entropic thinking intervenes to project, based on the present data, the possible future scenarios in accordance with the existing relationship between the current environment, which is complex in its nature, and the possible actions to be taken. Thus, the change can be placed in time in the past-present-future dynamic, which allows the description of any real transformation process in time. (Figure 3)

Thus, entropic thinking, which is the basis of the strategic thinking system, involves the projection in time of the possible scenarios for each decision taken at the level of the organization or institution. This type of thinking involves the analysis of existing variables and the perception over time as a result of the decision-making process of three scenarios, the most likely outcome, the best outcome, and the worst possible outcome. This projection over time allows the managerial system to constantly analyze the risks to which the organization is subjected and to adapt in time to the interferences that may occur during the development of one of the scenarios. Of course, the analysis of these scenarios does not only require their awareness, but also the establishment of a course of action by it and the analysis of a future return to the equilibrium situation.

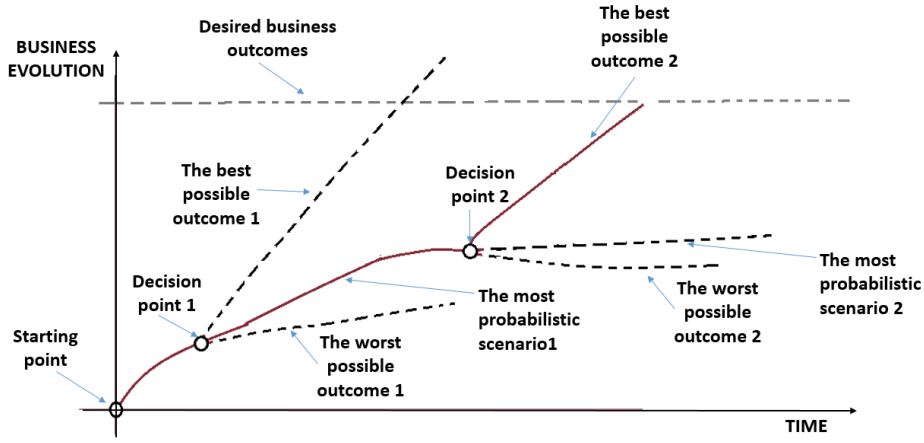

Fig. 3. Gândirea entropică

Strategic thinking is that form of thinking that projects the future by orienting towards it, it helps us calculate our chances of reaching the desired future but also the possible less desirable scenarios, it increases our confidence in our forces and optimizes our chances of success. It is a formula to bypass passivity, get out of it and adopt a constructive attitude of continuously searching for opportunities and capitalizing on them. Strategic thinking does not only involve the evolution towards a desirable future, it allows the anticipation of possible crises, which may delay the desired result, but at the same time, it allows the development of creative constructs that allow overcoming those situations.

This way of thinking is essential for the development of Smart Leaders and implicitly Smar City as it is a generator of change by its very definition. In this sense, we emphasize the importance of developing a smart city based on a system of knowledge transfer and knowledge distribution in such a way as to increase its entropy, respectively, the culture of innovation. In conjunction with entropic thinking, knowledge entropy reflects the distribution of knowledge in a given organization at a given point in time [18]. The implementation of such a model of thinking and transfer of knowledge at the level of a future society involves significant interference from the leaders who lead the change, without the directions drawn by them the change will be chaotic and unsustainable.

5. Future leaders of smart cities, a radiography of the way of thinking

At the base of every development is a culture of innovation, a culture that allows constant growth and the projection of the desirable future in terms of strategy reported in clear and concise times. And Smart City is no exception. The present article highlighted the need for continuous development of thought processes and knowledge, to facilitate the development of true Smart Cities. I emphasize this fact because without a social climate that makes the transfer of knowledge and knowledge dynamic Smart City boils down to technological implementation only. Technology brings nothing but evolution in return, as it is constant, growing in intensity with each newly discovered notion, and will not stop. What we now call the Smar City of the future will change its image in a few years, if not even sooner. No matter how much technology we implement in everyday life, without a culture that will fruit the development of companies as sustainable organisms and of individuals and society itself, the ideal of a Smart City cannot be achieved.

The transition to change will be made by leaders from various fields, these leaders are destined to develop skills that allow the sustainability of the Smart City idea over time. Skills that enable them, along with understanding the complex economic, social, and technological challenges in smart cities, the need to gather and combine the knowledge, expertise, and experiences of people from both the public and private sectors, to design the future.

Smart leaders should create an ecosystem of thrust, knowledge sharing, and constant learning on each level of human life. They must project the change in time and be able to think about change in terms of the scenario of evolution. Smart leaders and smart leadership must focus, in my point of view on the following characteristics.

Skills in knowledge management and implementation of methods of capturing, filtering, and dissimilating knowledge in order to be exploited.

Long-term thinking. Thinking that discerns beyond the immediate project outcome. This management system approach has as its main objectives the improvement of economic, social, and environmental outcomes for local businesses and long-term residents;

Developing strategic thinking by projecting in time the desirable future and calculating the available scenarios to achieve this future. This type of thinking allows the projection in the time of development stages, leading to the creation of an environment ready to respond to future challenges.

Dynamic thinking skills. Which involves the use of a historical trajectory to stimulate and guide the evolutionary course of the relationships that produce changes over time on the system, so that an initiative can be created that successfully uses the change in a performance fit.

Worldview. A vision with rational rather than positional projection. Which entails leadership approaches and behaviors that are capable of stimulating, exploiting, and disseminating learning. Vision to create an atmosphere that comes to support and creates the exchange of knowledge, especially knowledge that is more intuitive, tacit, and emergent over time;

Ability to access and mobilize tacit knowledge. Adapting a constant knowledge-gathering approach to be embedded in the local culture at all possible levels, organizations of all types but also from the everyday experiences of residents;

Social understanding. The leader must have a good understanding of the implications and impact these new technologies and smart processes will have on work life, development opportunities, and overall well-being.

These skills and abilities listed must enable the leaders of the future to create a culture that will develop a learning society. This form of organization must allow an exchange of mentality between governing bodies and social participants, as well as an understanding of the fact that innovation and social development are based on collaboration mechanisms, continuous learning, knowledge sharing, and reflection. Smart Leaders must understand that Knowledge creation and acquisition is the driving force for innovation and development of smart cities. And therefore the sustainability of this change is driven by a strategic thinking system.

Smart City development does not causally imply the removal of any kind of challenge, but on the contrary, we need to show an increased awareness that the Smart City brings new and perhaps even more technologically intense challenges at all scales. This is one of the main reasons why the development direction of the leaders who will be part of the governing bodies must be thought about and drawn. Management teams within any Smart City whether we are talking about institutions, companies, or communities with different cultures, capabilities, and needs, one characteristic remains constant, these management teams must have a high degree of adaptability and master a series of skills including leadership skills, communication, management, conflict resolution, consensus building, knowledge development and resource provision and so on.

At the same time, these teams must work continuously to ensure that they are constantly aware of the changing needs and capabilities of the Smart City community and stay in constant touch with opportunities generated by the developments of emerging digital business models, local markets, national, international, and developed processes. To accomplish all these tasks, this form of leadership has the obligation to facilitate the application of a collaborative approach to knowledge creation, knowledge management, knowledge transfer, and its dissemination, to integrate everything into a culture that regards knowledge as being an important local attribute of the Smart City type society.

6. Conclusion, limitation, and future research

The present study highlights the importance of the systems thinking of leaders who drive change for the future sustainable implementation of innovation as well as for the creation of a culture of continuous learning. The analysis shows the existing intersection between knowledge dynamics and systems thinking and how they need to be understood and implemented at the social level for the development of the smart city.

In the descriptive note of this article, the smart city is not presented as a system of technologies, technological innovations, and economic growth, it becomes an ecosystem of thinking, knowledge transfer, and the balance between data, technologies, and the human mind, which allows a development sustainable gradualism and not a fallible technological boom. Therefore, leaders' approaches regarding the development and management of smart cities must be oriented towards facilitating the environment for the transfer of knowledge, so that this environment in turn facilitates the delivery of innovations. Such an approach aspires to generate new knowledge and to exploit and disseminate knowledge in cities to improve local economic development, and social and environmental outcomes.

This article traces the importance of strategic thinking and knowledge transfer to be implemented in all aspects of building and understanding a smart city, starting from its development to creating the sustainability of such a society. We thus highlight two emerging and interconnected elements of the smart city that represent a conceptual approach that leads to the improvement of change management and implementation mechanisms, namely the integration of knowledge exchange perspectives at the level of smart cities and the development of organizational learning capabilities.

The limitations of this study are represented by its very original purpose, namely to analyze the specialized literature and explore the existing knowledge, to allow the development of a skeleton of the thinking system and the defining characteristics of a smart leader, without however developing empirical data to support existing notions. At the same time, this limitation of the present article also determines possible future research that allows the superimposition of the conceptual framework built on the sustainable development of the smart city that allows the validation or invalidation of the initial premises of the presented system.

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Urban mobility and accessibility of public transport in Bucharest

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Abstract

The paper aims to address a current problem, namely urban mobility, which is a major challenge faced by major European cities including Bucharest, which currently offers a partially developed public transport, although the citizens of the capital want an efficient, integrated, sustainable, safe public transport system that ensures a high quality of life. Urban mobility is the ease with which people can travel between destinations in urban areas using the public transport network. A civilised and attractive public transport system requires that passengers are well informed about vehicle timetables, routes and transfer possibilities. At European level, €16.3 billion has been allocated for the period 2014-2020 and the Interconnecting Europe Facility (IEF) has allocated more than €200 million for transport in large European cities. The paper is structured on three levels: the legislative framework for urban mobility at European and national level, urban mobility in Bucharest, analysis of the accessibility of surface public transport routes and their efficiency for public transport in the capital and the implementation of concepts and systems ("intermodal node", "Park & Ride" system, passenger information system). Urban mobility in Bucharest is currently provided both by public transport (RATB, Metrorex) and by personal or company cars. Although there have been levels of growth in the total population, the capacity offered by public transport has decreased, leading to an increase in the use of personal means. This has led to overcrowding in the centre of the capital, as well as on many main roads. As a negative consequence, surface public transport has suffered, leading to a decrease in its use.

Keywords*: urban mobility, accessibility, public transport, passenger information system.*

1. Introduction

Transport is fundamental to our economy and society, and mobility is vital for the internal market and for the quality of life of citizens, as they enjoy the freedom to travel. Transport enables economic growth and job creation; it must be sustainable

in the light of the new challenges we face. Transport is a global business, so strong international cooperation is needed to make action effective. That is why public transport must develop sustainably and environmentally friendly, with adequate safety standards, so that it becomes efficient, integrated, safe and designed to promote socially inclusive economic and territorial development and ensure a high quality of life.

2. Content

The paper is structured on three levels: the legislative framework on urban mobility at European and national level, urban mobility in Bucharest, analysis of the accessibility of surface public transport routes and their efficiency in public transport in the capital and the implementation of concepts and systems ("intermodal node", "Park & Ride" system, passenger information system).

2.1. European and national legislative framework

European and national legislative framework in this field is:

- White Paper on the future development of the common transport policy (1992) This promoted the opening of the transport market, the extension of the trans-European transport network, improved safety and the harmonisation of social provisions. The White Paper also marked a turning point towards an integrated and intermodal approach based on the "sustainable mobility" model. Subsequently, in the White Paper of 22 July 1998 entitled "Fair payment for infrastructure use: A phased approach to a common transport infrastructure charging framework in the EU" (COM(1998)0466), it was pointed out that there were large differences between Member States in the calculation of transport charges, which led to multiple distortions of competition in intra- and intermodal transport.
- White Paper "European transport policy for 2010: time to decide" (COM(2001)0370). In June 2006, the Commission presented a mid-term review of the 2001 White Paper (COM(2006)0314), entitled "Keep Europe moving - Sustainable mobility for our continent".
- 2006 - Communication from the Commission to the Council and the European Parliament on a Thematic Strategy on the Urban Environment, COM(2005)718 final
- 2007 - Green Paper: Towards a new culture for urban mobility, COM(2007)551 final
- Regulation (EC) No 1370/2007 of the European Parliament and of the Council of 23 October 2007 on public passenger transport services by rail and by road,
- 2009 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Action Plan on Urban Mobility, COM(2009) 490 final,

- The Commission published its 2011 White Paper on the future of transport up to 2050, Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system (COM(2011)0144), on 28 March 2011. Among the 10 objectives included in the 2011 White Paper, the Commission included the creation of a Single European Transport Area by removing all remaining barriers between modes and between national systems, simplifying the integration process and facilitating the emergence of multinational and multimodal operators. On 1 July 2016, the Commission presented a report, in the form of a working document (SWD(2016)0226), on the progress made in implementing the 10-year programme set out in the 2011 White Paper. Annex II contains a detailed assessment of the activities undertaken so far.
- The Transport White Paper (2011) recognises the influence of urban transport in ensuring transport sustainability at national level and sets out 40 initiatives that contribute to increasing mobility, removing major barriers in key areas, reducing fuel consumption by removing cars from the road and increasing the number of electric cars, rail and waterborne transport taking over 50% of medium distance journeys made by road, reducing carbon emissions in air transport by at least 40%. Cities must develop urban mobility plans aligned with Integrated Urban Development Plans.
- White Paper Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system (2011)
- Guidance for the development and implementation of Sustainable Urban Mobility Plans (SUMPs) published in 2014 by the European Commission, and the main objectives are: providing transport modes for all citizens, improving transport safety and security, reducing noise, air pollution, greenhouse gas emissions, increasing the attractiveness and quality of the urban environment for the benefit of citizens and society as a whole.
- In 2016, the Commission published a Communication "A European Strategy for Low Carbon Mobility" (COM(2016)0501), in which it proposed measures to accelerate the decarbonisation of European transport.
- 2017 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Europe on the move: An agenda for a socially just transition to clean, competitive and connected mobility for all, COM(2017)283 final,
- The 'Sustainable and Smart Mobility Strategy 2021' lays the foundations for how the EU transport system can achieve its green and digital transformation and become more resilient to future crises. As outlined in the European Green Deal the result will be a 90% reduction in emissions by 2050, secured by a smart, competitive, safe, affordable and accessible transport system. Sustainable transport means stimulating the uptake of zero-emission vehicles, ships and planes, renewable and low-carbon fuels and related infrastructure, creating zero-emission airports and ports,

ensuring healthy and sustainable inter-city and urban mobility, multi-modal mobility and a European Urban Mobility Scoreboard based on common targets; examining, for cities of a certain size, the possibility of imposing an approach in line with national standards and based on EU guidelines, Intelligent Transport Systems.

- Law No 350/2001 with subsequent amendments and additions on spatial planning and town planning, published in the Official Gazette, Part I, No 373 of 10 July 2001. Annex 2 to the law defines an urban mobility plan as a strategic territorial planning instrument that links the spatial development of localities, metropolitan areas with the mobility and transport of people, goods and goods.
- Romania's National Recovery and Resilience Plan [1] is a strategic document based on 6 main pillars (green transition, digital transformation, smart, sustainable and inclusive growth, social and territorial cohesion, health and economic, social and institutional resilience, policies for the New Generation) which sets out the investment priorities and reforms needed for recovery and sustainable growth, linked to the green and digital transition envisaged by the European Commission which provides 507 milestones and targets linked to the reforms and investments undertaken.

The National Recovery and Resilience Plan under the section dedicated to "Sustainable Transport" sets out a series of milestones, targets and indicators that address all modes of transport.

The first milestone relates to ensuring sustainable transport, decarbonisation and road safety - Improving the strategic, legal and procedural framework for the transition to sustainable transport by creating and implementing a new distance-based charging system for heavy goods vehicles (trucks) and higher property taxes for the most polluting passenger vehicles (cars/coaches/coaches), based on the polluter pays principle and the principle of green taxation, stimulating the use of clean vehicles and fleet renewal programmes by domestic users, private companies and public institutions, scrapping of polluting vehicles, increasing the number of zero emission vehicles, creation of a large number of charging stations for electric vehicles installed nationwide, adoption of the national road safety strategy and its implementation through the development and adoption of road safety legislation - legislation on monitoring, enforcement and penalties for road safety violations, adoption of the rail infrastructure development strategy 2021-2025 and implementation of the action plan, publication and implementation of the European Rail Traffic Management System (ERTMS) national action plan, adoption of the Maritime Transport Strategy, approval of the Intelligent Traffic Systems (ITS) Strategy and the related legislative package [6 The National Recovery and Resilience Plan].

The second milestone concerns ensuring efficient management for quality transport - Improving institutional governance and corporate management capacity by reforming CNAIR and creating a new road investment project management company (C.N.I.R.) The law was approved by Parliament and came into force in April

2021. The primary and secondary legislation needs to be amended to allow for streamlining of the company's activities and realignment of C.N.A.I.R.'s institutional tasks and mechanisms. Selection and appointment of members of the boards of directors of state-owned transport companies (C.N.A.I.R., C.N.I.R., C.F.R., Metrorex, C.F.R. Călători . An independent assessment of the financial and operational performance of C.N.A.I.R., C.N.I.R., C.F.R. (National Railway Company), C.F.R. Călători and Metrorex will be carried out in accordance with OECD standards and the main recommendations of the assessment will be implemented.

For the independent evaluation, the Ministry of Transport and Infrastructure will select through competitive tendering procedures an international financial institution or an international audit firm, recognised for its competence and expertise in the performance of state-owned companies. An independent assessment of the financial and operational performance of C.N.A.I.R., C.F.R., C.F.R. Călători and Metrorex will be carried out in accordance with OECD standards. Another issue to be considered is the improvement of the performance of the railway system in terms of train punctuality, modernisation of railway lines, including the implementation of the European Rail Traffic Management System (ERTMS level 2), centralisation of railway stations, renewal and electrification of lines [6 The National Recovery and Resilience Plan].

The third milestone concerns the development of road infrastructure linked to the TEN-T Core network, as well as that necessary for the implementation of new tolling and control measures, road traffic management systems and road safety and the development of the metro network in Bucharest and Cluj-Napoca (M4 Bucharest: section Gara de Nord - Filaret (6 stations), length 5.2 km and M1 Cluj-Napoca): SF. Maria - Europa Unită (9 stops), length 7.5 km). In relation to the metro, contracts for works will be signed, following open and competitive tenders, and the relevant authorisations will be obtained for structural works, stations, interstations, tunnels, galleries and other constructions for the two new metro lines.

2.2. Urban mobility in Bucharest

The mobility of the population is currently ensured both by public transport (RATB, Metrorex) and by personal or company cars. Although there have been levels of growth in the total population, the capacity offered by public transport has decreased, leading to an increase in the use of personal means. This has led to overcrowding in the centre of the capital, as well as on many main roads. As a negative consequence, surface public transport has suffered, leading to a decrease in its use.

Although investments have been made in recent years to partially replace the vehicle fleet (1000 buses, 100 trolleybuses, modernised trams), they do not compensate for the very long journey times and lack of rhythm, which makes surface public transport less attractive.

Table 1. SWOT analysis of public transport in Bucharest

Strengths (S)	Weaknesses (W)
Public transport in Bucharest offers a good variety of options (tram, trolleybus, buses, metro), The network is dense and has potential, The most used means of transport in Bucharest is the metro, due to the fact that the metro lines are complex and provide fast and safe transport from one end of Bucharest to the other and the waiting time is short. The metro network is very well structured with the following main lines: Dristor-Patelimon, Pipera-Berceni, Preciziei- Anghel Saligny Gare de Nord - Străulești depot Eroilor - Râul Doamnei	The journey times in the itineraries do not correspond to the real situation, Lack of parking spaces leads to frequent blockages of RATB traffic, Passenger information is very poor (no posted timetables; only connections from the same station are announced in new vehicles), There are areas where many routes overlap over long distances (especially bus routes that duplicate tram or trolleybus routes).
Opportunities (O)	**Threats (T)**
Increase the density of cycle lanes, Provide off-street public parking spaces to free up street space for other uses such as bus lanes, sidewalks/bike lanes, Increase the percentage of fully accessible public transport vehicles, Increased accessibility for pedestrians (quality of surfaces, crosswalks and crosswalks), Reduce bus travel time along key corridors on the street network, Park&Ride system - parking in peripheral areas linked to public transport terminals, Reviewing the transport network and circulation schedules for efficiency, New urban planning projects that will attract new passenger flows. Construction of the Gara de Nord-Henri Coandă Airport metro line to pass through the Băneasa and Otopeni districts of Ilfov county, Improving the traffic management system, Painting pedestrian crossings with anti-skid material and providing pedestrian crossings with level access and good visibility, Creating a safe waiting area in the middle of the street, at long pedestrian crossings and at roundabouts, Parking guidance system and variable message display system.	Surface public transport (for the most part) has no advantages over personal cars, The number of cars keeps increasing, To the suburbs, minibuses of other transport companies block the stations, Urban plans for new shopping centres or new residential areas do not provide for the integration of public transport from the outset, and various improvisations subsequently arise.

Source: Author own work

2.3. Analysis of the accessibility of surface public transport routes and their efficiency for public transport in the capital and implementation of concepts and systems ("intermodal node", "Park & Ride" system, passenger information system)

Given the poor state of the fleet used in public passenger transport and in accordance with the provisions of the Sustainable Urban Mobility Plan (PMUD) 2016-2030 developed for the Bucharest-Ilfov region, the purchase of trolleybuses is desired, as they are low carbon, low-floor vehicles are accessible to both the elderly and those with locomotor disabilities, are 100% electric with zero emissions, have intelligent technical systems and produce little noise. [3 STB activity reports 2020, 2019, 2018 STB SA]

In order to make public passenger transport more attractive and encourage citizens to give up using their own vehicles to reduce pollution and traffic congestion, 400 buses, 100 hybrid buses, 100 electric buses running on 14 routes, 100 trolleybuses and 100 trams have been purchased. The trams to be purchased will run on lines 1, 10, 21, 25, 32, 40, 41 and 55.

The newly purchased buses will have: low floor, on-board computer for the fleet management system, dual validators for the ticketing system, passenger information system inside and outside, wheelchair ramp, automatic passenger counting system, video surveillance system inside and outside, driver-dispatcher voice communication system, vehicle parameter and driving mode monitoring system.

The purchased trolleybuses will reduce pollution and noise, increase passenger comfort and provide easy access for people with reduced mobility, are environmentally friendly, capacity is 100 passengers respectively 150 passengers.

To reduce operating costs, the most efficient means of transport are trams and trolleybuses because they run on electricity and the energy produced is 100% from hydropower.

In the Bucharest-Ilfov Region there are 200 public transport lines in operation, 135 of which are urban lines and 65 are regional bus lines. The total number of tram routes is 22 and trolleybus routes are 16. The total number of bus routes is 162 of which 72 are urban day lines, 65 regional lines and 25 night lines.

The length of public transport routes is 2420 km (double track), divided as follows: 273 km trams, 152 km trolleybuses and buses 1995 km of which 801 km regional lines.

In 2021, the total vehicle fleet of 1,728 of which 281 trams, 176 trolleybuses and 1,271 buses was distributed on 187 routes as follows: 24 tram lines, 146 bus lines of which 43 regional lines and 17 trolleybus lines. The total number of vehicles is 2159 of which 1527 buses, 227 trolleybuses and 405 trams. 227 trolleybuses, 1000 buses and 300 trams have exceeded their normal service life. [3 STB activity reports 2021].

All means of transport are equipped with automatic fare collection systems and information boards inside.

The fare offer is advantageous because there is an integrated transport system. Thus, there are surface-only trips (bus, trolleybus and tram, the type being

one trip, two trips or ten trips of 90 minutes each and offering the possibility of transferring from one line to another and from one means of transport to another), another is integrated (metro and surface means of transport, one trip, two or ten trips of 120 minutes each) and surface transport passes (there are several categories: 24 hours, 72 hours, 7 days, 1 month, 6 months and 12 months), as well as 50% reduced passes for pupils and students. There are also integrated (surface-train) passes for 24 hours, 72 hours, 7 days, 1 month, 6 months and 12 months and integrated surface-train metro passes for Gara de Nord and Otopeni Airport valid for 1 month, 6 months and 12 months. And the last type of offer is the tourist travel card for 24 hours or 72 hours as well as passes for 1 month, 6 months and 12 months. [2Bucharest City Hall] [2].

At present, at least 20 major intermodal nodes can be identified in Bucharest. In these nodes there should be a better connection between the means of transport serving them (stations as close and easily accessible as possible), but also better information for passengers about all possible connections and their schedules, not just the connections from the current station.

These intermodal nodes are:

- Bucur Obor - metro, trams, trolleybuses, buses,
- Clăbucet - metro, trams, trolleybuses, buses,
- Dristor - metro, trams, buses,
- Basarab station - metro, trams, trolleybuses, buses, CFR,
- Gare de Nord - metro, trams, trolleybuses, buses, CFR,
- Lujerului - metro, trams, trolleybuses, buses,
- Charles de Gaules Square - metro, buses,
- Crângaşi Street - metro, trams, buses,
- Drumul Taberei Street - trams, trolleybuses, buses, metro,
- Eroii Revoluţiei Square - metro, trams, buses,
- Iancului Street - metro, trams, buses,
- Presei Libere Square - trams, buses,
- P-ţa Romană - metro, trolleybuses, buses,
- P-ţa Sudului - metro, trams, trolleybuses, buses,
- Titan Street - metro, trams, trolleybuses, buses,
- Unirii Street - metro, trams, trolleybuses, buses,
- Victoriei Street - metro, trams, buses,
- Eroilor Bridge - metro, trolleybuses, buses,
- Grozăveşti Bridge - metro, trams, buses,
- Răzoare - trams, trolleybuses, buses, metro,
- Universitate - metro, trolleybuses, buses.

Lack of parking at the entrance to the city leads to traffic congestion. Park & Ride parking offers citizens the possibility to park their car safely and continue their journey by public transport to their destination. Access from the car park to public

transport should be easy and have access to information on connections to different points of interest in the city.

Such parking lots with access to public transport can be arranged in the following locations: Băneasa Airport, Anghel Saligny, Bucurestii Noi / Pajura, CFR Progresul, Colentina / Helitube, Alexandria Depot, Granitul / Antilopa, Metro Nicolae Teclu / IMGB, Petricani / Glucoza Factory, Preciziei.

A civilised and attractive public transport system requires passengers to be very well informed about vehicle timetables, routes and transfer possibilities.

Maps showing the public transport network are missing from most stations and vehicles. Area maps describing all transport links should be displayed at major stations. The vehicle schedule is not displayed, so the passenger cannot know the frequency of the line, nor the first and last passes of vehicles through the station. It is necessary to mention the times of the journeys through the station on all days, unless the intervals are sufficiently short, in which case the first 3 and last 3 journeys through the station and the frequency per hour interval shall be mentioned. It is recommended to implement electronic devices in the main stations to announce the time remaining until the arrival of the next vehicle, together with the development of a smartphone/tablet app to provide real-time information.The information can be made available in stages starting with tram and trolleybus lines and continuing with major bus lines. As a priority, it is recommended that the full schedules (all departures) for all lines be posted on the RATB website and drivers be encouraged to follow them. The passenger information system on the metro is effective.

3. Conclusions

The tram network is comprehensive but does not provide service at full capacity due to lack of priority in traffic, resulting in low speeds, lack of passenger comfort and reduced frequencies on some lines. The tram system does not directly reach downtown destinations and does not provide cross-town service. In order for the tram system to operate under optimum operating conditions, it should have its own lanes on as long a section of the network as possible, be given priority at intersections (according to evaluations carried out in European research projects, it was found that giving priority to trams at intersections helps to improve the flow of all traffic, including cars), have a modern dispatching system and be equipped with modern means of transport.

Although the current bus and trolleybus systems provide extensive coverage of the city, there is no good integration with other modes of transport, but rather an overlap with them.

Some of the city's main squares, such as Unirii, Victoriei, Universităţii and Romană are particularly complex in terms of mobility and urban conditions, combining surface and underground public transport services and mixed urban functions.

The current residential on-street parking system in Bucharest cannot provide residents in densely built-up neighbourhoods with reserved parking spaces close to

their homes. Given the large number of urban development planning proposals and regulations, mobility planning should be linked and coherent with urban development planning (and vice versa), so as to respond to accessibility, housing quality and environmental requirements. Public transport system operating technologies fail to provide basic passenger information and safety features such as: on-board video surveillance, real-time passenger information systems, integrated dispatching system for all operators, schedule compliance - all of which should lead to increased trust and attractiveness of the public transport system with an impact in reducing individual car transport. The increase in the number of private cars, the lack of parking spaces both in residential areas and in the central area have led to a sharp deterioration of the pedestrian infrastructure, green spaces and the quality of public spaces in general.

Cycling is a means of transport that should be encouraged for short journeys of up to 5 km, and for longer distances it should be combined with public transport, with parking facilities at stations, transfer points and terminals.

It is recommended that the public transport network should benefit from several transport corridors with increased capacity, integrated with metro lines, which should be adapted to the volume and structure of transport demand in the areas concerned. Along these transport corridors, transfer points can also be established which, depending on the situation on the ground, provide an attractive link to some of the new, less accessible residential areas.

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Digital twins, the software solution for safer cities

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Abstract

Objectives: The S4ALLCities project's main goals are to build an open platform for information exchange and management, as well as to provide real-time situational awareness and decision support, thereby increasing the resilience of European cities while respecting citizens' fundamental right to privacy. Prior work: The project seeks to optimize smart cities through modular subsystems known as digital twins, each of which contributes to the overall goal in a unique way. These digital twins excel at real-time digital representation and machine learning of processes and objects encountered in a variety of open public spaces. Approach: These digital twins aid in the detection of potential hazards in urban public spaces. They will be validated for three months in three European cities: Trikala, Bilbao and Pilsen.They will monitor infrastructure in the city, such as traffic and access to restricted areas, as well as detect potential explosions, cyber attacks, and suspicious activity.Results:The demonstration events will demonstrate the effectiveness of the smart monitoring system by taking key measurements of city infrastructure (such as traffic, access to restricted areas, and evacuation routes), detecting explosives, cyber-attacks, and suspicious activity. Implications: S4ALLCities will be validated in three European cities over the course of three months, where it will be installed and tested. Its advantages will be demonstrated to stakeholders through a series of scenarios involving physical and cyber attacks on soft targets in the aforementioned smart cities. Public space, which is currently vulnerable to attacks of all kinds, could be a soft target. Value:By using innovative digital twin technologies, possible dangers to public safety are prevented.

Keywords: *S4ALLCITIES; security; smart city.*

1. Introduction

The advancements in IoT, big data analytics, and machine learning have made the concept of a smart city a reality. As we all know, the goal of a smart city is to provide efficient answers to its residents by utilizing modern technology and data analytics collected by sensors. The concept of a smart city was something SF for many people in the twentieth century, and it was only portrayed in popular media. Cities are becoming smarter not only in terms of automating routine operations for individual people, buildings, and traffic systems, but also in terms of monitoring, comprehending, analyzing, and designing the city in real-time to increase efficiency, equity, and quality of life for its inhabitants. organizations to keep up with newly emerging vulnerabilities and threats, given the dynamics of the domain. A smart city is more than just using digital technology to increase resource efficiency and reduce pollution. Improved urban transportation networks, updated water and waste disposal facilities, and more energy-efficient lighting and heating systems are all part of the plan. It also includes more involved and responsive local government, safer public spaces, and addressing the needs of the elderly. In this paper, we will look at what a smart city is today, how it has evolved in recent years, the domains where it is used (for example, traffic management, healthcare, and public safety), and the global future of smart cities.

The concept of "smart cities" has received a lot of attention in the context of urban development policy (Schaffers, et al. 2011). Smart cities are technologically advanced metropolitan areas with a high degree of connectivity between people and organizations. All of the components work together to form an integrated system that provides real-time access to high-quality services and goods while remaining economically and socially sustainable. This strategy includes the use of information and communication technologies (ICTs) to boost economic growth and improve quality of life, as well as the integration of all hardware and software technologies to improve urban administration (Kitchin 2015). According to the definition of "smart city," this new city "frequently links together technical informational transformations with economic, political, and socio-cultural development." (2018, Voda and Radu)

Smart cities begin with smart human capital because only smart people can develop ICTs with AI (Figure no. 1).

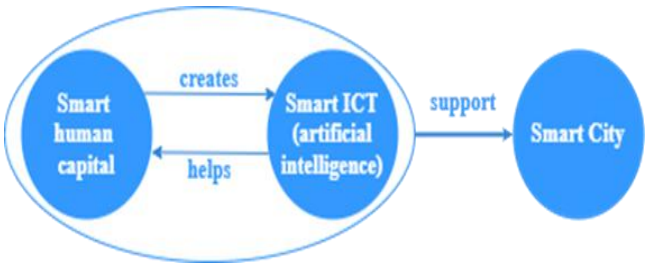

Fig. 1. How are Smart Cities built
Source: Kitchin, Rob. 2015. "Making sense of smart cities: addressing present shortcomings." Cambridge Journal of Regions, Economy and Society 8: 131-136.

A. IoT technology – an important actor in the smart cities development

The majority of cities are looking for intelligent solutions to improve their operations. This term refers to the combination of innovative ideas that include general improvements to existing technologies, all of which typically borrow the same principles from one another. All innovative ideas borrow technologies related to IoT, cybersecurity, and ICT.

ICT advancements must improve management and environmental operations. As a result of the rapid pace of change, smart city problems are becoming increasingly difficult. This results in constantly updated technologies, which cause organizational changes. These can be enhanced by collecting personal information about people through mobile applications and social networks [1].

According to the UK's Department for Business, Innovation, and Skills, the global market for smart city solutions is expected to reach $408 billion in 2020, accounting for approximately 24% of the global market. The actual amount reached in 2020 was $410.8 billion, with a projected increase to $820.7 billion by 2025 [2], [3]. The interest of authorities in platform manufacturers over smart solutions is a significant factor driving the global growth of the smart city market. The platform is used by the vast majority of shareholders.

The Internet of Things is a rapidly evolving paradigm that allows electronic devices to communicate with one another over the internet. The Internet of Things aims to make people's lives easier by providing innovative solutions to various challenges or problems in government, public, or business situations. In fact, they are a hybrid of various smart devices, sensors, and frameworks, with the added benefit of providing storage space and high processing speed.

The Internet of Things (IoT) is at the heart of the European Spaces Safety and Security for All Cities (S4ALLCities) project, which aims to implement and assess cyber and physical security threat levels in smart cities through digitally augmented situational awareness. It is under constant development and will focus on risk-based systems for security management, detection of suspicious activities, identification of illegal objects, and real-time estimation of physical or cybernetic attacks from multiple locations, as well as crisis management countermeasures. S4ALLCities will also play an important role in promoting European city security.

2. IoT platform State of the Art

This section's goal is to provide preliminary information needed to design an IoT platform. The information on IoT platforms is provided at a higher level of abstraction and from a broader perspective. The information presented here is primarily derived from academic literature. The terms IoT platform, IoT framework, and IoT middleware are used interchangeably in this section. Concerning the architectural specifications, it can be mentioned:

1. Interoperability: A middleware can interact with disparate devices/technologies/applications without requiring additional effort from the application or service developer. Heterogeneous components must be

able to exchange data and services. Interoperability in middleware can be viewed from three perspectives: network, syntactic, and semantic, all of which must be provided for IoT.

2. Service-based: A middleware architecture may be service-based to provide greater flexibility when adding new and advanced functions to an IoT's middleware.
3. Context-awareness: Context-awareness is an important requirement for developing adaptive systems and determining value from sensed data. The IoT middleware architecture must be aware of the context of users, devices, and the environment in order to provide effective and essential services to users.
4. Adaptive: Middleware must be adaptable in order to evolve in response to changes in its environment or circumstances. The network and its environment are likely to change frequently in the IoT.
5. Abstraction in Programming: An API for application developers is a necessary functional requirement for any middleware. High-level programming interfaces must be used by the application or service developer to isolate the applications or services from the operations provided by the underlying, heterogeneous IoT infrastructures. When creating an API, the level of abstraction, programming paradigm, and interface type must all be considered. The level of abstraction describes how the application developer sees the system (individual node/device level, system-level). The programming paradigm (for example, Publish/Subscribe) is concerned with the model for creating or programming applications or services. The style of the programming interface is defined by the interface type.
6. Distributed: The applications/devices/users of a large-scale IoT system (e.g., WSNs, VANETs) exchange information and collaborate.
7. Autonomous: To be autonomous means to be self-governing. Devices/technologies/applications are functional participants in IoT processes, and they should be able to interact and communicate with one another without requiring direct human intervention.

3. Architectural requirements - related difficulties

1. Service-based: The majority of middleware is service-based. Each service must include a description of service composition or discovery. To ensure semantic and syntactic interoperability, a standard service description is required.
2. Interoperability: While most existing middleware supports network interoperability, many lack semantic and syntactic interoperability. Because of heterogeneity and a lack of standards in ontologies, semantic interoperability in IoT is extremely difficult. The service-oriented approach provides the best support for semantic interoperability among all

middleware categories. Support for syntactic interoperability, on the other hand, is limited.

3. Programming Abstraction: The majority of middleware supports programming abstraction. The new languages and tools that must be adopted, on the other hand, have a steep learning curve for both developers and users.
4. Context-awareness and autonomous behavior: Various types of middleware have taken advantage of some level of context-awareness. For example, MUSIC regulates context for self-adaptation in order to maintain a satisfactory QoS. Popular context applications (for example, context-aware resource)
5. Adaptive: In many approaches, adaptation decision-making is hard coded and must be recompiled and re-deployed. Adaptation is more dynamic; policies, rules, or QoS definitions are used, and these can be changed during runtime to produce new behavior. Despite the fact that most middleware is dynamic, the rules, policies, and QoS definitions are mostly hard-coded and not context-aware. This approach is not scalable in IoT.

A. Fundamental IoT-SYSTEM concepts

Figure 2 depicts the overall system architecture and problem setup for our approach. We concentrate on the analysis of potential technologies and IoT platforms for the realization of an Industrial IoT-platform (IIoT-platform, shown in light green in the above figure), which is a critical component for enabling communication between different subsystems, devices, and machines, as well as inter-communication at various levels.

Additionally, the primary communication technology, i.e., the lower physical communication layer, is considered, which allows the actual physical signal and data transfer between system components.

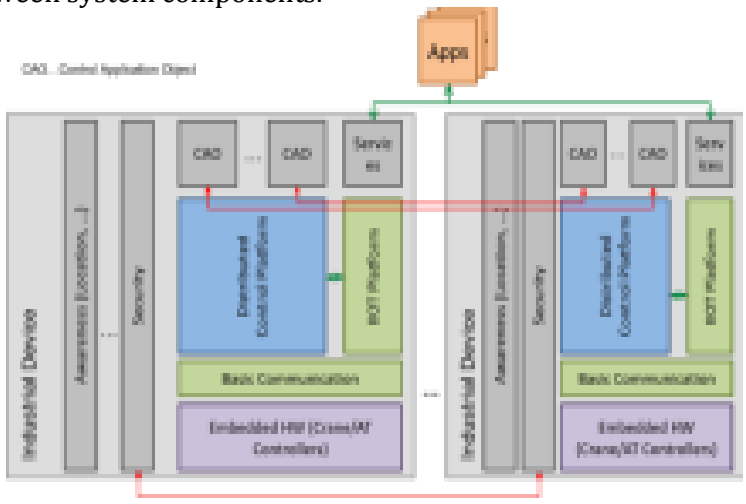

Fig. 2. System architecture and key system components

B. IoT systems and protocols stack

The IoT protocol stack was created to simplify and facilitate the development of complex networked systems, with the goal of achieving widespread adoption of IoT systems. Figure 2 depicts and compares the various layers of the IoT stack to the international standard ISO-OSI-model and the consolidated Internet protocol stack (TCP/IP).

The main feature of this stack, as shown in figure 3, is its simplicity. In contrast to the ISO-OSI-model, it has only four distinct layers.

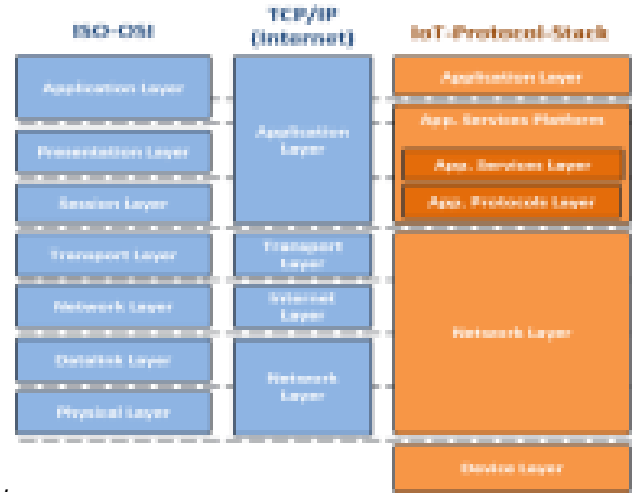

Fig. 3. Representation of the IoT protocol stack and comparison with the ISO-OSI and consolidated TPC/IP (Internet) models.

4. S4ALLCITIES Project

A. The architecture of the system

The S4ALLCities project aims to address smart city optimization through modular subsystems known as digital twins, each of which contributes to the goal in a complementary way. These digital twins are experts in real-time digital representation and machine learning of processes and objects encountered in various open public spaces. (Fig. 2)

The Digital Twins are as follows:

- The Internet of Things (IoT) Distributed Edge Computing (DECIoT) provides intelligent edge processing of measurements and sensor observations.
- MAIDS stands for Malicious Actions Information Detection Systems, and it is in charge of machine detection and intelligent detection of suspicious behavior.

- ACMS (Augmented Context Management System) is in charge of information within a common operational picture and augmented reality.

Thus, when digital twins are used in conjunction, they achieve high levels of awareness of potential risk situations in public spaces.

Fig. 4. Digital twins
Source: https://www.s4allcities.eu/press-release-01

The main goals of the S4ALLCities project are:

- to create an open platform for information exchange and management, as well as to provide real-time situational awareness and decision support, thereby increasing the resilience of European cities while respecting citizens' fundamental right to privacy;
- to design and develop an intelligent architecture for communication and interconnection of smart systems via IoT.
- completing smart city monitoring systems in order to improve preparedness and responsiveness in the event of a physical or cyber attack

S4ALLCities will be validated in three European cities: Trikala (GR), Bilbao (ES), and Pilsen (CZ), where it will be installed and tested for three months. Its benefits will be presented to stakeholders through various scenarios involving physical and cyber attacks on soft targets in the aforementioned smart cities. A soft target could be public space, which is currently vulnerable to attacks of all kinds. The demonstration events will demonstrate the effectiveness of the smart monitoring system by taking key measurements of city infrastructure (such as traffic, access to restricted areas, and evacuation routes), detecting explosives, cyber-attacks, and suspicious activity, and detecting explosives, cyber-attacks, and suspicious activity.

The Trikala pilot scenario will concentrate on two key soft targets: autonomous bus transportation and the park of Trikala municipal buildings.

These two scenarios will show how Digital Twins technology will handle crowd protection in public spaces or autonomous bus transportation infrastructure.

The Bilbao scenario will be based on detecting suspicious behavior, explosives, and directing people to a safe location. This scenario is based on the events of the 2017 Cambrils terrorist attack, in which members of a terrorist organization attacked several pedestrians on the street. On the same day, 100 kilometers away, another member drove a van into a crowd, killing 14 people and injuring many more. These dreadful scenarios can be avoided and avoided if detection systems are put in place.

The Malicious Actions Information Detection Systems will detect anomalies and illicit behaviors of various individuals or groups of people in various crowded places in a high risk area. The Augmented Context Management System will detect explosives and suspected armed attackers using augmented reality technology. Furthermore, the early detection and protection of cyber-attacks will be tested, with the goal of avoiding the loss of control over the scenario's information and systems.

The Pilsen demonstration will call for the evacuation of the football stadium. It can hold up to 15000 people, and with the surrounding area, which includes a pedestrian zone, park, and bus terminal, the number can be much higher.

The scenario focuses on crisis management at the stadium in the event of a terrorist attack or a toxic ammonia gas leak from a nearby brewery. Its main purpose is to safely evacuate people from the stadium and its surrounding areas.

Another data collection method that will be expanded in the S4ALLCities project is the use of fiber optic networks for communications, which are already prevalent in many urban areas.

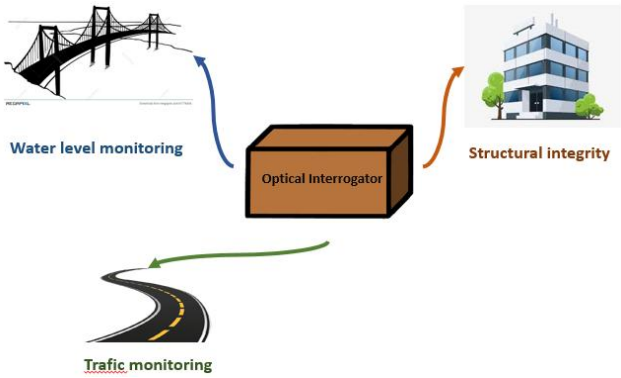

Fig. 5. Data collection using FBG

These can be used to transmit various low-data optical signals from various deployed sensors in critical infrastructure locations. Fibre Bragg Grating (FBG) sensors will be used, which have high accuracy at a low cost. (Fig. 5)

This System of Systems aims to achieve TRL-7 by the end of the project, demonstrating the S4ALLCities functionality to the appropriate end-users and stakeholders.

5. Conclusions

At the end of this paper, Smart Cities face challenges due to far too rapid change. The S4ALLCITIES project's solution optimizes solutions through modular systems, also known as digital twins. These digital twins aid in identifying potential risks in urban public spaces. They will be validated in three European cities for three months: Trikala (GR), Bilbao (ES), and Pilsen (PL) (CZ). They will measure the city's infrastructure, such as traffic and access to restricted areas, as well as detect potential explosions, cyber attacks, and suspicious activity.

Acknowledgements

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eWarranty, the solution for buyers, stores and services

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Abstract

Decision-makers in fields as diverse as industry and services face a number of challenges while working to develop safe, sustainable and environmentally friendly products. Identifying customer needs and ensuring excellent service are key decisive factors for success in almost all areas of business. Traditional services will be gradually replaced by state-of-the-art integrated e-commerce systems, which are not limited to creating catalogs with advanced search engines, offering solutions to much more complex problems, such as the one addressed in this presentation, respectively, the management, governance and analysis of large data used to ensure the guarantee of the quality of a purchased product or service. The purpose of this communication is to present an application, which is in the development phase, consisting of three interconnected software solutions that are individualized according to the beneficiary user, all based on an application that runs all the processes related to them. Therefore, the three "client" applications that will work on the principle of client-server applications are: Application for persons (customers) - intended for buyers; Application for stores - intended for shops that sell items with a warranty; Service application - for companies that service items under warranty. The problem that we want to solve through this application is the lack of an efficient and digital way to manage products with warranty, as well as the gap between the buyer, the trader and the service in tracking the life cycle of a product with warranty, from purchase to scrapping and recycling. eWarranty offers an innovative IT solution that is fast, secure, sustainable, and environmentally friendly. The new system is designed for the digital management of all data related to a guarantee, with a flexible architecture, allowing the adaptation of the system to other products, services, or other potential actors.

Keywords: *warranty, big data, services, smart people.*

1. Introduction

Decision-makers in fields as diverse as industry and services face several challenges while working to develop safe, sustainable, and environmentally friendly products. Identifying customer needs and ensuring excellent service are key decisive factors for success in almost all areas of business. The emergence of digital market services and IT systems also plays an important role for the consumer, not just for SMEs. Traditional services will be gradually replaced by state-of-the-art integrated e-commerce systems, which are not limited to creating catalogs with advanced search engines, offering solutions to much more complex problems, such as the one addressed in this presentation, respectively, the management, governance and analysis of large data used to ensure the guarantee of the quality of a purchased product or service.

The analysis of consumer behavior in the digital age is especially important because it incorporates customer requirements and preferences and contributes to the development of the marketing and advertising process, as well as to an efficiency of work in the right direction, customer satisfaction. Through the purchasing decision, consumers influence the sales and, even, the profile of a company and, therefore, any marketing and communication activity must be analyzed and carried out in relation to their needs. John Naisbitt [1] claims that the evolution of the world is towards globalization, the fragmentation of the market by economic systems proving to have a strong impact on the consumer, the concentration of marketing on economic poles with an emphasis on the digital sphere will become a necessity.

While in the past the focus was mainly on identifying socially conscious consumer characteristics, more recent work has been focused on identifying the underlying consumer motivation and satisfaction and explaining the relationship between cognitive or motivational factors and customer behavior [2].

The realization of eWarranty application started from the identification of a practical problem observed in the daily activity that has an impact on a very wide category of population: the difficulty of properly managing the different commercial or conformity guarantees related to the different products or services purchased. Currently, a wide range of products and services are sold accompanied by a commercial guarantee and compliance, according to the legislation in force. The practical problem arises when the buyer finds a technical or compliance problem and wants the warranty to be activated. At that time, often more than a year after purchasing the product, he must have at his disposal a whole series of documents, which are often difficult to find or reconstruct.

A different problem from the seller's point of view related to the management of the different commercial guarantees or conformity for the marketed products is that of the resources allocated to drawing up the necessary documents in the relationship with the customer. Given that some stores sell thousands of different products bearing warranty, from dozens of different manufacturers, they have to manage different warranty contracts, allocating for this staff and space for the management of a very large number of documents.

From the analysis of the applications identified so far, the vast majority are different forms of the same type of application: a digital wallet, in which the user

stores information about guarantees, the data entry being very different, from photos and scans to the manual entry of information. Another category of applications also performs related services, such as service, but only for certain products, being applications specific to a manufacturer and without the involvement of the sales service. A conclusion of the research carried out is that no other application has been identified with integrated functionalities such as buyer / trader / service similar or at least close to those targeted by this application.

eWarranty is a digital application intended for the three main actors: the consumer, the supplier of the guaranteed entity (the seller, manufacturer or service provider) and the specialist providing under warranty repairs, in order to ensure quick and efficient access for all those involved to all information on the warranty of a product, service or process, while generating a wide range of useful information on various commercial or technical aspects, based on the analysis of a large volume of data.

eWarranty offers a fast, safe, sustainable, and environmentally friendly innovative IT solution. The new system is designed for the digital management of all the data related to a guarantee, but the architecture is designed so as to be as flexible as possible, to allow the adaptation of the innovative system to other products or services, to add other potential players on the Romanian market and/ or to be extended to the European market.

The problem that the application aims to solve is the lack of an efficient and digital way to manage products with warranty, as well as the gap between buyer, merchant and service in tracking the life cycle of a product with warranty, from purchase to scrapping and recycling.

2. The solution

eWarranty is an information system for managing guarantees in a digital way, composed of the following applications:

- SaaS application running in the browser, with double role: used by traders to create and manage warranties, as well as to generate statistics on the products sold; used by technicians to create and manage service sheets, as well as to generate statistics on repaired products;
- Mobile app interconnected with the software as a service (SaaS) app, used by buyers to add and manage products with warranty;
- mobile application interconnected with the SaaS application, used by technicians to streamline the process of receiving / handing over a product with warranty.

The goal is for eWarranty to become the default way of managing products with warranty, an effective and environmentally friendly alternative to the traditional way using the printed invoice.

The platform has three types of commercial users, two of them also having an administrative role, defined as follows: 1. Buyer, 2. Trader, 3. Service.

2.1. The buyer

For the buyer-type user, who can be a natural or legal person, the framework has been created for him:

a) to be able to download and install the application for free from the Google Play or iTunes store, to manage the list of products with warranty;
b) to be able to easily create a list of purchased items under warranty, edit it and manage those items;
c) to be able to easily consult the status of guarantees within the validity period;
d) to have access to the necessary documents to activate a guarantee;
e) to have access to information about the courses of action for activating a guarantee;
f) to have access to information related to the objects in service.

How it works in brief: the user downloads and installs the application for free from the store of the device they have (Google Play or iTunes). Then, at any store that implements the system, upon completion of the purchase, according to the law, the user receives an invoice or an equivalent document, hereinafter generically called an invoice. On the invoice or separately on the seller's screen, together with the invoice, a QR Code is generated for scanning. The user opens the app and scans this QR Code, and all related information is automatically taken into their app in digital format, including the self-completed digital warranty form, invoice and tax receipt.

2.2. The trader

For the trader type user, the specific functionalities for three different roles are defined: user, manager and administrator. The trader type user has the possibility:

a) to define and edit warranties, manage the database of warranty-bearing products;
b) to define links between each product and its corresponding service procedure;
c) to interconnect the app with the seller's billing app;
d) to extract commercial information related to the products and the activation of their guarantees;
e) to manage the access codes of their own employees;
f) to have access to an interface through which a third-party application of the seller can do the management of the users of the application.

The application intended for the merchant is of the SaaS type and is offered for a fee to the stores willing to use. The application has a management module and a user one. The management module allows the seller to define and versionize guarantees (it can scan the model provided by the supplier and based on it can

define the fields that will be filled in automatically). Also, this module gives the possibility to establish the details related to the names and contacts of the companies that service the respective good or range of goods. The management module also shows statistics regarding the products sold as well as allows the management of the access accounts of the seller's employees (there is also an API through which a third-party application of the seller can manage the users of this application). The use module allows a commercial worker at the seller's guarantee office or even the person at the cashier to print the guarantee if desired (automatically filled in with all the necessary data).

2.3. The service

For the service user, the application has two components - a software as a service (SaaS) application that is offered for a fee to stores eager to use and an IN/ OUT application, mobile - interconnected with the SaaS application, which has the role of facilitating the entry and exit from the service based on QR code of an object. For the service application there are four types of actors: the user, the manager, the administrator and the technician.

The service has the possibility to:

a) be able to define and version the forms of the service sheets;
b) access statistics on serviced products;
c) access the history of serviced products;
d) manage the access codes of their employees;
e) have access to an interface through which a third-party app can manage the app's users;
f) allow employees to receive products for repairs;
g) allow employees to hand over the products brought for repairs.

The SaaS application has two modules: a management module and a use module. The management module gives the possibility of defining and versioning the forms of the service sheets (with the automatic retrieval through QR Code of the buyer's data). The management module also shows statistics on the products served as well as the management of the access accounts of the employees of the service (there is also an API through which a third-party application of the service can do the management of the users of this application). The use module gives the service employees the possibility to receive goods for repairs, write observations when taking over, research the repair history, write observations at the completion of the repair and issue a QR code with the exit from the service.

2.4. Server application

The Server application part that supports all other applications described is developed as a 3-tier distributed enterprise compliant application to be scalable and distributable. The application runs in real time and can be configured using fail-over mechanisms. The solution runs in an application server and connects to a database.

The platform guarantees stability for at least 1000 concurrent users and has a maximum performance of 5 seconds for accessing any functionality (except material or high volume data loading functionalities) under concurrent access conditions at full capacity if there is adequate network and hardware connection. The solution is an application that delivers access to data for Client applications in real time, capable of running scalably and distributed, guaranteeing operations performed in order of performance and without troublesome delays for end users.

The Server application as a whole is compatible with a wide range of operating systems and database types and can be installed on various server structures, depending on the use and the estimated number of users.

3. Conclusions

eWarranty is an application aimed equally at buyers and sellers. Using the application, buyers will have at their disposal a useful and fast tool for managing and using commercial guarantees for purchased items. For sellers, the application means a streamlining of the workflow and a saving of resources.

Acknowledgements

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The Role of Small Medical Units in a Smart City – The Case of Timisoara

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Abstract

Objectives: The present paper intends to analyze the challenges for medical services in this century from a Smart City perspective. Prior work: Smart City concepts have primarily addressed technical and infrastructural functions (e.g., urban transportation, energy, water supplies, etc.) and have less targeted medical institutions. However, any modern urban structure requires competent, technologically updated, and synchronized medical services for diverse communities. Approach: We start from the main differences between large and small medical units (e.g., urbanistic structure, specific services, networks, technological equipment) to analyze the position of small units within medical networks and the role of public agents in the optimal configuration of this system of services. We use the case of small clinics to study medical units from an inter-relational perspective by applying the concept of Grid to the offer of medical services. Results: In contrast to large medical institutions in a Smart City, small medical units show more flexibility by not requiring a long-term urbanistic restructuring of public services. While not covering the wide range of functions provided by large units, small clinics offer specialized services and provide patient monitoring and long-term medical assistance, contributing

greatly to patients' quality of life. Communication networks between units ensure patients' transition from large to small medical units. A Grid model can be applied to the present network to optimize medical functions by implementing new data collection systems. Implications: Inter-professional networks (e.g., between medical units, public beneficiaries, technological providers, and scientific researchers) are key to Smart City medical services. Accessing technological innovations (e.g., long-distance monitoring of physiological parameters, machine-learning systems, pattern recognition algorithms) will be a priority for small units. Value: The role of small medical clinics in a Smart City is analyzed within a Grid and linked to future challenges and technological advances.

Keywords: *Grid, urbanistic flexibility, long-term medical assistance, quality of life, technological equipment.*

1. Introduction

The concept of a Smart City is gradually becoming more popular in the modern world. An estimation by the UN stated that by 2050, approx. 70% of the world's population will live in cities [1]. Moreover, the latest COVID-19 pandemic has had a major impact on the general quality of life: the fact that the majority of infections occurred in urban areas [2] signaled the daily risks to residents' health and the need to improve living conditions, but also health monitoring, diagnostic and intervention methodologies.

In a Smart City, a sustainable digitalized infrastructure becomes key to offering its inhabitants better living and healthcare conditions. The Grid concept is used to represent complex interrelations between energy requirements and distribution, information communication and security, and sustainable pricing policies [3]. On the one hand, from the institutional perspective, a "smart grid" should contain integrated systems that allow data interoperability between healthcare systems, public safety, housing, social and emergency services, and transportation. On the other hand, from the public perspective, the functionality of a smart grid is ensured by several factors, such as health literacy, technological education for system navigation, access to information, and knowledge of rights and responsibilities [2].

While extensive research on Smart City topics focused on technical & infrastructural functions [2], [4], [5],[6], [7], there is an emergent interest in developing and studying smart solutions for healthcare system implementations [8], [9], [10]. Such solutions rely on affordable and effective technological innovations and inter-professional networks between researchers, healthcare providers (medical units), technological providers, and public beneficiaries. Several Smart Cities already exist in the world (e.g., Cascais in Portugal, Louisville in Kentucky, USA, and Kashiwanoha in Japan). In Romania, the first Smart Medical City – Enayati Medical City –was completed in 2021. The facility offers a wide range of medical services for patients of all ages, as well as collaborations with other medical units, research activity, and public dissemination of results.

A systematic review of the literature on healthcare applications in smart cities rendered several targeted domains, such as population surveillance, promoting and

supporting healthy lifestyles and active aging, organizing care services, emergency administration, and socialization [10]. The revised articles suggested technological applications for disease and accident surveillance and prevention, monitoring and improvement of environmental conditions and food quality, as well as promoting emotional and physical well-being. The proposed innovations included gamification endeavors, interactive platforms, tracking sensor implementations, personalized recommendations of exercises, and emergency management applications.

Other researchers have reviewed the implication of AI [11] and the Internet of Things (IoT) in Smart City healthcare systems [9], highlighting the importance of interoperability between medical units (i.e., reliance on blockchain technology, wireless sensor networks, and machine learning technology to access and exchange patient data between units and specialists). Implementing such technology is designed for diagnosis, health monitoring and prognosis, treatment of acute and chronic conditions, long-term outpatient care, and as an aid for complex decision systems in emergencies [9].

The introduction of technological advances lays a Smart City's foundation and contributes to the healthcare system (e.g., mobile sensors that offer remote measurements of bodily functions and ambient sensors to detect changes in the environment and keep optimal parameters) [8]. We start from the assumption that accessing technological innovations (e.g., long-distance monitoring of physiological parameters, machine-learning systems, pattern recognition algorithms) is mandatory for any medical unit in a Smart City. Reliance on a grid constitutes a prerogative for effective functioning in a Smart City. However, several challenges ensue from accessing novel technology, such as data privacy and security [12], accessibility and usability, and interconnectivity with other smart services [8], [13].

Apart from the challenges related to the inter-relational dynamics between various healthcare providers, special attention should also be paid to remote patient monitoring systems. We note the entry into the public health arena of new players, unencumbered by the rigors of the traditional medical establishment (e.g., telephone services, internet providers, providers of computer programs intended for remote monitoring of biological parameters), encouraged by the need for specialized data processing services. This picture also includes providers of patient management services and administrative follow-up programs. The power with which the new services and functions press on the medical functional ensemble forces the prefiguration of some general operation principles (e.g., Cyber Security, safety, private Life, protection of data, and interference of the state in individual life) that address both the current system and potential new systems. Therefore, a Smart City is not only an effort toward the optimal provision of quality public services but also a challenge that goes to the root of philosophical questions.

Most studies on the topic targeted complex medical facilities, so there is a lack of research concerning small healthcare facilities in a Smart City. Therefore, our objective is to highlight the role of small clinics in the service networks offered to citizens as well as the role of the rapidly evolving technological innovations in prefiguring the optimal functioning of this service system.

We will investigate medical units from an inter-relational perspective and apply the Grid concept to the offer of medical services. We will compare large medical units (regional hospitals, county hospitals, municipal hospitals) with

smaller medical units (dispensaries, associations of medical offices, polyclinics, private clinics) from the perspective of their infrastructure, specific functions, interrelations, and technological equipment.

2. Small Clinics in Timişoara – A case study

An online search of the current situation of small clinics in Timişoara identified 235 private and public medical units in contractual relation with CAS Timiş. These include individual practices, small clinics with restricted specializations, and units operating under the license of larger medical systems (e.g., Medlife, Medicis, Hyperdia). Faced with a continuously evolving technology, these units need to re-organize as the medical system advances and new technological opportunities become available.

Our objective is to answer the question of whether to allow this situation's natural development or filter it through theoretical principles of desirability (e.g., liberalism vs. coordinated development, data security and privacy, interference of the state in private affairs, etc.). In other words, should small clinics become engulfed by a continuously evolving city? Or can a Grid model be applied to sustain their partially autonomous functioning and ensure service interconnectivity in a Smart City?

To answer these questions, we analyze the role of small clinics in a Smart City from the perspective of infrastructural flexibility, specialization of medical services, inter-relations with other healthcare providers, and technical utilities.

2.1. Infrastructure

Large medical facilities and hospitals are complex systems that must function autonomously within an urban structure that, in turn, must make room to accommodate them. The hospital of the future is an autonomous mini city that includes its own medical buildings that serve patients and relatives (e.g., restaurants, cafeterias, chapels), administrative buildings, buildings that provide electricity, water, heating, medical equipment, intervention services, internal and external transport services, road systems, parking lots, rescue access areas, helicopter landing pads, etc. Large medical facilities force accessibility issues to be addressed. The hospital is an important node in the urban transportation system, the electricity or water supply system, etc.

In Timisoara, the main hospital is the County hospital (Timiş County Emergency Clinical Hospital-SCJUT). SCJUT assures all the emergency hospital services for Timis county and the region. Nevertheless, this hospital was erected in 1974 (totaling 1030 beds and 13 specialty clinics) and has been continuously functioning for almost half a century. Apart from the main building, a few new buildings were added in the last decades. Despite being the newest large hospital in Timisoara, it is far from complying with modern functional requirements (not enough parking place, no recreational or green areas, no circuits for families, no cafeteria, etc.)

Building a new large hospital to meet actual requirements is a huge endeavor. However, a new hospital must conform to the necessities of the future (50-100 years from now). Society’s high developmental rhythm makes it difficult to predict the

future needs of large medical units. Moreover, we expect a permanent delay or unconformity of large units with the needs of a continuously changing society. The example of the City Emergency Hospital in Timisoara shows how difficult it is to think, build and operationalize a large medical unit. The construction started before 2000 and stopped for two decades; now, it is being reconceptualized in a modern way. The estimated costs are 200-400 million euros [14]. On the other hand, small medical units seem more adaptable and flexible to changes.

While there is no single definition of standards required for large smart hospitals [15], there are several proposed urbanistic requirements [16]. The urbanistic infrastructure of the hospital of the future in a Smart City will comprise man-made facilities built on the inter-communication between various systems (e.g., energy, water supply, transportation, disaster-risk management, healthcare, information communication systems). Any hospital in a Smart City should comply with the United Nations' Sustainable Development Goals and be built within a Smart City platform. Such a platform contains three interfaces: the data acquisition interface relying on sensing and infrastructure providers, the interoperability interface relying on data and computation providers, and the services interface relying on services and application providers [16]. Based on this framework, smart hospitals should be built in a Smart City which resides and operates on the following infrastructures: energy, water supply, transportation, communication, disaster-risk prevention, cultural and sports, educational, social welfare, and healthcare infrastructures, which should all be managed through IoT and AI technologies [16].

With such extensive requirements, the "hospital of the future" could be an intangible objective for medium sizes cities like Timişoara (which totaled 306,615 inhabitants in 2022) or even for the entire Romanian social reality. Looking back to the last decade of the Communist era, constructing the House of Parliament took 17 years (a period that witnessed the fall of the Communist regime) and reached costs of about 4 billion euros. It also imposed significant urbanistic sacrifices on Romania's capital city, despite currently using only 30% of its capacity [17]. Such a project is just a small part of what a hospital of the future would represent.

Constructing the "hospital of the future" is a complex and difficult process that implies, among other aspects, populating the hospital with human resources of different specializations and competencies. Brain hunting (i.e., searching for qualified workforce – a mandatory requirement for a large hospital) is a time-consuming process that can be boosted by extremely attractive wage and salary policies. These, in return, can cause financial imbalances in the system (e.g., higher costs supported by the state and the community, inflation of costs expected to be absorbed in many years of functioning, or an influx of employees with insufficient training).

Moreover, the hospital of the future comprises various public health services in a single location that could be vulnerable to war, calamity, terrorist attacks, power breakdowns, etc. Such exposure to various adverse factors could contribute to the system's collapse. By contrast, considering a grid of small and medium-sized medical units as an alternative to large medical cities could offer other advantages, from easier management to better inter-collaboration for solving patients' problems.

Small medical facilities are much more flexible from an urbanistic standpoint. They do not necessarily impose a large-scale and long-term urban vision. They also

do not require rethinking the entire public service system, for instance, a special helipad or parking lots for thousands of cars. On the other hand, facilitating specialized training for the existing employees of small and medium-sized medical units could provide a more cost-effective alternative to brain hunting.

2.2. Functions

While large public institutions offer services in all medical specialties, small medical units are more specialized in certain medical services. Large units generally manage health problems in critical situations by offering emergency and intensive care services. They do not take over the follow-up activity and long-term surveillance healthcare procedures. Rather, patients' quality of life depends greatly on the long-term supervision and dispensarization procedures that are taken over by small medical units.

Small medical units usually have specific functions, specialized in sub-domains to satisfy the needs of various patient categories. For instance, the first MRI equipment in Timişoara was acquired in 1999 by Neuromed, a system of clinics specialized in medical imagistic services. Since then, other units have emerged, and the network of clinics has spread across the city. Figure 1 displays a segment of medical units selected by just one searching criterion ("medical units Timişoara").

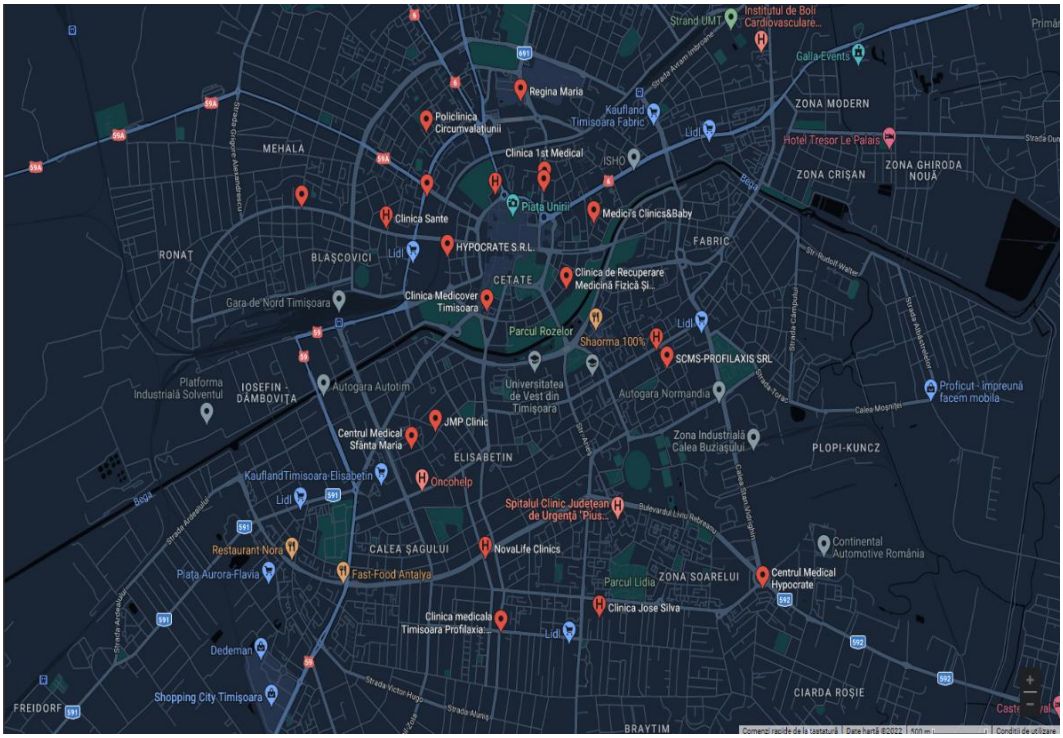

Fig. 1. An image of medical units dispersed in Timişoara
Source: Google Maps (28.11.2022)

2.3. Grid of interrelations

Looking at the current map of large and small medical facilities, we notice that they are dispersed throughout the urban structure. They partly work autonomously, but there are also predefined interrelations. For example, the imaging center or laboratory provides imaging or laboratory services to all other medical facilities, and the family doctor redirects patients for specialist consultations in other medical units. However, without the appropriate technology to facilitate data management, the collaboration between specialists is often hindered by spatial or technological constraints. As it is currently presented, a Grid model can be applied to this network for its optimization. Data collection and intervention systems are needed to optimize the medical service grid's functionality.

Rapid technological development also requires the increasing specialization of medical centers to accommodate and operate new technologies. Technological management is currently attributed to specialized units or laboratories rather than large medical institutions. For instance, controlled clinical trials on multiple sclerosis are carried out in specialized centers following strict protocols specialized for this disorder). By comparison, in a Smart City, patient tracking and monitoring technology will have to be managed by units specialized in collecting, storing, and processing data and all units involved in case management. Therefore, the inter-relations between units are key to better assistance of patients. In this regard, medical services are no longer localized but become “cross-border” in a Grid concept where specialists in different areas can collaborate on a patient’s case.

2.4. Technology

Before the COVID-19 era, the concept of telemedicine seemed distant. A version of remote medicine was practiced based on local sensors (e.g., an EKG performed by the family doctor, with the data collected and remotely interpreted by a specialist). The pandemic forced the appearance of telemedicine which involved other practical challenges, from the quality of the medical services to the weight that objective information has in the diagnostic process. In the COVID-19 era, collecting anamnestic information and performing remote clinical examinations became a priority among diagnostic modalities and overtook other objective data collection modalities (e.g., physical, imagistic, or biological assessment).

The remote tracking systems of patients and citizens represent an even more complicated issue. Currently, technology allows us to track the location, heart rate, electroencephalography, the patient's movements, the number of steps taken, the duration and quality of sleep, and many other parameters of interest. Such data will grow and will require more powerful analysis systems. New science will arise solely from tracking these medical sensors, collecting, organizing, and transmitting the data. Complex machine learning and pattern recognition systems will allow the anticipation of several medical events (e.g., the onset of atrial fibrillation and a possible stroke), as well as new intervention protocols corresponding to new nosological entities that will be identified through these systems. For instance,

advances in robotics could soon facilitate remote operation procedures carried out by robots who either assist or completely replace human surgeons or help patients in their daily functioning.

Machine learning technologies connected with sensors that collect information directly from patients could lead to the early diagnosis of neurodegenerative diseases (e.g., Alzheimer's dementia, Parkinson's disease). Therefore, the analysis of complex physiological, biological, verbal, para-verbal, and motor information collected from the patients and their environments could facilitate the recognition of crisis or emergency situations and the corresponding intervention methods. To this end, effective inter-relations between the individual medical units that assist patients and systems of collecting and transmitting patient-related information are essential [8], [13]. For instance, in Europe, a smart intervention system in emergencies relying on drones will be implemented in the Netherlands. In a traffic accident, the information is picked up by environmental and physical sensors and transmitted to nearby drones with various functions (e.g., intervention, blood analysis, etc.).

Healthcare monitoring and intervention technologies are reaching new performances in a rapidly evolving technological world. System interoperability within a grid seems key to their effective functioning. Nevertheless, several questions need to be answered within the current perspective: Who owns the electronic data collected from patients, and who has the right to transfer them: the patient? The technology provider? The data processing medical unit?

3. Conclusions

Small medical units are part of the medical system and are essential for supplying medical services. They cooperate with large and medium medical facilities to answer the specific or general needs of the patients. Optimal healthcare implies good functioning and an effective interplay of the „actors" involved in the process. This Grid interplay needs communication tools and flexibility to adapt to new challenges.

Nowadays, we note a fascination toward large medical units and ambition to build such mega hospitals. Still, we consider those just a segment of a medical system that must cooperate and compete for better services.

New technology, the nearby war, and the COVID-19 pandemic unraveled the fragilities of the accepted truth. New complex dynamics with many operants could be favored and envisaged. The technologies providers who are not restrained by the „Hippocratic oath" act following their economic interests in a free market. Some ethical limitations of health care providers are not applicable, and they develop fast, offering surprising solutions for medical use. Consequently, combining a free market for medical services and a centralized public healthcare system seems a convenient solution for the desired outcome.

The functioning of the medical Grid depends on data traffic and communication. Large amounts of data require continuous data management and quests to access information. We do not know yet who the data owner is: the

patient, the technology provider, or the medical unit. Nevertheless, the transparency of patients' medical data raises issues related to their right to privacy and intimacy. Questions like "How transparent should the data be?" still need to be answered.

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Accelerating innovation at the confluence of public, political, citizen interests

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Abstract

Could accelerating the best and highest quality innovation be the most effective strategy to drive sustainable growth? It tries to answer one of the great challenges of our time: what transformations will digital technology produce - from artificial intelligence to virtual reality - in social and political life, at the confluence of public, political, citizen interests? Analyzing how it can be used by the state and big technology companies with the aim of exercising control over people's lives and drawing inspiration from the millennial treasury of human thought, we try to challenge readers to review the meaning of concepts such as "democracy", "justice", "liberty" "equality", "power", "property". But sometimes or in such uncertain times, slowing down innovation can seem like an appropriate strategy. However, history shows us that accelerating relevant innovation is the best way to mitigate the consequences of any challenge. In this context, the Smart Cities International Conference (SCIC), 10th edition, 8 December 9 – 2022, with the provocative title Acceleration of innovation, organized by the Faculty of Public Administration within the National University of Political Studies and Public Administration, invites you with love to the 10th edition of the Smart Cities International Conference, motivated us to "innovate" at a higher level, to strengthen the value equation of the conference and to further stimulate the interest of the readers.

***Keywords**: accelerating innovation, artificial intelligence, challenges, public interest, rights and freedoms.*

1. Argument - warning: acceleration of innovation, steps towards the future or a return to the past?!

For our society, the year 2020 brought an unprecedented situation in a pandemic context never seen before by contemporaries. The danger of losing life and the fear of the unknown have determined and continue to determine a state of insecurity that fundamentally affects all areas of society. Of course, the sphere of law could not be avoided either, this very important field of society being seriously affected by all the measures that were taken to combat, limit and avoid the spread of the virus. This epidemiological challenge faced by humanity generated specific regulations but also highlighted the role of artificial intelligence, digitization, innovation, in general. Our work has been designed with an increased degree of accessibility and is intended for the public of any age and any intellectual, humanistic or scientific training, established specialists or young people at the beginning of their careers. It can also be used as didactic material in the university environment, with the aim of orienting and substantiating the taste for debate, practicing critical thinking, developing analytical capacity and showing the creative spirit. Analyzing the relationship between science and current technology acquisitions, we appreciate the fact that the products introduced to the market by hi-tech companies, in their vast majority, do not derive from scientific research, but above all from the induction of a consumer need. Technological innovations do not emphasize human or social requirements, but the consideration of increasing profit in an era where technological dependence has become a reality and man's relationship with nature is disturbed by the power that technology gives him, by the exponential growth of the population during the last decades and an obvious decline of spiritual values. The democratization of access to technological means and the lack of knowledge of their balanced use will generate the progressive alteration of material resources and may lead to the extinction of communities. A possible solution would be to reconsider the forms of learning and put the emphasis on educating citizens. This must be accompanied by the rational management of technology, the development of artificial intelligence in accordance with human values and the choice of progress solutions that capitalize on the moral perspective, opting in full knowledge between good and evil. From the beginning of the health crisis and now in full war at Romania's borders, actions dedicated to research should be intensified, with the aim of seeing how the pandemic influenced the acceleration of innovation, as well as its effects on people.

The exponential speed of technological innovation has made the analysis of trends in the field the main driver of studies about the future. However, we remained deficient in the analysis of social developments associated with technological progress. Studies on the cutting-edge fields that ensure competitiveness, as well as strategic studies dedicated to the legal field, reveal that technology has become essential, and man is the main problem. We have solutions that can help us solve the problems generated by overcoming the technological frontier, but we cannot say that we also have solutions to the problems of the beneficiaries of technology, the people. This is perhaps the most important battle in the near future - the re-settlement of technology in the world order on a lower circle

than man, an almost heroic recovery of the integralist vision of the known universe. His solution is one that completes the discourse on technology with a philosophical reflection on the man of the future. The synthesis of this solution, difficult to describe in a few words, is that man as a person, and not the consumer, needs his own evolution to respond to a highly technological future. The appeal to morality has an important role: "it is not possible for the lot of mankind to improve significantly until there is a significant change in the fundamental makeup of its way of thinking." So said the English philosopher John Stuart Mill in his Autobiography from 1873 [1]. The approach must be laborious, a true testing ground for the most significant effects of technologies on the state, democracy, justice and politics, but the real stake is to find the direction of change in the way of thinking and in society. It is not enough for the majority of citizens to have unrestricted access to the Internet and to have a high-performance smartphone. We must realize not only the fantastic power of technology that instantly integrates you into a civic or political platform of debate, but also the limits to which the digital framework established by manufacturers, internet providers and network administrators forces you. The more we use technology platforms to exercise our freedoms, the more we become constrained by technology. The more we use technology platforms to exercise our freedoms, the more we become constrained by technology. Also, online presence makes man the "study" object of technologies that monitor and evaluate him by collecting data about him. This informational integration is itself a form of power. It is for the first time in history that almost everything relevant about our lives and identity can be collected, analyzed and stored in the form of data. Even more important is another aspect. The more information available to government agencies and technology companies, the more personalized tools there are that can be used to impose third-party behaviors and goals on us. It should also not be ignored that the mere act of collecting data can act as a deterrent to certain types of behavior – if we know we are being tracked, we are more likely to discipline ourselves.

Furthermore, technologies have the ability to control our perception of the world. We increasingly rely on them to gather and select information that serves a wide variety of needs. And the dilemma that, from now on, we will encounter more and more often is that between my technologically mediated reality and the technologically mediated reality of others. From this dilemma it will be very easy to pass to another problem: what effect will the use of artificial intelligence algorithms to solve the social and political problems caused by the determination of our political priorities? An artificial intelligence democracy that imposes new rules on social debate is no longer a utopian and very distant goal. At the same time, however, it is a very strange and worrying prospect because it represents a radical mutation in our traditional way of being. "If politics is about the collective life of people - why we live together, how we organize and bind our collective life, how we could or should organize and bind this collective life differently - then any change in what it means being human is likely to have important political consequences. A world in which a class of "new demigods" appears, who will live alongside the ancient homo sapiens, is one in which the very notion of politics ceases to have a

clear or fixed meaning [2]." I hope that these lines and brief reflections to awaken your desire to participate in the debates about our future. In this sense, from the perspective of public and citizen interests, we will now address the issue of the influence of innovation in the legal and judicial system.

2. Acceleration of innovation and its impact on the legal and judicial system

What is the concrete impact of new technologies on the legal world in Romania? To quote a famous song, when we refer to a significant impact of new technologies in justice, I think we can say that "the best is yet to come". Moreover, the technologies that are new in the justice system are far from having a novelty character in society in general, so we could also have a discussion about what can be defined as new technology in the legal world. Let's not forget, however, that until not long ago, the only way we could send documents to the courts outside of working hours, in order to be considered to have been submitted on that day, was through the Romanian Post, communications by email or fax confirming the date of dispatch [3]. I believe that there is still no significant impact of new technologies on the legal professions in Romania, nor on the day-to-day activity of the professionals. However, if I look back I can't help but notice how my daily work as a lawyer has changed. First, it is now much easier to process and access a much larger number of documents. As a rule, as a lawyer in very high-volume files you have to access and process a huge number of documents. Whether we're talking about internal documents or the pieces of a large criminal investigation file, they can all now be stored on a secure cloud or server and accessed safely from your mobile phone, tablet or laptop from anywhere. Unfortunately, the lack of digitization of authorities, whether we are talking about prosecutors' offices, courts or other public authorities, discourages the adoption of new technologies by professionals in the legal world. Internal communication between the teams of lawyers or lawyer and client is increasingly based on new technologies, while interaction with the authorities is hampered by a lack of digitization. I know that these are not new technologies at the moment, but in order to be able to talk about new technologies it is essential that we first talk about digitization as a pillar of the development of new technologies [4].

Here we could talk about a series of changes brought recently in the practice of courts and prosecutors' offices in Romania, such as the use of the electronic file or correspondence carried out by email. Sure, they're not new technologies in 2021, but it seems the pandemic has led to their widespread acceptance and use nonetheless. Technology often simplifies and facilitates the work of those involved in the act of justice, including the work of lawyers. However, sometimes the imposition of certain methods of action (such as scheduling by email or through the programs made available by different courts for the registration of applications, the study of files, etc.) also creates some order that can even be considered counter-productive. If until now it was possible to study a file from one day to another, now these activities must be scheduled well in advance. Obviously, these aspects are not completely related to technology, but to the way in which we understand how to use it.

The pandemic has been a catalyst for some changes in the administration of justice, and I hope that the trend of improvements will continue. It would be regrettable to restore the previous situation from all points of view, including the technologies and good practices developed in the organization of justice, with the relaxation of the restrictions imposed by the pandemic. Until now, in our career or in our personal life, we have encountered applications or software that use Artificial Intelligence, but in the work of a lawyer, these software can be said to be largely absent, although they are extremely necessary. Empathy being a professional skill for me, always trying to think or understand the position of the one I interact with, I can say that when I use a software that uses AI and that software is still not very accurate, I always think that these technologies are at started and with time they can develop and be more and more useful. Just as computers were not the most useful tools in the 1990s and now they have become indispensable to anyone, whether we are talking about private or professional life, in the same way I believe that software using AI has the ability to become an ever-increasing support for us and maybe in a few years we will talk about addiction to them. Compared to their necessity in the activity of a lawyer, I think they can support the lawyer to study and identify the nerve points of a file, even if that file was composed of hundreds or thousands of volumes of two or three hundred pages of documents. And even if even now lawyers study the cases thoroughly and manage to formulate defenses, I think that the time required to actually study a case to formulate the best strategy could be greatly reduced. I can tell you that in a process reaction time is essential, sometimes even the best defense strategy, if applied too late, would no longer have any beneficial effect on the client's situation.

Humanity is now facing a global crisis. Perhaps the greatest crisis of our generation. The decisions that people and governments make in the next period will probably shape the world for years to come. They will shape not only our health systems, but also our economy, politics and culture. We must act quickly and decisively. We should also consider the long-term consequences of our actions. When choosing between alternatives, we should ask not only how to overcome the immediate threat, but also what kind of world we will live in once the storm passes. Yes, the storm will pass, humanity will survive, most of us will be alive – but we will live in a different world. Many short-term emergency measures will become the norm of life. This is the nature of emergencies. They rapidly advance historical processes. Decisions that would normally take years of deliberation are made in a matter of hours. Immature and even dangerous technologies are put into operation because the risks of doing nothing are greater. Entire countries serve as guinea pigs in large-scale social experiments. What happens when everyone works from home and only communicates remotely? What happens when entire schools and universities operate online? In normal times, governments, businesses and boards of education would never agree to carry out such experiments. But these are not normal times. In this time of crisis, we face two particularly important choices. The first is between totalitarian surveillance and citizen empowerment. The second is between nationalist isolation and global solidarity [4].

Turning from the past to the future, we must ask ourselves how the revolutionary digital technologies - information and communication technologies - will influence our political system. This is the question that is the basis of this book. We know that the effects of technology differ from place to place. The advent of printing in China and Korea, for example, did not cause the change determined by the advent of Gutenberg's printing press in Europe, where society was more prepared for a religious and political revolution. Such differences can be explained, as a rule, through the prism of economic and political circumstances. Who owns and controls a certain technology, how it is received by the public, whether its possible uses are considered in advance and whether it is directed towards a certain goal - all these will influence the impact of that technology. Therefore we should not jump to the conclusion that the development of a certain technology will inevitably or inexorably produce a certain social effect. Consider the Internet: because its network structure was suitable for a decentralized and non-hierarchical organization, many confidently predicted that "life" in the online environment would be quite different from that in the offline world. However, things did not stay that way. Thanks, in large measure, to the commercial and political world in which it emerged, the Internet has increasingly come under the coordination and control of large companies and political entities that track and influence our online experience. Furthermore, we cannot consider technology to mean progress. Exempi, gratia, Alfred Nobel, the inventor of dynamite, believed that his explosives would make people give up war more than "a thousand international conventions". The creator of the machine gun believed that his invention would "make war impossible". In the 1890s, in the early days of the telephone, AT&T's chief engineer announced that "one day we will build a world-wide telephone network that will unite all the people on Earth in one brotherly community." In 1912, still optimistic, Guglielmo Marconi, the inventor of the radio, announced that "the beginning of the age of wireless communication will make it impossible to start a war because war will become ridiculous." In 1917, Jules Verne declared that "the submarine can contribute to the complete cessation of hostilities because fleets will become useless and war will become impossible." Here all these creations, as well as the torpedo, the hot air balloon, toxic gases, land mines, rockets and laser weapons have been announced as inventions that will end all war. Which didn't happen. While Lenin described communism as "Soviet power plus electrification", Trotsky realized that technological progress is no guarantee of moral progress. "Next to the 20th century", he wrote, "the 10th or 13th century" coexists: A hundred million people use electricity, but continue to believe in the magical power of omens and exorcism [5].

A modern justice requires the implementation of modern management standards, able to provide quality and effectiveness to the act of justice. The realization of an efficient, accessible and quality act of justice, based on an integrated strategic management, requires a coherent and integrated approach to the needs of equipment, "upgrading" and, last but not least, it needs a vision that, taking into account the principles of independence and decentralization, to allow the concentration of resources, taking into account the fact that the implementation of IT solutions is a continuous process, which requires permanent adaptation and

renewal by reference to new technologies and emerging products [6]. Through the "Communication from the Commission to the European Parliament and the Council on the digitalization of justice in the European Union", from 2020, the European Commission set out to identify at the Union level the opportunities offered by digital technologies, in order to ensure easy access to justice and judicial cooperation effective cross-border [7]. Also, the document aimed to guide and coordinate a process at EU level to accelerate the digitization of judicial procedures, to promote the interoperability of different national systems and the adoption of new technologies in the day-to-day functioning of justice systems, with the consolidation of procedures in which The EU has competence, especially in cross-border cases. If the Strategy for the Development of the Judicial System 2015-2020 formulated as an objective the transition to the digitization of the judicial system, currently, it is necessary to complete this objective [8].

The realization of the digitalization of the judicial system cannot be put into practice without a prior digitalization of the Ministry of Justice and subordinate institutions, considering the legal attributions and competences of the ministry in the logistical aspects of the functioning of the judicial system. The strategic vision on the digitalization of the justice system, at the national level, should also take into account an effective management of the use of equipment and financial resources, because only through a unitary vision can both the directions of action and their integration in a single compatible system, used both by the judicial system and by the ministry and subordinate institutions. In order to achieve a modern digitization system, able to respond to challenges that take into account the evolution of society and EU legislation, it is necessary to establish/modernize data centers, facilitate remote work by adopting mobile computing solutions, implement integrated registration systems , management and archiving of documents, digitization of the existing and generable archival fund, implementation of dedicated IT systems for processing and management of classified information, integrated surveillance and access control systems, securing the stations and the book fund in digital format, including the automation of managerial processes in the field of administration of the judicial public service, through artificial intelligence mechanisms and the introduction of computer robots to carry out recurring activities [9].

With the increase in the volume of data and taking into account the specifics of the activity and the level of security, such as the risks of cyber attack, it is imperative to take measures aimed at cyber security as a priority. Currently, the justice system faces a relatively low level of automation of certain procedures (e.g., it is necessary to develop new document-generating templates, including some issued by courts and prosecutor's offices), while certain workflows are not supported by the current system (eg, a good part of the registers provided by the legislative framework) or do not benefit from adequate data validation procedures. The problems of the existing systems, from a technical point of view, are generated by an outdated architecture both in terms of system performance (e.g., inadequate reaction and response speeds at the level of courts/prosecutions with a high volume of activity, limitations in the use of certain functionalities such as predefined forms or types of functions for searching and displaying information, generating ad hoc reports for a large number

of records, using the report generator for institutions with several departments, respecting security rules, etc.), as well as its maintenance (e.g., implementing a relatively simple functionality requires disproportionate resources). The systems do not have a proper procedure for analyzing the functioning, identifying problems and their causes and developing solutions to solve them.

Currently, they represent a "mix" of functionalities and technologies, due to the outdated architecture and the multiple requirements introduced after the creation of these systems. In order to significantly improve performance, it would be necessary to redesign and rewrite the systems, using a unitary approach both from the point of view of functionalities and the technical solution, being necessary to adapt, modernize and expand the ECRIS electronic case management system, thus contributing to the achievement of the objectives of the Judicial System Development Strategy. In order to achieve these objectives, it is necessary to establish, at the level and through collaboration with all the institutions involved, the development needs of the system, so that it corresponds in a significant percentage to the current requirements of the judicial system, both from a technological point of view and and functional, with the subsequent establishment of state-of-the-art technologies, an IT&C system with an architecture based on services and layers, allowing the introduction of new functionalities to be done with minimal effort, ensuring a lifetime as long as possible of the system, under proper operating conditions.

Digitization has profound effects and is therefore coherently addressed at the level of all internal and external policies of the Union. The development of infrastructures, connectivity, user-centered services and protecting them all in times of crisis, together with the strengthening of regulations, investments, opportunities and impacts related to environmental and climate protection or sustainable development, as well as health, will play a important role. Building the right data ecosystem, according to the EU Commission's Data Strategy, will play a crucial role in how successfully Europe can shape the digital transformation. The stage and needs identified at the national level, as well as by the evolving European efforts, have outlined the EU guidelines regarding the digitalization of justice systems, constituting part of the new European impulse, an important objective foreseen among the political priorities of the Commission. In this sense, at the decision-making level, the need for digitization of justice was emphasized as representing an important condition for improving the quality of current systems, as well as the need for actions to be coordinated at the Union level, in order to effectively combat the COVID-19 pandemic and its consequences his [10]. And now the armed conflict in Ukraine.

3. Digitized justice: realities and perspectives

Some of our readers might be surprised by the optimistic tone of our more than optimistic statements about the use of artificial intelligence and digitization in our everyday lives. However, things are not quite like that, as anything man-made has advantages, some of its effects also produce risks. When dealing with digital

environments and the potential dangers they present, we must turn our attention not only to Google; nor can it simply be ignorance. Modern brain research shows that the widespread use of digital media is a serious cause for concern. Our brains are in a continuous process of change, from which it necessarily follows that the daily use of digital media cannot fail to have effects on us, the users. Digital media – computers, smart phones, game consoles and last but not least the television – are changing our lives. In the US, young people now spend more time on digital media – seven and a half hours a day – than they spend sleeping, according to a representative study of more than 2,000 children and young people between the ages of 8 and 18. In Germany, according to a survey of 43,500 students, ninth graders spend 7.5 hours a day on digital media, not including cell phones and MP3 players. That being the case, we find an alarm signal about digital dementia, a warning from Germany, from Manfred Spitzer, one of Germany's most famous neuroscientists, very involved in the debate about technology and education. He studied medicine, psychology and philosophy at the University of Freiburg, and is currently a professor of psychiatry at the University of Ulm, where he heads the University Psychiatric Clinic since 1997 and the Center for Neuroscience and Learning since 2004. He was twice visiting professor at Harvard University [11].

Another and more serious signal comes from here, in Romania, from the lawyer Gheorghe Piperea who, on a social network, draws attention to the fact that banks are preparing the introduction of digital currency issued by central banks. For the accuracy of the information, we reproduce the quote without interventions or comments. You, our readers, our judges, can do this. "Without wanting to annoy anyone, I'm highlighting a piece of news that slipped between the lines yesterday - that Romanian banks intend to abolish 3,000 ATMs. If implemented in a coordinated manner, the move will further reduce the circulation of peon money in the visible economy (with the consequence that circulation in the gray, non-visible economy will correspondingly increase). It is very likely that the coordinated cartel gesture of the banks comes in preparation for the imminent introduction of the digital currency issued by the central banks (CBDC - central bank digital currency), a totalitarian instrument through which we will be imprisoned in a global digital cage where everyone will sit , as in feudalism, on the bar corresponding to his social status. Each bee of the hive shall have the right to purchase with HIS money, obtained through HIS work/activity and taxed/taxed/penalized with amounts paid by HIM (to the state or state-approved corporation), only those products or services that he will allow the central bank. This horrible apartheid will be a simple matter, to be perfected from the buttons of the digital platform within which all our digital avatars (s.n) are stored and built from estimates of our behavior, made based on what we leave/upload on internet or in social networks every time we use them - and we do this with the awareness that our life is better, easier, more spectacular, and the decision belongs to us, not being manufactured, unconsciously, by the technological golem in which we were deep down With CBDC on the forehead, under the skin, in the smartphone, in the blood, we will no longer be able to buy or sell anything but what the beast will allow us, a beast whose mark we will be forced to wear everywhere, sleeping and waking, to work in the amphitheater or in the fields,

in the church or in the bodega. However, here is what art. 2191 paragraph 1 CCIV: "By setting up a deposit of funds with a credit institution, it acquires ownership of the sums of money deposited and is OBLIGED to return the same monetary quantity, of the same species, at the agreed term or, as the case may be, ANYTIME, at the depositor's request, in compliance with the notice period established by the parties or, failing that, by custom". Based on this legal text, all those who have money in the bank can request their withdrawal at any time, in full and in cash. The bank is obliged to return this money immediately - not to other bank accounts, but even in cash, at the counter. The bank may be forced to work with people and with physical money, at least to give us our money back, money on which they built their debt-money empire. Only if you have loose money can you do anything you want with it and buy anything with it without being forced to bear the mark of the Beast. Of course, you cannot make payments higher than 5 thousand lei per day - but who needs to consume 5000 lei per day?" [12]. There would be more to say about the criminal liability of artificial intelligence and the ethics of artificial intelligence [13]. All this and more in a future study. Now let's return to the subject of our scientific research endeavor, digital security, and discuss some topics that government officials should consider when planning or executing digital infrastructure upgrades. It's all too easy to focus on tackling each of these digital infrastructures separately—especially since the money often comes from a mission-focused funding source, in the case of a government agency that might distribute funds. Funds are expected to be spent by public administration officials or their private sector partners on distinct projects in specific infrastructures. Although this result is understandable, the adoption of such a narrow hierarchical vision generates a form of institutional myopia that limits the potential benefits that can be obtained from the unitary investment and the simultaneous modernization of several infrastructures. Can anyone predict how the 1956 bill that created the United States' interstate highway system will be useful and how the modernization of road infrastructure will transform the lives of Americans and even the landscape of the country. Digital technology evolves and improves rapidly, but physical infrastructure usually does not keep up. The largest city in Romania still uses water pipes that were installed in the 1960s. Unlike our personal electronics, where we routinely replace older products with new and improved ones, the infrastructure cannot simply remove and replace, so it is essential to consider the long-term implications of purchases. If you have a choice, instead of adding hardware that is difficult to upgrade later, opt for software-based solutions such as software-defined networking and cloud solutions. To the extent that the same capabilities can be achieved through either software-based or hardware-based solutions, software-based approaches can be updated and improved more quickly and affordably. The priorities for operational technologies in infrastructure are usually operational safety and reliability. Security is in third place. But cyber security must be included in any infrastructure project. Otherwise, not only is that infrastructure and its users vulnerable due to its interconnected nature, but we all become collectively vulnerable to cascading failures and consequences that can spread across sectors and regions.

For public/private entities modern infrastructure must be "smart". Disparate infrastructures should be able to communicate with each other, and funding agencies and infrastructure providers need to plan ahead for interoperability to avoid "siloed" solutions. Because threats can move across networks and to other networks, no infrastructure can afford to operate in an information vacuum, and cybersecurity plans must include threat intelligence sharing. You can't protect yourself against a threat you don't understand and can't see. Cyber attacks are inevitable, so infrastructure providers should be able to coordinate their responses to improve their ability to recover from them. Just as first responders from neighboring jurisdictions must be able to use common communications in the event of an emergency requiring a multi-jurisdictional response, it is easier to plan for front-line interoperability than to improvise during a crisis.

5. Conclusions

Innovation is the basis of all developed societies of the 21st century. Today, Romania is part of the European Union, one of the most innovative and dynamic communities worldwide. Moreover, innovation has become the differentiator in today's competitive landscape. Old solutions are no longer always applicable, and political decision-makers must quickly implement new ideas and solutions to remain competitive and relevant to their citizens. The innovation process is present in all fields and requires a thorough understanding on the part of public and private entities and innovation has become the element of synergy between the private, public and academic environments. In order to have a sustainable development, Romania must focus primarily on innovation in education, according to the answers of 49.2% of those surveyed, more precisely, in new education models, new subjects, methodologies adapted and converging to digitalization trends. In second place (20.6%) respondents selected technological innovation (using new technologies to create new products). The third place is occupied by the innovation of continuous improvement of organizational processes (15.9%), and the last place, with a percentage of 14.3%, is the radical innovation in business (new products, new types of services) . The innovative element within the educational system is seen by the majority of respondents as relatively low (32.8%). 24.6% believe that innovation is present in the educational system in Romania, while 21.3% believe that it is not present at all [14].

At the same time, the new innovation model - innovation-as-a-service - proposes a pragmatic process for the future and in the context of geopolitical tensions and the health crisis, it represents good news for society in order to reach a substantial development threshold. The direct benefit of innovation-as-a-service is to reduce the complexity of innovation so that teams can focus on the core competencies that have brought the organization success so far: generating new ideas, being present in the market, keeping in touch with customers . Innovation-as-a-service reduces, and in some cases eliminates, the effort and cost of building a team. Currently, it is no longer possible to discuss innovation without the involvement of elements of sustainability, which has become a priority field in

Romania. Innovation processes, in addition to the fact that they must improve operations and make them more efficient, must ensure that they also involve the element of sustainability, both financially, socially, climatically, and from the point of view of responsibility for those present but also for generations . Likewise, the same significant majority is maintained when it comes to the potential impact that innovation-as-a-service can have on the public environment, with the aim of accelerating certain processes with added value for citizens. So in the public domain this new service can be a real help.

Digital innovation has the potential to radically improve people's lives and help drive development. In addition, this pandemic has forced all of us, in all fields, to get out of our comfort zone, to adapt to the new situation generated by social restrictions and to find ways to continue functioning coherently and effectively. Society cannot stagnate from any point of view, especially in the legal field and their way of solving, justice being the regulator of society. In trials, virtual hearings have become the new normal, and it remains to be seen whether the situation will remain that way. But we can predict that this benefit will remain earned, it is a tested possibility that has proven useful, functional and advantageous from various points of view, within the reach of those who want it, which can be quite easily adopted. Courts have had, and still have, the mission of being trend-setters in implementing the most modern means of carrying out procedures that meet user requirements. However, it is important to differentiate between different types of virtual hearings, complete or hybrid, dedicated to a certain procedural stage, which in a post-pandemic world can be harmoniously combined and used so that the arbitration can only benefit. For any form of virtual hearings, the participants together with the court are required to evaluate the applicable law and rules, in order to respect the parties' right to a fair trial and all procedural principles governing a fair trial. In the light of the recent adoption of new procedural rules by the majority of courts, which would provide openness and ensure the normative framework necessary for the use of these modern methodologies for conducting trials, the application of new technologies will become the habit and the organization of a virtual hearing will become more and more easier and used. Of course, not without weighing the advantages/risks of such a measure, according to the particular circumstances of each individual case. Certainly, the fact that many national courts are developing experience with remote hearings is an opportunity that should be cherished and taken advantage of, as it allows participants in the administration of justice to increase their set of tools and modern technologies to find the most suitable solution for each case.

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Accelerarea inovaţiei la confluenţa intereselor publice şi cetăţeneşti – cu privire deosebită asupra lumii juridice din România

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Abstract

Oare accelerarea inovaţiei superioare şi de cea mai bună calitate poate fi cea mai eficientă strategie pentru a stimula creşterea sustenabilă? Încearcă ea să răspundă la una dintre marile provocări ale timpului nostru: ce transformări va produce tehnologia digitală – de la inteligența artificială la realitatea virtuală – în viața socială și politică, la confluența intereselor publice, politice, cetățenești? Analizând felul în care ea va putea fi întrebuințată de stat și de marile companii de tehnologie cu scopul de a exercita controlul asupra vieții oamenilor și inspirându-ne din tezaurul milenar al gândirii umane, încercăm să-i provoacăm pe cititori să revizuiască semnificația unor concepte precum „democrație", „dreptate", „libertate" „egalitate", „putere", „proprietate". Însă, uneori ori, în astfel de vremuri marcate de incertitudine, încetinirea inovării poate părea o strategie adecvată. Cu toate acestea, istoria ne arată că accelerarea inovaţiei relevante este cea mai bună cale de atenuare a consecinţelor oricărei provocări. În acest context, Conferința Internațională Smart Cities (SCIC), ediția a 10-a, 8 decembrie 9 – 2022, cu titlu provocator, Accelerarea inovației, organizată de Facultatea de Administrație Publică din cadrul Universității Naționale de Studii Politice și Administrație Publică, vă invită cu drag la cea de-a X-a ediție a Conferinței Internaționale Smart Cities, ne-a motivat să „inovăm" și noi la un nivel superior, pentru a consolida ecuaţia valorică a conferinței și pentru a stimula și mai mult interesul cititorilor.

Cuvinte cheie: *accelerarea inovaţiei, inteligența artificială, provocări, interes public, drepturi și libertăți.*

1. Argument – avertisment: accelerarea inovației, pași spre viitor sau întoarcere în trecut?!

Pentru societatea noastră anul 2020 a adus o situație inedită într-un context pandemic nemaiîntâlnit până acum de către contemporani. Pericolul pierderii vieții dar și frica de necunoscut au determinat și determină în continuarea o stare de nesiguranță ce se repercutează fundamental în toate domeniile societății. Bineînțeles că nici sfera dreptului nu putea să fie evitată, acest domeniu foarte important al societății fiind grav afectat prin toată măsurile ce au fost luate pentru combaterea, limitarea și evitarea răspândirii virusului. Această provocare epidemiologică cu care s-a confruntat umanitatea a generat reglementări specifice dar a reliefat și rolul inteligenței artificiale, al digitalizării, al inovației, în general. Lucrarea noastră a fost gândită cu un grad sporit de accesibilitate și este destinată publicului de orice vârstă și de orice formare intelectuală, umanistă ori științifică, specialiști afirmați sau tineri aflați la început de carieră. Ea poate fi utilizate inclusiv ca material didactic în mediul universitar, cu scopul de a orienta și a fundamenta gustul pentru dezbatere, exersarea gândirii critice, dezvoltarea capacității analitice și manifestarea spiritului creativ. Analizând raportul dintre știință și achizițiile actuale ale tehnologiei apreciem faptul că produsele introduse pe piață de companiile *hi-tech*, în marea lor majoritate, nu derivă din cercetarea științifică, ci mai ales din inducerea unei nevoi de consum. Noutățile tehnologice nu pun accent pe cerințele umane sau sociale, ci pe considerentul măririi profitului într-o eră în care dependența tehnologică a devenit o realitate iar relația omului cu natura este perturbată de puterea pe care i-o conferă tehnologia, de creșterea exponențială a populației în decursul ultimelor decenii și de un declin evident al valorilor spiritului. Democratizarea accesului la mijloacele tehnologice și lipsa cunoștințelor de utilizare echilibrată a acestora vor genera alterarea progresivă a resurselor materiale și pot conduce extincția comunităților. O posibilă soluție ar fi reconsiderarea formelor învățării și punerea accentului pe educarea cetățenilor. Aceasta trebuie însoțită de managementul rațional al tehnologiei, de dezvoltarea inteligenței artificiale în concordanță cu valorile umane și de alegerea unor soluții de progres care valorifică perspectiva morală, optând în deplină cunoștință între bine și rău. De la începutul crizei sanitare și acum în plin război la granițele României, ar trebui intensificate acțiunile dedicate cercetării, cu scopul de a vedea modul în care pandemia a influențat accelerarea inovației, precum și efectele acesteia asupra oamenilor.

Viteza exponențială a inovării tehnologice a făcut din analiza tendințelor în domeniu motorul principal al studiilor despre viitor. Am rămas însă deficitari la analiza evoluțiilor sociale asociate progresului tehnologic. Studiile privind domeniile de vârf care asigură competitivitatea, ca și studiile strategice dedicate domeniului juridic relevă faptul că tehnologia a devenit esențială, iar omul constituie problema principală. Avem soluții care ne pot ajuta să rezolvăm problemele generate de depășirea frontierei tehnologice, însă nu putem spune că avem soluții și la problemele beneficiarilor tehnologiei, oamenii. Aceasta este, probabil, cea mai importantă bătălie în viitorul apropiat – reașezarea tehnologiei în ordinea lumii pe un cerc inferior omului, o recuperare aproape eroică a viziunii integraliste despre universul cunoscut. Soluția sa este una care întregește discursul despre tehnologie

cu o filosofică reflecţie despre omul viitorului. Sinteza acestei soluţii, greu de descris în câteva cuvinte este aceea că omul ca persoană, şi nu consumatorul are nevoie de propria evoluţie care să răspundă unui viitor puternic tehnologizat. Recursul la morală are un rol important: „nu este cu putinţă ca soarta omenirii să se îmbunătăţească semnificativ până când nu are loc o schimbare semnificativă în alcătuirea fundamentală a modului ei de gândire." Aşa spunea filosoful englez John Stuart Mill în Autobiografia sa de la 1873 [1]. Abordarea trebuie să fia laborioasă, adevărat poligon de testare a celor mai semnificative efecte ale tenologiilor asupra statului, democraţiei, justiţiei şi politicii, însă miza reală este aceea de a găsi direcţia schimbării în modul de gândire şi în societate. Nu este de ajuns ca majoritatea cetăţenilor să aibă acces neîngrădit la internet şi să dispună de un smartphone performant. Trebuie să conştientizăm nu doar puterea fantastică a tehnologiei care te integrează instantaneu într-o platformă civică sau politică de dezbatere, ci şi limitele la care te obligă cadrul digital stabilit de producători, de furnizorii de internet şi de administratorii reţelei. Cu cât folosim mai mult platformele tehnologice pentru a ne exercita libertăţile, devenim mai constrânşi de tehnologie. De asemenea, prezenţa on-line îl face pe om obiectul de „studiu" al unor tehnologii care îl monitorizează şi îl evaluează culegând date despre el. Această integrare de natură informaţională este ea însăşi o formă de putere. Este pentru prima oară în istorie când aproape tot ceea ce este relevant despre viaţa şi identitatea noastră poate fi strâns, analizat şi stocat sub forma datelor. Şi mai important este un alt aspect. Cu cât există mai multe informaţii la dispoziţia agenţiilor guvernamentale şi companiilor de tehnologie, cu atât există mai multe instrumente personalizate care pot fi întrebuinţate pentru a ni se impune comportamente şi obiective ale unor terţe părţi. Nu trebuie ignorat nici faptul că simplul act de strângere a datelor poate reprezenta un mijloc de descurajare a anumitor tipuri de comportament – dacă ştim că suntem urmăriţi, este mai probabil să ne disciplinăm.

În plus, tehnologiile au capacitatea să controleze percepţia noastră asupra lumii. Ne bazăm din ce în ce mai mult pe ele pentru a aduna şi a selecta informaţii care servesc unor necesităţi dintre cele mai diverse. Iar dilema de care, de acum încolo, ne vom lovi din ce în ce mai des este cea dintre realitatea mea mediată tehnologic şi realitatea mediată tehnologic a altora. De la această dilemă se va trece foarte uşor la o altă problemă: ce efect va avea folosirea algoritmilor de inteligenţă artificială meniţi să rezolve problemele sociale şi politice provocate de determinarea priorităţilor noastre politice? O democraţie a inteligenţei artificiale care să impună reguli noi dezbaterii sociale nu mai este un obiectiv utopic şi foarte îndepărtat. În acelaşi timp însă, este o perspectivă foarte stranie şi îngrijorătoare pentru că reprezintă o mutaţie radicală în modul nostru tradiţional de a fi. „Dacă politica are legătură cu viaţa colectivă a oamenilor – de ce trăim împreună, cum organizăm şi cum închegăm viaţa noastră colectivă, în ce mod am putea sau ar trebui să organizăm şi să închegăm altfel această viaţă colectivă – atunci orice schimbare a ceea ce înseamnă să fii om va avea probabil consecinţe politice importante. O lume în care îşi face apariţia o clasă de «noi semizei», care vor trăi alături de vechii homo sapiens, este una în care însăşi noţiunea de politică încetează să mai aibă un înţeles clar sau fix [2]." Sper ca aceste rânduri şi reflecţii sumare să vă trezească dorinţa de

a participa la dezbaterile cu privire la viitorul nostru. În acest sens, din perspectiva intereselor publice şi cetăţeneşti vom aborda acum problematica influenţei inovaţiei în sistemul juridic şi judiciar.

2. Accelerarea inovaţiei şi impactul aceteia asupra sistemului juridic şi judiciar

Care este impactul concret al noilor tehnologii asupra lumii juridice din România? Ca să citez o celebră melodie, când ne referim la un impact semnificativ al noilor tehnologii în justiţie cred că putem spune că „the best is yet to come". De altfel, tehnologiile care sunt noi în sistemul de justiţie sunt departe de a avea un caracter de noutate în societate în general, deci am putea purta o discuţie şi despre ceea ce poate fi definit ca tehnologie nouă în lumea juridică. Să nu uităm totuşi că până nu cu mult timp în urmă, singura modalitate în care puteam trimite documente către instanţe în afara orelor de lucru, pentru a se considera a fi fost depuse în ziua respectivă, era prin intermediul Poştei Române, nefiind acceptate comunicările prin email sau fax care să ateste data expedierii [3].

Consider că încă nu se resimte în mod semnificativ un impact al noilor tehnologii asupra profesiilor juridice din România şi nici asupra activităţii de zi cu zi a profesioniştilor. Cu toate acestea, dacă aş privi retrospectiv nu aş putea să nu observ cum s-a schimbat activitatea mea zilnică ca avocat. În primul rând, acum este mult mai facilă procesarea şi accesarea unui număr mult mai mare de documente. De regulă, ca avocat în dosare foarte mari ca volum trebuie să accesezi şi să procesezi un număr imens de documente. Fie că vorbim de documente interne sau piesele unui dosar mare de urmărire penală, toate acestea pot fi stocate acum pe un cloud sau server securizat şi accesate în siguranţa de pe telefonul mobil, tabletă sau laptop de oriunde. Din păcate, lipsa digitalizării autorităţilor, fie că vorbim de parchete, instanţe sau alte autorităţi publice, descurajează adoptarea noilor tehnologii de către profesioniştii din lumea juridică. Comunicarea internă între echipele de avocaţi sau avocat şi client se bazează tot mai mult pe noile tehnologii, pe când interacţiunea cu autorităţile este îngreunată din cauza unei lipse a digitalizării. Ştiu că acestea nu sunt noi tehnologii în acest moment, însă pentru a putea vorbi despre noi tehnologi este esenţial ca în prealabil să vorbim de digitalizare ca pilon al dezvoltării noilor tehnologii [4].

Aici am putea vorbi despre o serie de modificări aduse în ultimul timp în practica instanţelor şi parchetelor din România, precum utilizarea dosarului electronic sau corespondenţa purtată prin email. Sigur, ele nu sunt noi tehnologii raportat la anul 2021, dar se pare că pandemia a dus totuşi la acceptarea şi utilizarea lor pe scară largă. Tehnologia simplifică şi înlesneşte de cele mai multe ori munca celor implicaţi în actul de justiţie, inclusiv munca avocaţilor. Cu toate acestea, uneori impunerea anumitor modalităţi de acţiune (precum programarea prin email sau prin intermediul programelor puse la dispoziţie de diferite instanţe pentru înregistrarea de cereri, studiul dosarelor, etc.) creează şi o oarecare ordine ce poate fi considerată inclusiv contra-productivă. Dacă până acum exista posibilitatea studiului unui dosar de pe o zi pe alta, acum aceste activităţi trebuie programate cu

mult înainte. Evident, aceste aspecte nu sunt complet legate de tehnologie ci de modalitatea în care noi înţelegem să ne folosim de aceasta.

Pandemia a avut un rol catalizator cu privire la unele schimbări în administrarea justiţiei şi sper să se continue tendinţa îmbunătăţirilor. Ar fi regretabilă o restabilire a situaţiei anterioare din toate punctele de vedere, inclusiv a tehnologiilor şi a bunelor practici dezvoltate în organizarea justiţiei, odată cu relaxarea restricţiilor impuse de pandemie. Până acum, în carieră sau în viaţa personală, ne-am întâlnit cu aplicaţii sau softuri care folosesc Inteligenţa Artificială, însă în activitatea de avocat aceste softuri pot spune că sunt în mare parte absente, deşi sunt extrem de necesare. Empatia fiind o deprindere profesională pentru mine, mereu încercând să gândesc sau să înţeleg şi poziţie celui cu care interacţionez, pot spune că atunci când folosesc un soft care foloseşte AI şi acel soft încă nu este foarte precis, mă gândesc mereu că aceste tehnologii sunt la început şi cu timpul se pot dezvolta şi să fie tot mai utile. Aşa cum computerele nu erau cele mai utile instrumente prin anii 1990 şi acum au devenit indispensabile oricărei persoane, indiferent că vorbim de viaţa privată sau profesională, la fel cred că softurile care folosesc AI au capacitatea să devină un sprijin tot mai mare pentru noi şi poate peste câţiva ani o sa vorbim despre dependenţa faţă de ele. Raportat la necesitatea lor în activitatea unui avocat, cred că ele pot sprijini avocatul să studieze şi să identifice punctele nevralgice ale unui dosar, chiar dacă acel dosar ar fi compus sute sau mii de volume a câte două sau trei sute de file de documente. Şi chiar dacă şi în acest moment avocaţii studiază temeinic dosarele şi reuşesc să formuleze apărări, consider că timpul necesar studierii efective a unui dosar pentru a formula cea mai bună strategie ar putea scădea considerabil. Pot să vă spun că într-un proces timpul de reacţie este esenţial, câteodată şi cea mai bună strategie de apărare, dacă este aplicată prea târziu, nu ar mai avea niciun efect benefic pentru situaţia clientului.

Omenirea se confruntă acum cu o criză globală. Poate cea mai mare criză a generaţiei noastre. Deciziile pe care oamenii şi guvernele le vor lua în următoarea perioadă vor contura, probabil, lumea anilor următori. Ele vor contura nu doar sistemele noastre de sănătate, ci şi economia, politica şi cultura. Trebuie să acţionăm rapid şi decisiv. De asemenea, ar trebui să luăm în considerare consecinţele pe termen lung ale acţiunilor noastre. Atunci când alegem între alternative, ar trebui să ne întrebăm nu numai cum să depăşim ameninţarea imediată, ci şi în ce fel de lume vom locui odată ce trece furtuna. Da, furtuna va trece, omenirea va supravieţui, majoritatea dintre noi vom fi în viaţă – dar vom trăi într-o lume diferită. Multe măsuri de urgenţă pe termen scurt vor deveni o normă de viaţă. Aceasta este natura situaţiilor de urgenţă. Ele avansează rapid procesele istorice. Deciziile care în timp normal ar putea dura ani de deliberare sunt adoptate în câteva ore. Tehnologiile imature şi chiar periculoase sunt puse în funcţiune, deoarece riscurile de a nu face nimic sunt mai mari. Ţări întregi servesc de cobai în experimente sociale la scară largă. Ce se întâmplă când toată lumea lucrează de acasă şi comunică doar la distanţă? Ce se întâmplă când întregi şcoli şi universităţi funcţionează online? În timp normal, guvernele, întreprinderile şi consiliile de învăţământ nu ar fi niciodată de acord să efectueze astfel de experimente. Dar nu sunt vremuri normale. În această perioadă de criză, ne confruntăm cu două alegeri deosebit de importante.

Prima este între supravegherea totalitară și împuternicirea cetățenilor. A doua este între izolarea naționalistă și solidaritatea globală.[4]

Întorcându-ne din trecut spre viitor, trebuie să ne întrebăm cum vor influența tehnologiile digitale revoluționare – tehnologiile informației și comunicațiilor – sistemul nostru politic. Iată întrebarea care stă la baza acestei cărți. Știm că efectele tehnologiei diferă de la un loc la altul. Apariția tehnicii tiparului în China și Coreea, de exemplu, nu a provocat schimbarea determinată de apariția tiparului lui Gutenberg în Europa, unde societatea era mai pregătită pentru o revoluție religioasă și politică. Asemenea diferențe se pot explica, de regulă, prin prisma împrejurărilor economice și politice. Cine deține și controlează o anumită tehnologie, modul în care aceasta este primită de public, dacă posibilele ei întrebuințări sunt avute în vedere dinainte și dacă ea este direcționată spre un anumit scop – toate acestea vor influența impactul tehnologiei respective. Prin urmare ar trebui să nu ne pripim trăgând concluzia că dezvoltarea unei anumite tehnologii va produce în mod inevitabil sau implacabil un anumit efect social. Să ne gândim la internet: fiindcă structura sa de rețea era potrivită pentru o organizare descentralizată și neierarhizată, mulți au prezis, plini de încredere, că „viața" în mediul on-line va fi destul de diferită de cea din lumea off-line. Lucrurile nu au stat însă chiar așa. Datorită, în mare măsură, lumii comerciale și politice în care și-a făcut apariția, internetul a intrat din ce în ce mai mult sub coordonarea și controlul marilor companii și al entităților politice care ne urmăresc și ne influențează experiența on-line. În plus, nu putem să considerăm că tehnologia înseamnă progres. *Exempi, gratia*, Alfred Nobel, inventatorul dinamitei, credea că explozivii lui îi vor face pe oameni să renunțe la război mai mult decât „o mie de convenții internaționale". Creatorul mitralierei considera că invenția lui va „face imposibil războiul". În anii 1890, în zilele de început ale existenței telefonului, inginerul-șef al companiei AT&T anunța că, „într-o zi, vom construi o rețea mondială de telefonie care îi va uni pe toți oamenii de pe Pământ într-o comunitate frățească". În 1912, încă optimist, Guglielmo Marconi, inventatorul radioului, a anunțat că „începutul epocii comunicării fără fir va face imposibilă declanșarea unui război fiindcă războiul va deveni ridicol". În 1917, Jules Verne declara că „submarinul poate contribui la încetarea completă a luptelor pentru că flotele vor deveni inutile, iar războiul va deveni imposibil". Iată că toate aceste creații, precum și torpila, balonul cu aer cald, gazele toxice, minele terestre, rachetele și armele cu laser au fost anunțate ca invenții care vor duce la încetarea oricărui război. Ceea ce nu s-a întâmplat. Pe când Lenin descria comunismul drept „puterea sovietică plus electrificare", Troțki și-a dat seama că progresul tehnologic nu reprezintă o garanție a progresului moral. „Alături de secolul al XX-lea", scria el, conviețuiește „secolul al X-lea sau al XIII-lea": O sută de milioane de oameni folosesc electricitatea, dar continuă să creadă în puterea magică a semnelor prevestitoare și a exorcismului [5].

3. Justiția digitalizată: realități și perspective

O justiție modernă presupune implementarea unor standarde de management modern, apte să ofere calitate și eficacitate actului de justiție. Realizarea unui act de justiție eficient, accesibil și de calitate, bazat pe un management strategic integrat,

presupune o abordare coerentă şi integrată a necesităţilor de dotare, „upgradare” şi, nu în ultimul rând, are nevoie de o viziune care, ţinând seama de principiile independenţei şi al descentralizării, să permită concentrarea resurselor, ţinând seama de faptul că implementarea soluţiilor IT este un proces continuu, care necesită o permanentă adaptare şi înnoire prin raportare la noile tehnologii şi produse apărute [6]. Prin „Comunicarea Comisiei către Parlamentul European şi Consiliu privind digitalizarea justiţiei în Uniunea Europeană”, din 2020, Comisia Europeană şi-a propus să identifice la nivelul Uniunii oportunităţile oferite de tehnologiile digitale, în vederea asigurării unui acces facil la justiţie şi a unei cooperări judiciare transfrontaliere eficiente [7]. De asemenea, documentul a avut ca scop orientarea şi coordonarea unui proces la nivelul UE pentru a accelera digitalizarea procedurilor judiciare, pentru a promova interoperabilitatea diferitelor sisteme naţionale şi adoptarea noilor tehnologii în funcţionarea de zi cu zi a sistemelor de justiţie, cu consolidarea procedurilor în care UE are competenţă, în special în cazurile transfrontaliere. Dacă Strategia de dezvoltare a sistemului judiciar 2015-2020 a formulat ca obiectiv trecerea la digitizarea sistemului judiciar, în prezent, este necesară finalizarea acestui obiectiv [8].

Realizarea digitalizării sistemului judiciar nu poate fi pusă în practică fără o digitalizare prealabilă a Ministerului Justiţiei şi a instituţiilor din subordine, având în vedere atribuţiile şi competenţele legale ale ministerului în aspectele logistice ale funcţionării sistemului judiciar. Viziunea strategică asupra digitalizării sistemului de justiţie, la nivel naţional ar trebui să aibă în vedere şi o gestionare eficientă a utilizării echipamentelor şi resurselor financiare, deoarece numai printr-o viziune unitară, se pot stabili atât direcţiile de acţiune, cât şi integrarea acestora într-un singur sistem compatibil, utilizat atât de către sistemul judiciar, cât şi de minister şi instituţiile subordonate. Pentru realizarea unui sistem modern de digitalizare, apt să răspundă provocărilor care ţin seama de evoluţia societăţii şi deopotrivă de legislaţia UE, este necesară înfiinţarea/modernizarea centrelor de date, facilitarea muncii de la distanţă prin adoptarea soluţiilor de calcul mobile, implementarea sistemelor integrate de înregistrare, management şi arhivare a documentelor, digitizarea fondului arhivistic existent şi generabil, implementarea sistemelor informatice dedicate de prelucrare şi gestionare a informaţiilor clasificate, sisteme integrate de supraveghere şi control acces, asigurarea staţiilor şi a fondului de carte în format digital, inclusiv automatizarea proceselor manageriale din domeniul administrării serviciului public judiciar, prin mecanisme de inteligenţă artificială şi introducerea de roboţi informatici pentru realizarea activităţilor recurente [9].

Odată cu creşterea volumului de date şi ţinând seama de specificul activităţii şi nivelul de securitate, precum riscurile de atac cibernetic, se impune cu prioritate luarea măsurilor ce vizează securitatea cibernetică. În prezent, sistemul de justiţie se confruntă cu un nivel relativ scăzut al automatizărilor anumitor proceduri (de ex., este necesară dezvoltarea de noi template-uri generatoare de documente, inclusiv unele emise de instanţe şi parchete), în timp ce anumite fluxuri de lucru nu sunt susţinute de sistemul actual (de ex., o bună parte dintre registrele prevăzute de cadrul legislativ) sau nu beneficiază de proceduri adecvate de validare a datelor. Problemele sistemelor existente, din punct de vedere tehnic, sunt generate de o

arhitectură depăşită atât în ceea ce priveşte performanţa sistemului (de ex., viteze de reacţie şi de răspuns necorespunzătoare la nivelul instanţelor/parchetelor cu volum mare de activitate, limitări în utilizarea anumitor funcţionalităţi precum formularele prestabilite sau tipurile de funcţii de căutare şi redare informaţii, generarea rapoartelor *ad hoc* pentru un număr mare de înregistrări, utilizarea generatorului de rapoarte pentru instituţii cu mai multe departamente, cu respectarea regulilor de securitate etc.), cât şi mentenanţa acestuia (de ex., implementarea unei funcţionalităţi relativ simple necesită resurse disproporţionate). Sistemele nu dispun de o procedură corespunzătoare de analizare a funcţionării, de identificare a problemelor şi a cauzelor acestora şi de dezvoltare a soluţiilor pentru rezolvarea acestora.

În prezent, acestea reprezintă un „*melanj*" de funcţionalităţi şi de tehnologii, datorat arhitecturii învechite şi a multiplelor cerinţe introduse, ulterior creării acestor sisteme. În vederea îmbunătăţirii semnificative a performanţei, ar fi necesară o reproiectare şi rescriere a sistemelor, utilizând o abordare unitară atât din punct de vedere al funcţionalităţilor, cât şi al soluţiei tehnice, fiind necesare adaptarea, modernizarea şi extinderea sistemului electronic de management al cauzelor ECRIS, contribuind astfel la atingerea obiectivelor Strategiei de dezvoltare a sistemului judiciar. Pentru îndeplinirea acestor obiective, este necesară stabilirea, la nivelul şi prin colaborarea cu toate instituţiile implicate, a nevoilor de dezvoltare a sistemului, astfel încât acesta să corespundă într-un procent semnificativ cerinţelor actuale ale sistemului judiciar, atât din punct de vedere tehnologic, cât şi funcţional, cu stabilirea, ulterioară, a tehnologiilor de ultimă generaţie, a unui sistem IT&C cu o arhitectură bazată pe servicii şi straturi, care să permită ca introducerea de noi funcţionalităţi să se facă cu un minim efort, asigurându-se o durată de viaţă cât mai lungă a sistemului, în condiţii corespunzătoare de funcţionare.

Digitalizarea are efecte profunde şi, prin urmare, este abordată în mod coerent la nivelul tuturor politicilor interne şi externe ale Uniunii. Dezvoltarea infrastructurilor, conectivitatea, serviciile centrate pe utilizator şi protejarea tuturor acestora în perioadele de criză, împreună cu consolidarea reglementărilor, a investiţiilor, a oportunităţilor şi a impacturilor legate de protecţia mediului şi a climei sau de dezvoltarea durabilă, precum şi sănătatea, vor juca un rol important. Construirea unui ecosistem de date adecvat, potrivit Strategiei privind datele a Comisiei UE, va juca un rol crucial în succesul cu care Europa va reuşi să modeleze transformarea digitală. Stadiul şi nevoile identificate la nivel naţional, precum şi de eforturile europene în plină evoluţie, au conturat orientările UE în ceea ce priveşte digitalizarea sistemelor de justiţie, constituind parte a noului impuls european, obiectiv important prevăzut printre priorităţile politice ale Comisiei. În acest sens, la nivel decizional s-a subliniat nevoia de digitalizare a justiţiei ca reprezentând o condiţie importantă pentru îmbunătăţirea calităţii sistemelor actuale, precum şi necesitatea ca acţiunile să fie coordonate la nivelul Uniunii, în vederea combaterii eficiente a pandemiei de COVID-19 şi a consecinţelor sale [10]. Iar acum şi a conflictului armat din Ucraina.

4. Securitatea digitală sau despre avatarurile digitale

O parte a cititorilor noştri ar putea fi surprinşi de tonul optimist al afirmaţiilor noastre mai mult decât optimiste cu privire la utilizaraea inteligenţei artificiale şi a digitalizării în viaţa noastră de zi cu zi. Numai că lucrurile nu stau chiar aşa, precum orice lucru făcut de mâna omului prezintă avantaje, o parte din efectele lui produce şi riscuri. Când tratăm despre mediile digitale şi posibilele pericole pe care le prezintă, trebuie să ne îndreptăm atenţia nu numai înspre Google; de asemenea, nu poate fi vorba pur şi simplu de ignoranţă. Cercetarea modernă a creierului arată că folosirea la o scară mai largă a mediilor digitale reprezintă un motiv serios de îngrijorare. Creierul nostru se află într-un proces continuu de schimbare, de unde rezultă în mod necesar că întrebuinţarea zilnică a mediilor digitale nu poate să nu aibă efecte asupra noastră, utilizatorii. Mediile digitale – calculatoare, telefoane inteligente, console de jocuri şi nu în ultimul rând televizorul – ne schimbă viaţa. În SUA, tinerii petrec acum mai mult timp cu mediile digitale – şapte ore şi jumătate pe zi – decât alocă somnului, conform unui studiu reprezentativ realizat pe un grup de peste 2 000 de copii şi tineri cu vârste între 8 şi 18 ani. În Germania, potrivit unui sondaj la care au răspuns 43.500 de elevi, timpul de folosire a mediilor digitale de către cei din clasa a noua este de 7,5 ore pe zi, fără a pune la socoteală folosirea telefoanelor mobile şi playerelor MP3. Aşa fiind, regăsim un semal de alarmă în legătură cu demenţa digitală, avertisment pornit din Germania**,** de la Manfred Spitzer, unul dintre cei mai faimoşi specialişti în neuroştiinţe din Germania, foarte implicat în dezbaterile despre tehnologie şi educaţie. A studiat medicina, psihologia şi filozofia la Universitatea din Freiburg, iar în prezent este profesor de psihiatrie la Universitatea din Ulm, unde conduce din 1997 Clinica psihiatrică universitară şi din 2004 Centrul pentru neuroştiinţe şi învăţare. A fost de două ori profesor invitat la Universitatea Harvard [11].

Un alt semnal şi mai grav vine de aici, din România, de la avocatul Gheorghe Piperea care, pe o reţea socială, atrăge atenţia că băncile pregătesc introducerea monedei digitale emisă de băncile centrale. Pentru acurateţea informaţiei redăm citatul fără intervenţii sau comentarii. Acestea le puteţi face, dumneavpastră cititorii, judecătorii noştri.

„Fără să vreau să sâcâi pe cineva, fac remarcată o ştire strecurată printre rânduri ieri – cică băncile din România intenţionează să desfiinţeze 3000 de bancomate. Dacă se va pune în practică în mod coordonat, mişcarea va reduce şi mai mult circuitul banilor peşin în economia vizibilă (cu consecinţa că va creşte corespunzător circulaţia din economia gri, ne-vizibilă). Este foarte probabil că gestul cartelar, coordonat, al băncilor vine în pregătirea iminentei introduceri a monedei digitale emisă de băncile centrale (CBDC – central bank digital curency), instrument totalitar prin intermediul căruia vom fi încarceraţi într-o colivie digitală globală unde fiecare va sta, ca în feudalism, pe bara corespunzătoare statutului său social. Fiecare albină a stupului va avea dreptul să cumpere cu banii SĂI, obţinuţi prin munca/activitatea SA şi taxaţi/impozitaţi/penalizaţi cu sumele plătite de EL (statului sau corporaţiei agreate de stat), doar acele produse sau servicii pe care i le va permite banca centrală. Acest oribil apartheid va fi o treabă simplă, urmând a fi perfectată de

la butoanele platformei digitale în interiorul căreia sunt depozitate şi stocate toate avatarurile noastre digitale (s.n)*, construite din estimările comportamentului nostru, efectuate pe baza a ceea ce lăsăm/încărcăm noi pe internet sau în reţelele de socializare de fiecare dată când le utilizăm – iar asta o facem cu conştiinţa că viaţa noastră e mai bună, mai uşoară, mai spectaculoasă, iar decizia ne aparţine, nefiind fabricată, pe nesimţite, de golemul tehnologic în care am fost adânc afundaţi. Cu CBDC pe frunte, sub piele, în zmartfon, în sânge nu vom mai putea cumpăra şi nici vinde decât ceea ce fiara ne va fi permis, fiară al cărui semn vom fi obligaţi să îl purtăm peste tot, în culcare şi-n sculare, la munca în amfiteatru sau la câmp, în biserică sau la bodegă. Cu toate acestea, iată ce spune art. 2191 alin. 1 Cciv: „Prin constituirea unui depozit de fonduri la o instituţie de credit, aceasta dobândeşte proprietatea asupra sumelor de bani depuse şi este OBLIGATĂ să restituie aceeaşi cantitate monetară, de aceeaşi specie, la termenul convenit sau, după caz, ORICÂND, la cererea deponentului, cu respectarea termenului de preaviz stabilit de părţi ori, în lipsă, de uzanţe". În baza acestui text legal, toţi cei care au bani în bancă pot cere retragerea lor oricând, integral şi peşin. Banca are obligaţia să restituie aceşti bani imediat – nu în alte conturi bancare, ci chiar în bani peşin, la ghişeu. Banca poate fi obligată să lucreze cu oameni şi cu bani fizici, măcar pentru a ne da banii înapoi, bani pe care şi-au construit, de altfel, imperiul banilor-datorie. Doar dacă aveţi bani peşin puteţi face orice vreţi cu ei şi puteţi cumpăra orice cu ei, fără a fi obligaţi să purtaţi semnul Fiarei. Desigur, nu puteţi face plăţi mai mari de 5 mii de lei pe zi - dar cine are nevoie să consume de 5000 de lei pe zi*?" [12]. Ar mai fi ceva de spus în legătură cu răspunderea penală a inteligenţei artificiale şi etica inteligenţei artificiale [13]. Despre toate acestea şi mai mult decât acestea într-un viitor studiu. Acum să revenim la obiectul demersului nostru de cercetare ştiinţifică, securitatea digitală şi să aducem în discuţie câteva subiecte pe care oficialii guvernamentali ar trebui să le ia în considerare atunci când planifică sau execută modernizări ale infrastructurii digitale.

Este prea facil să ne concentrăm asupra abordării separate a fiecăreia dintre aceste infrastructuri digitale – mai ales că banii provin adesea dintr-o sursă de finanţare care se axează pe o anumită misiune, în cazul unei agenţii guvernamentale care ar putea distribui fonduri. Este de aşteptat ca fondurile să fie cheltuite de către oficialii administraţiilor publice sau de către partenerii lor din sectorul privat pentru proiecte distincte în infrastructuri specifice. Deşi acest rezultat este de înţeles, adoptarea unei astfel de viziuni ierarhice înguste generează o formă de miopie instituţională care limitează beneficiile potenţiale ce pot fi obţinute din investiţia unitară şi modernizarea simultană a mai multor infrastructuri. Poate cineva să prevadă în ce fel va fi util proiectul de lege din 1956, care a creat sistemul de autostrăzi interstatale din Statele Unite ale Americii şi cum modernizarea infrastructurii rutiere va transforma viaţa americanilor şi chiar peisajul ţării. Tehnologia digitală evoluează şi se îmbunătăţeşte rapid, dar de obicei infrastructura fizică nu ţine pasul. Cel mai important oraş din România încă foloseşte conducte de apă care au fost instalate în anii 1960. Spre deosebire de aparatele noastre electronice personale, situaţie în care schimbăm în mod obişnuit produsele mai vechi cu altele noi şi îmbunătăţite, infrastructura nu se poate pur şi simplu scoate şi

înlocui, aşdar este esenţial să fie luate în considerare implicaţiile pe termen lung ale achiziţiilor. Dacă aveţi posibilitatea de a alege, în loc să adăugaţi hardware dificil de actualizat ulterior, optaţi pentru soluţii bazate pe software, cum ar fi reţelele definite prin software şi soluţiile cloud. În măsura în care aceleaşi capabilităţi pot fi obţinute fie prin soluţii fie bazate pe software, fie bazate pe hardware, abordările bazate pe software se pot actualiza şi îmbunătăţi mai rapid şi cu costuri mai accesibile. Priorităţile pentru tehnologiile operaţionale din infrastructură sunt, de obicei, siguranţa în operare şi fiabilitatea. Securitatea este pe locul al treilea. Dar securitatea cibernetică trebuie să fie inclusă în orice proiect de infrastructură. În caz contrar, nu numai că infrastructura respectivă şi utilizatorii acesteia sunt vulnerabili din cauza naturii interconectate a acesteia, ci devenim cu toţii, colectiv, vulnerabili la defecţiuni în cascadă şi la consecinţe care se pot răspândi în diverse sectoare şi regiuni.

Pentru entităţile publice/private infrastructura modernă trebuie să fie „inteligentă". Infrastructurile disparate ar trebui să fie capabile să comunice între ele, iar pentru interoperabilitate agenţiile de finanţare şi furnizorii de infrastructură trebuie să planifice din timp, pentru a evita soluţiile de tip „siloz". Deoarece ameninţările se pot deplasa în reţele şi către alte reţele, nicio infrastructură nu îşi poate permite să funcţioneze într-un vid informaţional, iar planurile de securitate cibernetică trebuie să includă schimbul de informaţii privind ameninţările. Nu vă puteţi proteja împotriva unei ameninţări pe care nu o înţelegeţi şi pe care nu o puteţi vedea. Atacurile cibernetice sunt inevitabile, aşa că furnizorii de infrastructură ar trebui să fie capabili să îşi coordoneze răspunsurile pentru a-şi îmbunătăţi capacitatea de recuperare în urma acestora. La fel cum echipele de prim-răspuns din jurisdicţiile vecine trebuie să fie capabile să se folosească de comunicaţii comune în cazul unei urgenţe care necesită un răspuns multijurisdicţional, este mai uşor să planificaţi interoperabilitatea în prima linie decât să improvizaţi în timpul unei crize.

5. Concluzii

Inovaţia stă la baza tuturor societăţilor dezvoltate din secolul XXI. România face parte astăzi din Uniunea Europeană, una dintre cele mai inovative şi dinamice comunităţi la nivel mondial. Mai mult, inovaţia a devenit elementul de diferenţiere în peisajul competitiv actual. Soluţiile vechi nu mai sunt întotdeauna aplicabile, iar decidenţii politici trebuie să ajungă să implementeze rapid idei şi soluţii noi pentru a rămâne competitivi şi relevanţi pentru cetăţenii lor. Procesul de inovare este prezent în toate domeniile şi presupune o înţelegere aprofundată din partea entităţilor publice şi private iar novaţia a devenit elementul de sinergie dintre mediul privat, public şi cel academic Pentru a avea o dezvoltare durabilă, România trebuie să se focuseze în primul rând pe inovaţia în educaţie, conform răspunsurilor a 49,2% dintre cei chestionaţi, mai precis, în noi modele de învăţământ, noi materii, metodologii adaptate şi convergente trendurilor în digitalizare. Pe locul doi (20,6%) respondenţii au selectat inovaţia tehnologică (folosirea noilor tehnologii pentru a crea produse noi). Al treilea loc este ocupat de inovaţia de tip îmbunătăţire continuă a proceselor organizaţionale (15,9%), iar pe ultimul loc se situează, cu un procent de

14,3%, inovația radicală în business (noi produse, noi tipuri de servicii). Elementului inovativ în cadrul sistemului educațional este văzut de majoritatea respondenților ca fiind relativ scăzut (32,8%). 24,6% consideră că inovația este prezentă în sistemul educațional din România, pe când 21,3% cred că această nu este deloc prezentă [14].

În același timp, noul model de inovație – *innovation-as-a-service* – propune un proces pragmatic pentru viitor și în contextul tensiunilor la nivel geopolitic și al crizei sanitare, reprezintă o veste bună pentru societate în vederea atingerii unui prag substanțial de dezvoltare. Beneficiul direct al *innovation-as-a-service* este reducerea complexității inovației, astfel încât echipele să se poată concentra pe competențele de bază care au adus succes organizației până acum: să genereze idei noi, să fie prezenți în piață, să țină legătura cu clienții. Innovation-as-a-service reduce, iar în unele cazuri elimină, efortul și costul de a construi o echipă. În prezent, nu se mai poate discuta de inovație fără implicarea elementelor de sustenabilitate care a devenit un domeniu prioritar în România. Procesele de inovație, pe lângă faptul că trebuie să îmbunătățească operațiunile și să le eficientizeze, trebuie să se asigure că implică și elementul de sustenabilitate, atât financiar, social, climatic, cât și din punct de vedere al responsabilității pentru cei prezenți dar și pentru generațiile. Deopotrivă, aceeași majoritate semnificativă se menține și când vine vorba despre potențialul impact pe care îl poate avea serviciul innovation-as-a-service asupra mediului public, cu scopul de a accelera anumite procese cu valoare adăugată pentru cetățeni. Astfel că în domeniul public acest nou serviciu poate fi un ajutor real.

Inovatia digitală are potentialul de a îmbunătăți în mod radical viața oamenilor și de a ajuta la stimularea dezvoltării. În plus, pandemia acesta ne-a forțat pe toți, în toate domeniile să ieșim din zona noastră de confort, să ne adaptăm la noua situație generată de restricțiile sociale și să găsim modalități de funcționare coerentă și eficace în continuare. Societatea nu poate stagna din nici un punct de vedere, mai ales în domeniul juridic și modul lor de soluționare, justiția fiind regulatorul societății. În procese, audierile virtuale au devenit o nouă normalitate și este de văzut dacă situația va rămâne așa. Dar putem prevedea că acest beneficiu va rămâne câștigat, este o posibilitate testată care s-a dovedit utilă, funcțională și avantajoasă din diverse puncte de vedere, la îndemâna doritorilor, care poate fi destul de lesne adoptată. Instanțelor judecătorești le-a revenit și le revine în continuare misiunea de a fi trend-setteri în a implementa mijloace cât mai moderne de desfășurare a procedurilor, care să corespundă cerințelor utilizatorilor. Este important însă să se diferențieze între diferite tipuri de audieri virtuale, complete sau hibrid, dedicate unei anumite etape procedurale, care într-o lume post-pandemică se pot combina armonios și utiliza astfel încât arbitrajul să aibă numai de profitat. Pentru orice forme de audieri virtuale, participanții împreună cu instanța este necesar să evalueze legea și regulile aplicabile, pentru a respecta dreptul părților la un proces echitabil și a tuturor principiilor procedurale ce guvernează un proces echitabil. În lumina adoptării în timp de noi reguli procesuale de către majoritatea instanțelor, care să ofere deschidere și să asigure cadrul normat necesar utilizării acestor metodologii moderne de desfășurare a proceselor, aplicarea noilor tehnologii va deveni obiceiul și organizarea unei audieri virtuale va deveni din ce în

ce mai facilă şi uzitată. Desigur, nu fără a cântări avantajele/riscurile unei astfel de măsuri, conform circumstanţelor particulare fiecărui caz în parte. Cu siguranţă, faptul că multe instanţe naţionale îşi dezvoltă experienţa cu audieri la distanţă, este o oportunitate care ar trebui să fie preţuită şi de care să se beneficieze, deoarece permite participanţilor la înfăptuirea justiţiei să îşi mărească setul de instrumente şi tehnologii moderne pentru a găsi soluţia cea mai potrivită pentru fiece caz.

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Implementation of digital reforms in public administration through efficient management of intelligent systems

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Abstract

The main objective of this scientific initiative is to identify an efficient system for achieving public administration digitization reforms by using the best strategic management practices. The main goal is to achieve our central objective of having a smart city and public policies aimed at increasing the quality of life of the citizen, we need a re-planning of the way things are done through electronic reforms at the administrative level, decision-making decentralization and implementing financial autonomy when it comes to implementing vital community projects. On the occasion of the research, a series of working models were identified, in the form of action plans for the preparation of an action plan for the development of the critical technological infrastructure on the three coordinates: time, money, and quality. The novelty of this initiative envisages the construction of general work plans, as well as the integration of smart roadmap systems, in the monitoring of digitization reforms with clear and precise deadlines and alert systems for each reference stage of the achievement of specific objectives. All in all, the success of the development strategy, the implementation of digital reforms, and public administration through efficient management of intelligent systems, can be achieved by promoting and implementing master plan in-laws in direct correlation with resource planning systems such as enterprise resource planning platforms – ERP. Capitalizing on such an approach having the direct role of effectively managing the vital information related to the digitization reforms in the public administration, which will oblige policies class, regardless of political color, to collaborate when it comes to the national strategic interest for the sustainable development of society, for increasing the quality of life of citizens.

Keywords: *smart city and public policies, quality of life of the citizen, development of the critical technological infrastructure, enterprise resource planning platforms – ERP, sustainable development of society.*

1. Introduction

Evaluating and selecting the development mechanism of the organization through projects in a "correct" way can be a formidable problem in itself. However, it is possible to classify development systems by projects, organizing them according to the results obtained.

These techniques are designed to increase the value of the human resources of an organization (or project team), making people feel better about themselves, educating them, and giving them new interpersonal and supervisory skills.

"As the project evolves, "human engineering" techniques will be coordinated; these include team building, restructuring values, organizational rules or communication channels, and programs aimed at changing the managerial style or individual and group behavior patterns. At the extreme edge of the project development system, the approach focuses especially on outcomes such as productivity, timeliness, and cost efficiency" [1].

Every project manager knows that selecting the right management methodology is crucial, seven of the most popular models which we can use to reform public administration are:

a) Agile. It is a type of process in which requests and solutions evolve through the collaborative effort of customers' autonomous and multifunctional teams.
b) Scrum. It is based on the development, delivery, and support of complex products through collaboration, responsibility, and iterative progress.
c) Kanban. It is another popular Agile framework that, similar to Scrum, focuses on early team launches, through collaboration and self-management.
d) Lean. This methodology promotes maximizing customer value while reducing waste and using fewer resources.
e) Waterfall. One of the cascade methodologies has a linear, sequential design approach in which progress flows down in a direction like a waterfall.
f) Six Sigma. It is the management methodology that aims to improve quality by reducing the number of errors in a process, identifying what does not work, and then eliminating it from the process.
g) PMI/PMBOK. Through PMI, comes PMBOK, which is not a methodology, but a guide that presents a set of standards that characterize project management.

As technology advances and projects become more complex, the work of the project manager becomes more difficult.

"Changes in environmental regulations, government policies, customer objectives, organizational policies, and more, keep the project manager constantly making decisions that affect the crucial considerations of the "Big Three" project: time, budget, and quality. regeneration of the project's human resources and the efficiency of the project team" [2].

2. Implementation of digital reforms in public administration

This is the technical side of decentralization on the way to an advanced democratization process and seeks to redistribute authority, responsibility and financial resources for providing public services among different levels of government.

Its aim is to introduce more participatory forms of governance, giving citizens or their representatives more influence in formulating and implementing policies and plans to develop the quality of life of citizens.

The importance of digitization in the process of decentralization of state authority: Osborne and Gaebler in "Reinventing Government" discuss the many advantages of flattening the traditional organizational hierarchy. Generally, these indiviuals are at the bottom of the organizational hierarchy [3].

In many hierarchical organizations enhance the ability of an organization to respond to future challenges [4].

3. The evolution of the digitization process of the public administration in Romania in comparison with the reference model of Estonia

The main electronic public services available today in Romania are of three types:

1. Integrated electronic services which are already working or in process of integration into the national electronic system of portals like: ghiseul.ro, e-guvernare.ro, e-licitatie.ro, cert.ro, icipro.ro, used most of the time for payment of taxes, procurement, cibersecurity or website aggregators.
2. Independent electronic services used by ministries or agencies, subordinated to the central government, for fiscal administration or relationship with ministries with internet or extranet access.
3. Independent electronic services used by local public administrations like central mayors and local county councils for the most part.

On the other hand, the reference model Estonia is one of the most digitally advanced governments in the world. One of the core principles that has enabled Estonia to be rather agile in developing IT systems, has been the principle of distributed architecture like X roads, meaning that every ministry and every agency is responsible for developing their own systems – and the IT development projects are not centrally coordinated, there is no one big central system that is supposed to do everything.

A few examples of how digital tools have enabled serving people and businesses more efficiently are:

1. E-Cabinet (Government IT system for meetings.)
2. Digital signature (To improve processes speed.)
3. E-Services (e-Business Register, e-School, e-Court, e-Police, e-Residency, Electronic ID Card, i-Voting, m-Parking, e-health, and so on.)

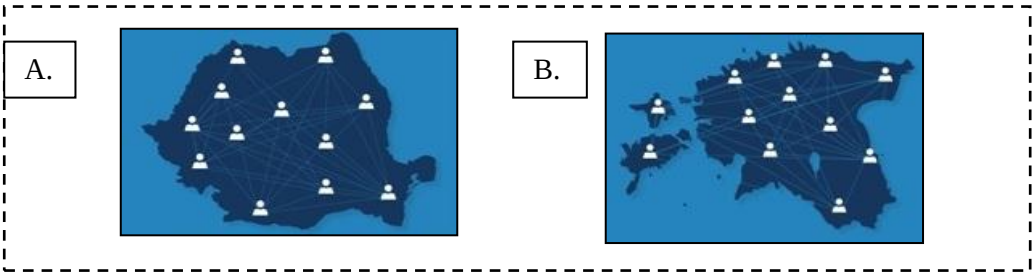

Fig. 1. Comparative analysis: (A) Romania; (B) Estonia.
Source: Internet pictures.

Moreover, it is very important to upgrade the national electronic system "www.e-guvernare.ro" and cloud infrastructure project for public Institutions in Romania "www.icipro.ro" as well as the speed of implementation of e-reforms as key elements for systemic transformation. In the process of a thorough analysis, the purpose and option of choosing income as a general mission is obvious, although, without a doubt, increasing income is a significant objective. Being much more important, we determine how to generate income, this information also coming from the particularities of the environment in which the company operates [5].

The insertion at governmental level of the vision to produce performance and profit, being vital through a real and continuous evaluation of human resources and e-reforms of public policies In public administration, the main objectives from the perspective of digitization have in mind a series of objectives, challenges and solutions as follows:

Objectives:

- Improving administrative capacity in terms of quality management, timeliness and service evaluation as a key element in improving the efficiency of public services in order to increase the quality of life for citizens.
- The Internet of things through Smart City.

Challenges:

- Decentralization of public services.
- Improving service quality.
- Redefining strategic objectives: people, technological infrastructure, storage spaces, data security, information transparency, artificial intelligence management, etc.

Solutions:

- Decentralization of public services and reconfiguration of technological infrastructure into independent units, coordinated by an intelligent system based on the best examples of good practice.

- Establishing clear, specific, measurable, achievable and relevant objectives in a well-defined time, like a roadmap for redesigning public administration.
- Implementing a management system for evaluating the performance of human resources and improving public policies through a promotion of specialists in public administration.
- Creating self-control and regulation mechanisms so as not to deviate from the proposed objectives transposed into a long-term master plan predictable, regardless of political color.

4. Functional analysis of digitalization at the level of the cultural ecosystem in Romania

In Romania, a functional analysis of the cultural ecosystem is very important because it is carried out by a group of independent experts and in 2022 had as a starting point for the development of the "Sectoral Strategy in the Field of Culture for the period 2023-2030" (SIPOCA project 709) identified the following problems with facing the cultural-creative sectors in Romania, with impact from the perspective of the valorization of cultural heritage through digitalization:

- The existence of very large differences between the urban and rural areas in the field of financing, both from the perspective of average expenditures per inhabitant for the culture sector and as a share of expenditures for culture in total expenditures, which led over time to the increase of urban-rural gaps and the very limited access of the rural population to the cultural offer.
- The evolution of the cultural infrastructure over the last 15 years, marked by both positive and negative fluctuations in the number of public cultural institutions (with considerable reductions in the case of libraries, cinemas, and cultural establishments, fluctuating developments, but with an increasing trend for museums and performance institutions), as well as their unequal territorial distribution at regional and county level, with major differences between urban and rural areas;
- In Romania, against the background of the insufficiency of financial resources and the shortage of specialized personnel, this process has been marginally treated, the degree of digitization being extremely low, and there are still high risks from the perspective of the loss of this heritage through damage or even destruction.
- Another important deficiency, as in the previous cases coming from outside the sector and generated mainly by the marginal place given to the culture sector in national policies, is that the cultural sector does not benefit from a permanent, unitary system of statistical data collection, the existing information is often redundant, outdated and incomplete.

An example in this regard is the evolution of the cultural infrastructure of the "E-culture: Digital Library of Romania" project, which is being implemented at the

level of the UMP - Ministry of Culture (financed by the European Regional Development Fund through the Competitiveness Operational Program 2014-2020. Priority Axis 2, Action 2.3. This project aims to digitize the cultural heritage with the help of IT technologies, so that the national cultural heritage can be preserved, promoted, and transmitted to future generations by digitizing at least 550 thousand cultural resources (texts, images, audiograms, video grams, 3D digital objects), of which at least 200 thousand will be exhibited in the European Digital Library.

Added to this is the fact that, in the case of occupations specific to the field of culture, there is currently no accepted unitary format, adapted to the sector, for training, specialization, and improvement, which is reflected in the poor performance of graduates and the insufficient capitalization of digital opportunities in the design and provision of cultural services.

Even in the conditions in which the institutions in the field, face a lack of adequate financial and human resources, in Romania, there are already a series of initiatives in the field of digitization of cultural resources, both at the level of libraries and museums in the national system, but for the fruition of these initiatives, it is imperative to correlate and coordinate digitization efforts to widen the access of the Internet using public to these cultural resources.

A recent survey on elements of cultural infrastructure (SIPOCA 607) revealed that in terms of digital infrastructure, representatives of cultural institutions, both public and private, emphasized the need for IT equipment, software acquisition, and licenses as well as telecommunications equipment.

A digital revolution is transforming the world as we know it at unprecedented speed. „Companies in the pre-digital age, to align their business, need to rethink their business vision, not by updating technology, but rather by changing their business strategy and corporate thinking to compete more efficiently in a world based on technology, in which more and more economic sectors become dependent on new technologies" [6].

The European Union will increase its support for digital transformation in the coming years, as illustrated by the recent proposal for the Digital Europe program (for 2021-2027) [7] – which would be the first-ever funding program dedicated solely to supporting digital transformation in the EU.

Further EU action will boost innovation, foster digital champions and businesses' digitalization, reduce existing digital divides, remove remaining barriers in the digital single market and ensure an adequate legal and regulatory framework in the areas of advanced computing and data, artificial intelligence, and cybersecurity.

The importance of digitalization is becoming increasingly pronounced within the EU and therefore the European Council in June 2016, called for fixed and high-capacity broadband radio connectivity across Europe. „The digital transformation in the field of electronic communications is extremely important for optimizing performance in all key sectors of society, through organizations around the world, especially in the areas of design thinking, big data and analysis, portfolio management and agile delivery" [8].

New digital applications - such as virtual and augmented reality, increasingly connected and automated driving, remote surgery, artificial intelligence, and precision agriculture, will require achievable speed, quality, and responsiveness only with the help of very high-capacity broadband networks.)

Thus, the "Strategic Agenda 2019-2024" of the European Council, adopted in 2019, states the need for Europe to ensure its sovereignty at the digital level. The proposed goal of briefly reviewing the importance and role of digitalization in the European Union has been achieved.

4.1. The main challenges and possible solutions to the efficient management of public administration in Romania

The local authorities have the difficult task of managing difficult and complex issues in the local communities.

The public authority ensures the management of financial resources, to meet the strategic objectives to satisfy the immediate or future needs of the local communities, and citizens should not be viewed as customers of government, as reinventing-government advocates assume, but rather as government's owners [9].

The main concerns being those related to the redefinition of strategic objectives: people, technological infrastructure, storage spaces, data security, information transparency, artificial intelligence management, etc. Several research studies have shown that public administration management in Romania has many challenges that there are many challenges of public administration's management, related to the problems of urbanization, industrialization, sustainability, efficiency and effectiveness of the public services delivered to the citizens, etc.

Improving public administration's management is possible if it is based on a coherent strategy of digitalization and decentralization, which may take into account the economic, social, and environmental problems that need to be solved to ensure the transition to the new era of e-government and to lay the foundations for a "Smart City" shortly.

4.2. Possible solutions identified for improving the management of the public administration

Some solutions available for systemic efficiency could be:

1. Decentralization of public services and reconfiguration of technological infrastructure through the "blockchain approach" and transformation into independent units, coordinated by an intelligent system based on the best examples of good practice. (Fig. 2)
2. Establishing clear, specific, measurable, achievable, and relevant objectives in a well-defined time, like a roadmap for redesigning public administration.
3. Creating public policies for encouraging self-financing to generate profit and performance in public administration.

4. Implementing a management system for evaluating the performance of human resources and improving public policies through the promotion of specialists in public administration.
5. Creating self-control and regulation mechanisms so as not to deviate from the proposed objectives by promoting and implementing master plan in-laws in direct correlation with resource planning systems, such as enterprise resource planning platforms – ERP.

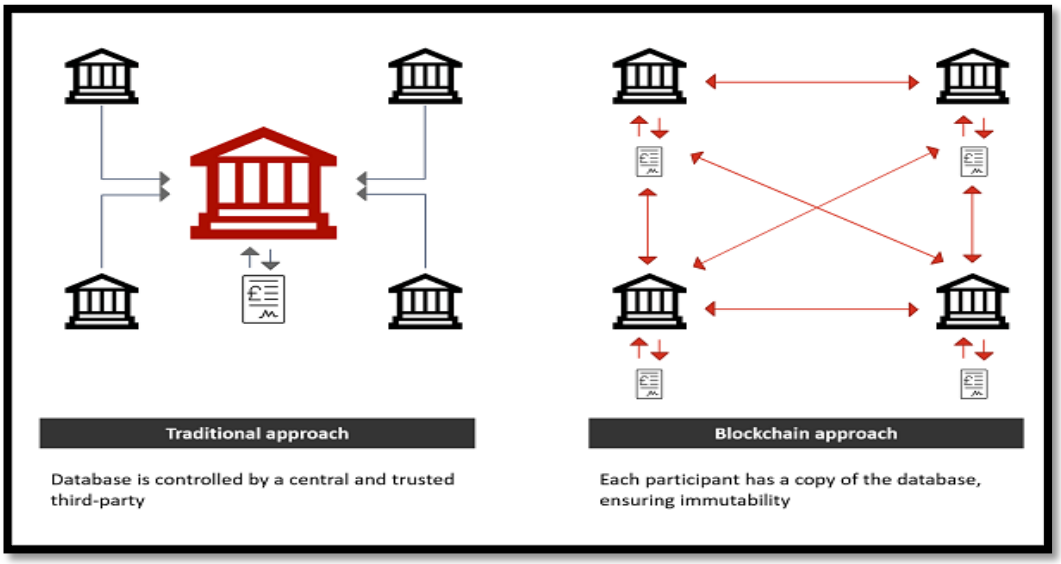

Fig. 2. Blockchain approach of database technological infrastructure.
Source: Blockchain - model picture from Internet

Decentralization of public administration is important because it represents a method of consolidating democracy and involves moving decision-making away from centralized control and closer to citizens with the main objective of improving their responsiveness and performance.

They are better able to respond to changing environments and citizens needs.

4.3. Measures that can be taken to improve the digitization process.

There is no simple strategic way to deal with the multidimensional nature of digital change. Is in vain to have the best IT experts if the rest of the population is not connected to technology. Our parents and grandparents look at technology reluctantly: paying by card, shopping online, reading the news, and all of this is largely foreign to them. IT experts are too few and too little connected to the smooth running of the "city" and citizens do not trust the use of online technology.

Even in the conditions in which the institutions in the field face a lack of adequate financial and human resources, in Romania, there are already a series of initiatives in the field of digitization, both at the level of public and private sector in the national

system, but for the fruition of these initiatives, it is imperative to correlate and coordinate digitization efforts in order to widen the access of the Internet user public such as social media, online payments, and recreational activities.

4.4 Steps that can be taken to improve the level of digitization

In this direction, we must consider 3 levels of addressability: A. Government, B. Business, and C. Citizens.

So we'll look at them one at a time.

A. At the governmental level we could consider:

1. *Regulation.* The main role of government is to build trust in digital services. For this, we need well-defined standards so that users know what the legal value of a digital signature means, the rights and obligations of data processors, and access to EU funds. („Next Generation EU") [10]. Thanks to the „Next Generation EU" instrument, worth EUR 750 billion, as well as specific increases in the EU's long-term budget for 2021-2027, the total financial capacity of the EU budget will reach EUR 1.85 trillion. Together with the three major safety nets for workers, businesses, and states, which were approved by the European Council on 23 April 2020 and together constitute a package of EUR 540 billion, these exceptional measures taken at the EU level would exceed EUR 1.290 trillion, in line with the EU's multiannual financial framework approved by the European Council. https://ec.europa.eu/info/strategy/recovery-plan-europe_en
2. *Deregulation.* Another role that the government has is to stimulate innovation. For this, in some areas, unfortunate regulations must be eliminated: in urban transport (UBER cases, Taxify), in hospitality services (Airbnb), etc.
3. *Construction of digital infrastructure.* In Romania, 10% of the population does not have access to internet connections, largely because their connection is not economically viable. For a faster transition to a digital society, the government needs to develop policies to cover these areas (the RO-NET project being one of them).
4. *Digital administration/e-government.* Increasing the number of forms that can be completed online. Interconnecting at a faster pace the various databases of various public institutions. Electronic services that the state provides to citizens such as identity authentication or validation of a digital signature can be one the examples.

B. From the perspective of the business environment, we could consider the following:

1. *Innovation.* Much of the digital evolution is given by the global digital industry. Google, Facebook, and Microsoft have contributed immensely to

the digitalization of society. Ideally, we should be able to develop Romanian services with high added value both in Romania and in the EU. (A good example is the case: of "Bitdefender" and "GeCAD Software" which are one of the top local software manufacturers and one of the largest exporters of IT services fully developed in Romania.)

2. *Increasing the number of users by making technology accessible* (lowering prices, eliminating language barriers, etc.). The only major criterion in the DESI index in which Romania is not in last place is connectivity, and this is primarily due to industry.
3. *Adoption and integration of new and functional concepts* from private sector companies, such as (ERP / CRM / RFID)
4. *Attracting additional EU funding through the „Horizon Europe"* program will be strengthened to fund vital research in the fields of health, resilience, the transition to a green economy, and the digital transition. The EU will support its global partners by allocating an additional € 16.5 billion to external action, including humanitarian aid: (https://ec.europa.eu/info/horizon-europe_en)

C. In the chapter citizens, we could consider:

1. *Education.* Traditionally, the world views education as part of the first part of a person's life. It is wrong. Any of us can teach our parents and grandparents to use the internet, tablets, smartphones, and cards, with their advantages and risks.
2. *Pressure on the authorities*. Authorities need to be pushed more and more to use digital technologies. From the publication of operating data (budgets, tenders, forms) to the acceptance of the submission of documents and the collection of taxes in electronic format.
3. *Civic Involvement.* Those who want to can get involved in digital digitization projects. OpenBudget, Geeks for Democracy, Code for Romania, and Civic Tech are initiatives that help immensely to digitize Romania.

Besides, to adapt the Romanian legislation to the digitalization strategy of the European Union, the central Romanian authorities have made efforts, at the governmental level, to harmonize as well as possible the conditions for obtaining the strategic technical support of the European Union. Therefore, through the new legislation for electronic signature - GEO no. 38/2020, all public institutions are practically obliged to accept documents in electronic format from citizens.

The new Technical Assistance Instrument (TSI), which is part of the "Next Generation EU" [10] package of measures is closely linked to the Reconstruction and Resilience Mechanism for the period 2021-2024 and has a total amount of over EUR 864 million in the period 2021 -2027 for all Member States, an allocation about 40% higher than in 2017-2020.

Among the major projects of strategic support granted to Romania by the European Union, for the central digitization projects of the local authorities is also

the project: "Improving the access and quality of services for citizens". The project is carried out in partnership with the Association of Romanian Municipalities (AMR) and the Norwegian Association of Local and Regional Authorities (KS) - which is also a partner of the program.

The project activities aim at setting up an e-ICT information center which will mainly provide, through an online support office, information and advice to ACoR and AMR members on ethical issues, transparency, conflict of interest, and incompatibility, and conducting training courses for local authority representatives. The target groups are represented by 3,300 representatives of local governments (of which 2,000 beneficiaries at the commune level, 800 beneficiaries at the municipal level, 300 newly elected - mayors, deputy mayors, and local councilors, and 200 elected and heads of municipalities Departments from 5 pilot communes and 3 municipalities).

Romania's role in the context of redefining and adapting the concept of systemic digitalization within the EU is a very important one, and in this sense in February 2015, Romania adopted the „National Strategy on the Digital Agenda for Romania 2020" [11] (SNADR) in which four areas of action are defined to support the EU's digital strategy in Romania as follows: e-Government, ICT (Information and Communication Technology) e-Commerce, and "Broadband"(Digital Services Infrastructure).

A recent study estimates that the successful deployment of 5G technology could benefit around € 113 billion a year in four industrial sectors (automotive, health, transport, and utilities), with these benefits being widespread among businesses, consumers, and society at large.

Regarding Romania's performance in the chapter "Electronic Governance" the report „eGovernment Benchmark 2019" [12] assesses the use of information and communication technologies in public administration, as well as the levels of cross-border interoperability and digital interaction between administrations and citizens or businesses in the EU Member States and eight other third countries. The report shows that Romania has an above-average level (63%; EU average 57%) of using the online channel in administrative services (Access) and a low level (40%; EU average 68%) of administrative digitization (Digitization).

The degree of "Access" - describes the extent to which the online environment is used in administrative services, while "Digitization" refers to the level of digitalization of public administration counters. In this direction, to support the improvement of vulnerable segments, Romania has undertaken several legislative actions to create new support mechanisms, such as Government Decision no. 89/2020 of January 28, 2020, which provides for the organization and functioning of a new body, "Authority for the Digitization of Romania" (ADR) [13] Under the coordination of the Prime Minister, ADR takes over the activities and structures of the Ministry of Communications and Information Society related to the fields of information technology, information society, and the national interoperability framework.

4.5. The implementation of an ERP legislative master plan at the governmental level

The implementation of an ERP system is a solution, given that we need more predictability of the legislative changes that must be correlated with the digitalization administrative reforms, to ensure more targeting and efficiency of the reforms in the public administration. Such an implementation would bring added value in terms of planning and tracking processes and activities, as well as creating systems for monitoring, reporting, and controlling the performance of the institute's employees and deputy directors. Enterprise Resource Planning systems eliminate data duplication and provide data integrity through a single true source, ensuring a series of savings in the institution's budget, decision-making chain management, and operations, economically, efficiently, and effectively.

Capitalizing on such an approach having the direct role of effectively managing the vital information related to the digitization reforms in the public administration, which will oblige policies class, regardless of political color, to collaborate when it comes to the national strategic interest for the sustainable development of society, for increasing the quality of life of citizens.

5. Conclusions

Several research studies have shown that public administration management in Romania has many challenges that there are many challenges of public administration's. Moreover, it is very important to upgrade the national electronic system "www.e-guvernare.ro" and cloud infrastructure Project for Public Institutions in Romania "www.icipro.ro" The main conclusions of this study are that improving public administration's management is possible if it is based on a coherent strategy of digitalization, which may take into account the economic, social, and environmental problems that need to be solved to ensure the transition to the new era of e-government and to lay the foundations for a "Smart City" shortly. To reach our central goal of having a city and smart public policies aimed at increasing the quality of life of the citizen, we need a re-planning of the way things are done through electronic reforms at the administrative level, decision-making decentralization and implementation of financial autonomy when it comes to implementing vital community projects.

On the other hand, it is necessary to draw up an action plan for the development of critical technological infrastructure on the three coordinates: time, money, and quality, in the form of a smart roadmap together with the implementation of control and verification mechanisms, similar to those used in the master plan for the creation of, with clear, precise and measurable objectives. Besides, the acceleration of the expansion of the distribution network ("backhaul") in "white areas, systemic interoperability, and digital services, common problems in the European Union can be achieved through the Agency for Digitalization of Romania created for better monitoring and control of implementation Of the National Digital Agenda Strategy given the EU's 5G strategic goal for 2025.

The challenge of digitalization in public administration is immense, and yet it is achievable if we address the issue systematically. ”This challenge can seem ginormous! So when asked, how do you eat an elephant?..meaning when a challenge seems so large, where does one begin, I respond: One byte at a time, and invite a lot of friends” [14].Thanks to the EUR 750 billion Next Generation EU instrument, as well as specific increases in the EU's long-term budget for the period 2021-2027, the total financial capacity of the EU budget, will reach EUR 1.85 trillion. Together with the three major safety nets for workers, businesses, and states, which were approved by the European Council on 23 April 2020 and together constitute a package of EUR 540 billion, these exceptional measures taken at the EU level would exceed EUR 1.290 trillion. Consequently, the redefining and adapting of the concept of organizational reform through digitization in the European Union and Romania is based on solid support and has already made considerable progress, made in the European Parliament and the Council.

All in all, the success of the development strategy by implementing digital reforms and public administration through efficient management of intelligent systems, can be done by promoting and implementing master development plan in-laws, that oblige the political class, regardless of political color to collaborate when it comes to the national strategic interest for sustainable development of society, to increase the quality of life of citizens.

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Bias in artificial intelligence

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Abstract

As artificial intelligence entities and usage will continue to increase, as assumed at an exponential rate, the need to have proper studies that identify, fight and ameliorate its algorithms will be essential. According to many studies, bias has been identified in many AI(artificial intelligence, but from this point onwards we will refer to it with its acronym) entities, specifically in machine learning (MA), and it falls in different categories. The purpose of this paper is to provide an overall introduction of two categories of bias in AI and MA, concretely: racial bias and association bias(commonly known as gender bias), and then analyze the impact and risks that they have/might have in society and provide possible resolutions. The limitations of this paper are evident, as no empirical study has been conducted in itself but it is based on referential work conducted by other researchers.

Keywords: *racial, gender, algorithm.*

1. Introduction

"*Like all technologies before it, artificial intelligence will reflect the values of its creators."* [1] The complexity of the world in which we live is increasing by the day and its acceleration is doing so as well. If we take a short journey back in time, how people lived in the 1880s didn't change *as drastically* with how people lived in 1910 *as* if we compare how people lived in the 1980s with how life was like in 2010. In just 30 years, the advent of the internet, personal computers and more recently the usage of artificial intelligence has made life back in the 1980s feel like centuries ago. When I observe today's middle school children as they watch a movie from the '80s, where there are fax machines and phones with cords, their reactions are impressive. I have heard children refer to Nokia 3310 as *ancient,* even though it was produced only 20 years ago. The semantics are interesting because they reveal our understanding of the world or lack of it thereof. If the near past due to technology feels like *forever* ago, it's even harder to imagine how much the future will change. The futurist Ray Kurzweil, in his essay 'The Law of Accelerating Returns', wrote: "We

won't experience 100 years of progress in the 21st century — it will be more like 20,000 years of progress (at today's rate)" [2]. Thus, arguing our inability to comprehend how much the world will change in the future. Perhaps the challenge would not be only in imagining the future but rather accepting and internalizing all these upcoming changes and the most substantial one would be to take measures that it develops in a way that nurtures the fundamental values which we all agree upon, such as: fairness, equality and so on.

When people are questioned regarding their understanding of AI, according to a survey by Weber Shandwick and KRC Research, whose results were published in Harvard Business Review, which surveyed 2,100 consumers in an online survey encompassing five global markets (the U.S., Canada, the UK, China, and Brazil). According to their survey the knowledge that people had on AI varied a lot: " Two-thirds of those surveyed say they know something about AI, although only about two in 10 (18%) say that they know a lot. One-third acknowledged knowing nothing about AI. We found that by far the most common first impression of AI is "robots," as 22% of respondents said [3]."

The matter of fact is that AI is not that robot which you might have encountered in a Star Trek movie or The Matrix. It's not something of the far future either. In reality, AI entities are being used in our daily lives without us being aware of it. Many AI entities are incorporated in the judicial system, for example, the software Correctional Offender Management Profiling For Alternative Sanctions (COMPAS) in the USA, utilizes AI in order to determine the release or not of an offender [4]. Furthermore, it's used in facial recognition softwares and various scoring softwares to assist companies or states to make decisions in finance, jobs and insurance. However, the accuracy of AI doesn't seem to reflect equally in these domains. By previous research it has been widely noted that bias in AI exists. Bias is defined as: *the action of supporting or opposing a particular person or thing in an unfair way, because of allowing personal opinions to influence your judgment.* (by Cambridge Online Dictionary) [5] Bias in AI is noted parcilucary in Machine Learning, consequently rendering in this manner the conclusion of the software as "unfair"[4]. *In the context of decision-making, for which AI is most predominantly used, fairness is the absence of any prejudice or favoritism toward an individual or a group based on their inherent or acquired characteristics* [6].

Of course, machines differently from people do not get bored or tired [7], so we would naturally expect them to be the most objective when it comes to decision-making. So, why is AI unfair and biased? What happens exactly and what categories of bias are shown? Facial recognition software which are embedded in most smart phones but also in other devices, have demonstrated to be more accurate on male and white people, [4] clearly demonstrating a bias in terms of judgement towards women and especially women of color. If you search for images in different search engines, such as "doctor" the results most likely would show a man and if you would alternatively search for a "nurse", the results have a tendency to show women. Of course, women can be, and are, doctors and men are/can be nurses but the machine learning algorithm, fed by historical data, reinforces a cultural bias, which is named association bias or more commonly known as gender bias which we will see in part

III.Furthermore, in the COMPAS software mentioned above, studies have shown that there is a higher score in terms of risk assessment for Afro-American offenders as compared to Caucasians (if other variables fall within the same profile) [4]. COMPAS assists judges to take their decisions on who to release, therefore, the impact of bias in such a software can be tremendous in a person's life. This categorizes as *racial bias*, which we will see in section II.

2. Racial Bias in AI

We are all aware of the definition of racism as the belief that one race is more superior than another/others. Even after centuries of struggle, racism still takes place in our everyday lives, especially when it is institutionalized racism. This belief system leads people or institutions to make unfair and unequal decisions, hence to be biased. Another term, with which we may not be very familiar with, is *implicit racial bias*. "*It is important to distinguish implicit racial bias from racism or discrimination. Implicit biases are associations made by individuals in the unconscious state of mind. This means that the individual is likely not aware of the biased association*." [9] These implicit racial biases that people have, very often get "fed" to Machine Learning algorithms under supervised learning and can have detrimental outcomes to society as a whole.

As in the example mentioned in the introduction, COMPAS, has racial bias embedded in itself, hence giving a non-objective result to the judge [4]. Another example would be Google's photo app, which gives automatic labels (inferring words, usually either adjectives or nouns) to images in digital photo albums, was actually labelling photos of black people as gorillas. Google made a public apology, claiming it unintentional. However, similar errors appeared in Hewlett-Packard's web camera software, which had a lot of trouble recognizing images of people with a darker skin tone and on Nikon's camera software,that labeled images/photos of Asian people as "blinking" [1].

From a technical perspective, when we consider the population (or more commonly the sample) in our statistical/machine-learning algorithm as homogenous and we do not take into account how heterogenous it might be in reality, then we, as scientists, might make fatal mistakes, when we advise people on their health, finances and so on. Let's take an example that actually demonstrates what bias might look like in AI.

The paper, A Survey on Bias and Fairness in Machine Learning, has taken a rning, consider a hypothetical nutrition study to demonstrate how the heterogeneities can bias data. This hypothetical study looks at how consuming pasta on a daily basis might impact body mass index (BMI) [6].

"*Regression analysis (solid red line) demonstrates a positive relationship in the population between the consumption of pasta and BMI. The positive trend suggests that increased pasta consumption is associated with higher BMI. However, unbeknown to researchers, the study population was heterogeneous, composed of subgroups that vary in their fitness level—people who did not exercise, people with normal activity*

levels, and athletes. When data is disaggregated by fitness level, the trends within each subgroup are negative (dashed green lines), leading to the conclusion that increased pasta consumption is, in fact, associated with a lower BMI. Recommendations for pasta consumption that come from the naive analysis are opposite to those coming from a more careful analysis that accounts for the difference between subgroups". [6]

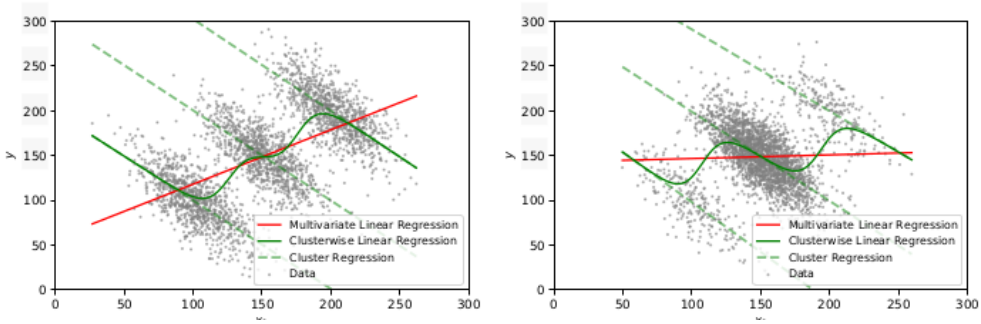


Fig. 1.
Source: Mehrabi et al.

Another example of this has been noted by ProPublica, regarding the AI algorithm in the judicial system, which estimates the probability of a criminal to commit another crime if they get out of prison. In the case study, there were the two cases of Brisha Borden and Vernon Prater. Broden stole a bike as she was waiting for her sister to come out of school and got arrested and charged with burglary and petty theft for the bike she stole, valued at an amount of $80. On the other hand, Prater (who was a 42 year old man with prior record) stole about the same value of items, so 80$, from a construction store. Even though Prater was a lifelong criminal, charged with armed robbery and many other crimes, when both individuals were booked in the prison system, something strange occured: Broden - who is black - was given a high score in terms of the risk of commiting a crime again whereas Prater - who is white - was considered by the algorithm as low risk. Two years later, Broden is not charged with any new crimes but Prater on the other hand got another 8-year long sentence. *The algorithm was wrong and racially biased* [4].

2.1. Gender Bias in AI

If automation and AI are not developed and applied in a gender-conscious manner, they are likely to reproduce or even reinforce already existing gender stereotypes and social norms which are discriminatory.

Examples:

- Virtual personal assistants such as Alexa, Siri and Cortana have female names and a default female voice. Companies which are behind these virtual assistants are reinforcing the social reality in which the majority of secretaries & personal assistants are women.

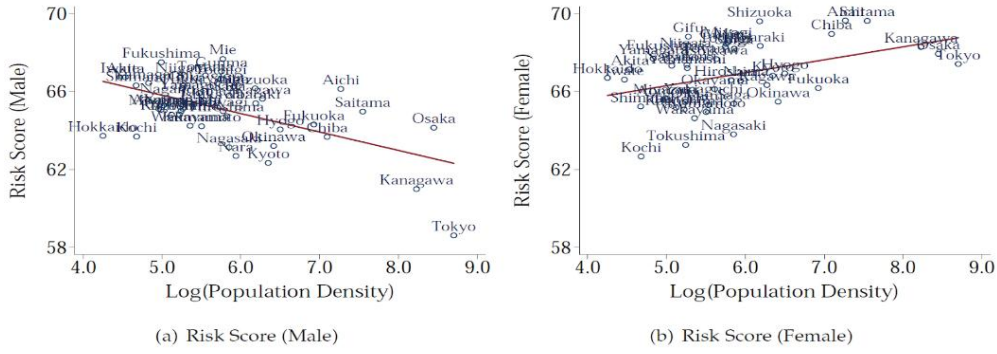
- Gender bias pervades AI algorithms as well. With close to 78% of AI professionals being men, the algorithm creation is informed and dominated by male experiences. This gender bias might have considerable adverse implications for women. Algorithms could affect women's access to different jobs or loans by automatically vetting out their applications or giving women an unfavourable rating. In addition, the algorithm-based risk assessment in the criminal justice systems can work against women if for example doesn't consider the fact that women are less likely than men to reoffend [11].
- The Robotization and automation of jobs will impact both men and women. But gender bias is likely to cause that automation impacts women disproportionately. For example, if more than 70% of workers in apparel manufacturing are women, automation will undoubtedly affect women more than men [11].

This study aims to quantify regional employment risk score of computerization by combining disaggregated occupational data with regional employment data. The risk score for gender g in prefecture a, $Score_a^g$, is calculated as follows:

$$Score_a^g = \sum_{i=1}^{N} Share_{ai}^g \cdot Prob_i, \qquad g \in \{\text{Male, Female}\}, \tag{1}$$

where N is the number of occupations (in this study, $N = 200$), $Share_{ai}^g$ is the share of occupation i in prefecture a for gender g, $Prob_i$ is the probability of computerization for occupation i based on

Fig. 2.
Soure: Frey and Osborne (2017).



(a) Risk Score (Male) (b) Risk Score (Female)

Fig. 3.

Reproduced from Figure 3 in Hamaguchi and Kondo (2018), Employment risk score of computerisation and city size [12].

As we can note from the formula above which is used to measure how employment will change with introduction of AI in Japan as a case study and its visualization in graphs it can be clearly noted that it impacts women and men very differently, by impacting women more especially in areas of large density of population such as Tokyo and Osaka.

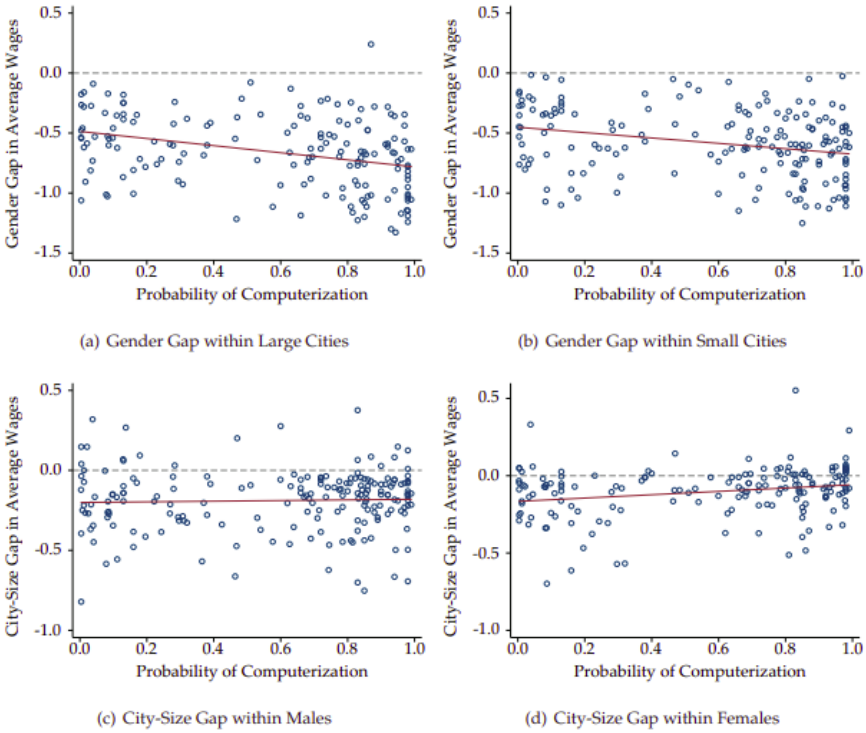


Fig. 4.

2.2. Potential causes:

1. Features & modeling techniques: The measurements used as inputs for models of machine-learning , or even the actual model training in itself, may introduce bias [10].
2. A skewed or incomplete training dataset: This happens when demographic categories are missing from the training data. Models developed with this data can then fail to scale properly when applied to new data containing those missing categories. For example, if female speakers make up a low percentage of your training data, let's say 12 percent, then when a trained machine learning model is applied to females, it will potentially produce a higher degree of errors [10].
3. The labels used in training: AI applications are generally trained using data that are generated by humans, and humans are inherently biased. Most

commercial AI systems use supervised machine learning, labeling the training data in order to teach the selected model how to behave. Oftentimes humans create these labels and considering that frequently people manifest conscious & unconscious bias and the machine-learning models are trained to estimate these labels, the misclassification and unfairness towards a specific gender category will be encoded into the model, leading to bias [10].

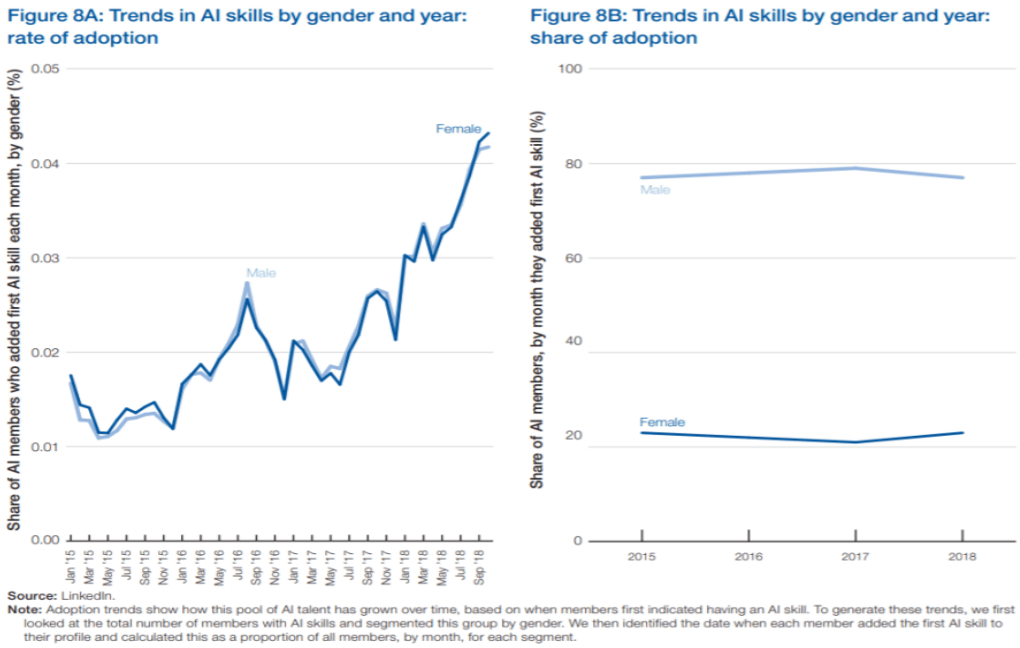


Fig. 5. The Global Gender Gap Report 2018 by World Economic Forum

3. Conclusions:

Like all new technologies, it takes time to come up with precision and accuracy. The matter of fact is, that unlike other technologies, AI has a very wide scope and can impact directly people's lives and the society's as a whole. In order to make sure that fairness is applied in the algorithms incorporated in AI entities, a few strategies have emerged [14]: Pre-processing data to make sure that the algorithm learns from a "clean" dataset. "*Counterfactual fairness"* has been coined as a term which tackles sensitive attributes such as gender and race. Silvia Chiappa's path-specific counterfactual method takes into consideration different ways that sensitive attributes impact outcomes—certain influences might be considered fair and could be retained by the algorithm, whereas other influences might be considered unfair and hence they should be discarded [15].

"Innovative training techniques such as using transfer learning or decoupled classifiers for different groups have proven useful for reducing discrepancies in facial analysis technologies." [14]

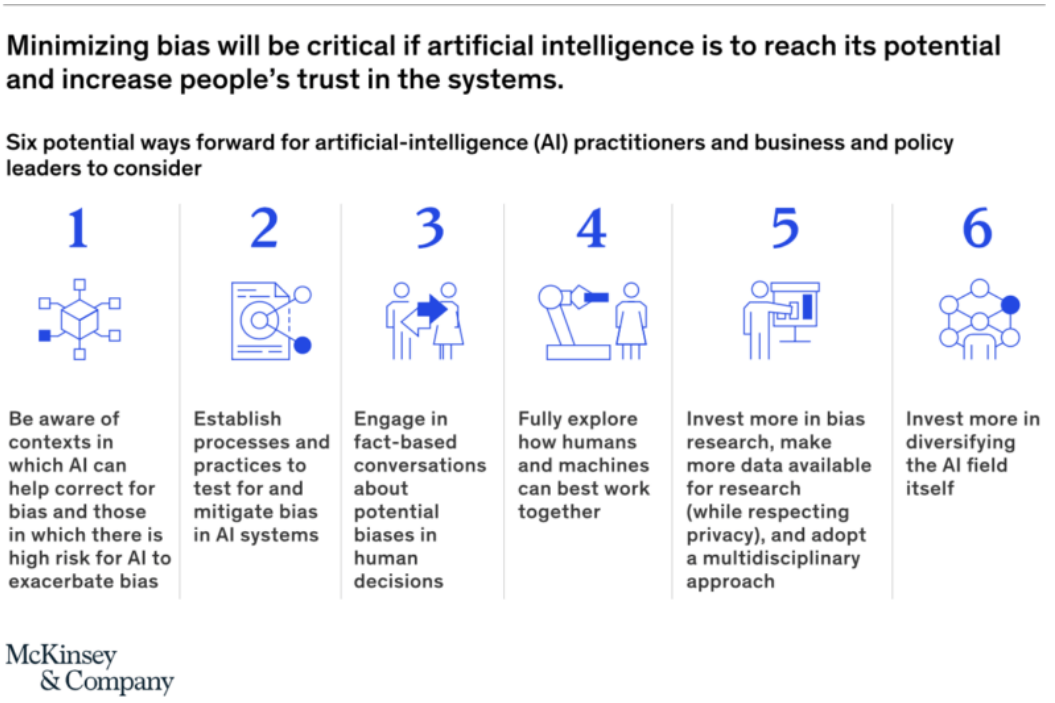


Fig. 6.
Source: MCKINSEY

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Designing an integrated modern parking in a crowded city area – a case study

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Abstract

Problems with parking places occur everywhere, especially in the cities. The purpose of this research is to design a concept of a modern parking place which can offer various services. With the rise of the world motor vehicle fleet and the emergence of new models, the infrastructure of major cities must be developed accordingly. The latter is increasingly affected by the needs of the population subject to mobility and the transport of various goods, which leads to crowded traffic. Our approach included the collection and analysis of real data regarding flow of traffic, simulation and designing a conceptual model of the parking place. Our findings focused on the advantages and disadvantages of developing such a solution and can be used for further development. The present study can be used in a variety of areas – for practitioners as a source of information and ideas, for academics and researchers as a model methodology. The study presents a methodology for designing a modern parking place taking into consideration various factors. This approach can be used to further increase the quality of life for the citizens living in the cities.

Keywords: *traffic, transportation, smart parking, quality of life.*

1. Introduction

Today's society faces multiple challenges. The increase in living standards has led to positive effects, such as increasing the quality of life, but also to negative effects, such as high energy consumption, pollution, waste. An area with a significant impact on the general balance in a positive sense, but also in a negative sense, is the field of transport. In a positive sense, transport contributes to the movement of

goods and people, access to resources, the development of consumer markets, fast and safe movement from one location to another. On the other hand, this field is related to a series of negative effects, such as: increase in the number of vehicles, air pollution, noise pollution, agglomerations, congestion, road accidents. The need for economic development and the need for mobility are factors that work to find solutions by which the positive elements are strengthened and the negative elements are reduced as much as possible.

Mobility in cities comes with various problems. With the increase in the number of automobiles, cities are being invaded by drivers who want to move quickly from one place to another. When they arrive at their destination, car users need parking spaces. If parking spaces are insufficient, the result is overcrowded streets, long waiting times in traffic, delays, stress. These problems have been analyzed by researchers for a long time, they are the subject of many scientific works. Thus, in the paper [1] the authors present the following effects resulting from the location or lack of parking: degradation of the functioning of the public transport system, increase in the risk of accidents, increase in the level of pollution, increasing fuel consumption. Other negative effects are mentioned in the paper [2]: thus due to the lack of parking spaces, situations of illegal double parking occur, which leads to an increase in congestion by 50% to 200%, respectively an increase in the level of pollution caused by CO emissions by 20%-25%. Other researchers confirm the negative effects, such as time lost in traffic, pollution, stress, congestion/traffic congestion. [3],[4].

To reduce the problems caused by the low number of parking spaces, various solutions have been proposed: improved parking management systems, creation of new parking spaces by identifying modern solutions (e.g. multi-storey car parks, underground car parks, automated car parks), optimizing the way of occupying existing parking spaces, influencing vehicle users to limit their journeys in central areas or congested areas, using public transport and alternative means of transport.

Various approaches to the proposed solutions can be found in the scientific literature, these being presented in the following. In the paper [5] the authors propose a method for optimizing the placement of parking spaces in an area where drivers travel that area in search of free parking spaces. In the paper [3] a smart infrastructure for parking is proposed which is based on the detection and location of vehicles, bidirectional vehicle-infrastructure communication, reservation of parking spaces, optimal allocation of parking spaces. An intelligent parking system architecture is presented in the article [6]. The authors propose solutions for an intelligent parking system based on IoT (Internet of Things), a system that can lead to a reduction in energy consumption and the time needed to find a parking space. The authors also propose reducing congestion in terms of parking spaces, by proposing a system in which the owners rent their parking spaces, for a fee, during the periods when these spaces are not used [6]. Other applications based on IoT technology are presented in the paper [7], where with the help of this technology information on free/occupied parking spaces can be transmitted through a mobile application or [8] by using sensors connected through an Arduino UNO platform. The structuring and operation of an intelligent parking assistant architecture is used for the optimal use of parking spaces [1]. Modern technologies can be used to make predictions regarding the occupation or freeing of a parking space, such a variant based on the use of sensors from a mobile phone is

described in the paper [9]. Identifying a free parking space in real time is a major challenge, to solve this problem is proposed an intelligent solution that uses an algorithm that takes into account a number of factors: the distance to be traveled to the parking space, the cost of parking, traffic congestion [10]. The policy of reducing traffic by increasing parking fees in central areas can also be a solution to parking related problems [11]. The development of new parking lots should be done strategically, in a comprehensive approach [12]. One of the proposed solutions for congested spaces is the creation of an automated parking lot with elevators for dense parking of vehicles [13].

As can be seen from the proposed solutions, they are grouped into two large categories: optimizing the existing situation and creating new modern parking spaces. In our study, the approach aims at the second group of solutions, namely the realization of a modern parking concept that will increase the number of available parking spaces in a congested area.

2. Designing an integrated modern parking in a crowded city area – a case study

2.1. Context of the study

The city of Sibiu is one of the most important cities in Transylvania, being an historical city. The town is located at 45°47' north latitude and 24°05' east longitude. With 155,000 permanent residents and 25,000 temporary residents, especially students, Sibiu is the largest city in the county [14]. The structure of the city is typical for a historical city, the building development starting from the central historical area, continuing to the periphery.

The city of Sibiu is a tourist, cultural, industrial and university city. The streets of the city of Sibiu add up to a length of approximately 150 km. The infrastructure is characterized by many narrow streets, especially in the central area. The types of roads are characterized by two-way roads, one-way roads, roads with one or two lanes per direction. Most of the large intersections in Sibiu are configured in the form of roundabouts, few of them being signalized. The city has a modern urban transport system, the fleet of vehicles includes buses with internal combustion engines, engines running on CNG and electric buses. Other travel possibilities are realized with the help of taxis, respectively alternative means of transport - bicycles, electric scooters. For the alternative transport system there are rental services and special tracks dedicated to this type of transport.

Traffic in the city of Sibiu is congested, especially during peak hours - morning (7-9), noon (around 12) and evening (15.30 - 18.30). The three intervals mentioned coincide with the following types of travel: the movement of employees to their workplaces, the movement of pupils and students to schools and faculties in the morning and vice versa, at noon and in the evening. Added to these movements are the flows of tourists visiting or transiting the city, especially on weekends or when there are cultural events in the city. During weekends and evenings there is traffic congestion in the peripheral areas of the city where there are shopping centers.

All these traffic flows combine with the need for parking spaces, whether for short-term or long-term activities. On top of this necessity, parking spaces for

residents are added. Due to the structure of the city, especially in the central area, there are limited possibilities for the configuration of road arteries, so for the creation of new parking spaces, in addition to the parking lots adjacent to the existing roads, the only solution is to identify alternative options.

2.2. The analyzed area

The analyzed area is the area adjacent to the Faculty of Engineering within the Lucian Blaga University in Sibiu (fig. 1). Our study started from a simple finding: in the analyzed area we noticed the difficulty of finding a parking space, especially during peak hours. This issue was raised by the Faculty of Engineering students and teaching staff.

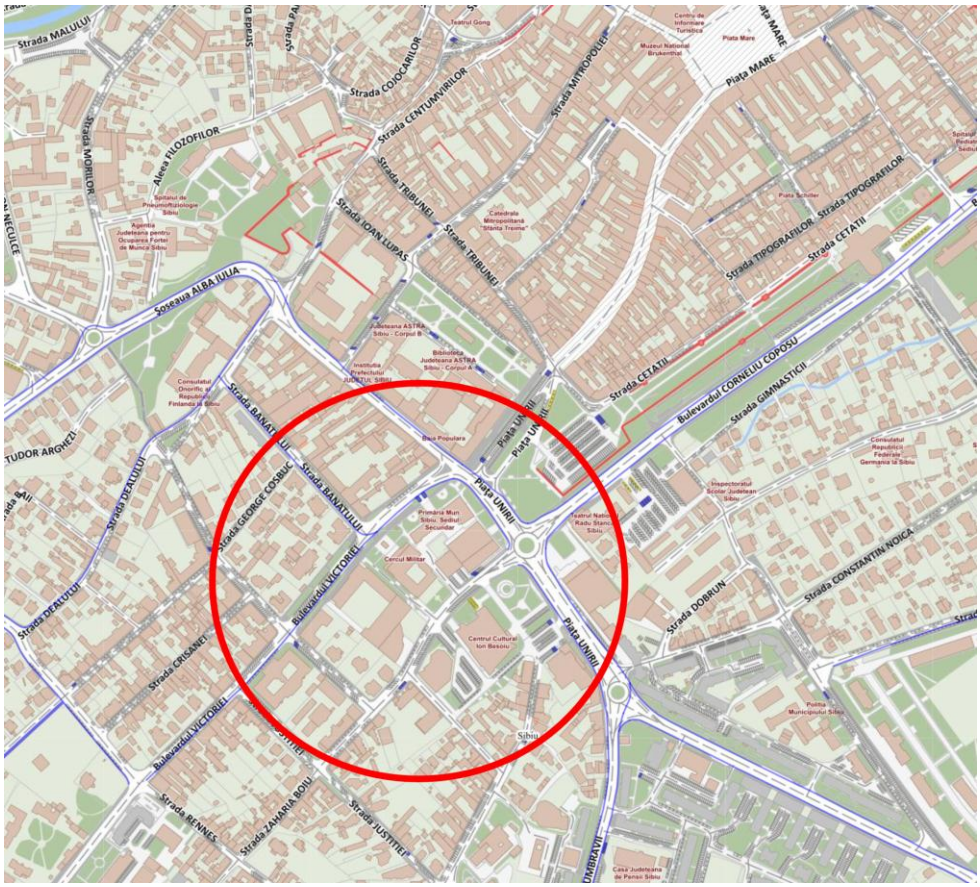

Fig. 1. Analyzed area.
Source: City Hall Sibiu https://www.sibiu.ro/hip/

The analyzed area is located at a distance of approximately 800 meters from "Piata Mare", considered the center of Sibiu, which is also the historical center of the city. In close proximity to the Faculty of Engineering, there are other points that lead to increased congestion. These are: two banks, three schools/high schools, three

faculties, ULBS rectory building, three hotels, one department store, City Hall building, spectacle building, theater.

The parking lots are arranged on the side of the road, there are also two parking lots on places specially arranged for this purpose. All parking lots in the analyzed area are paid parking lots. Our objective was to identify a solution by which additional parking spaces can be created, especially for the students of the Faculty of Engineering. This is where the idea of the study starts, namely to create a concept for a modern parking lot.

2.3. Study methodology

To carry out the study, the following steps were taken: analyzes were made regarding the availability of parking spaces in the analyzed area, a study was carried out to establish the degree of loading of parking lots in the area, an analysis of traffic in the area was made to identify the possibility of location of the parking lot, the location of the parking lot was established, the design of the parking lot was realized, establishing the type, structure, dimensions and functionalities.

2.3.1. Disponibility of parking places around the analyzed area

In order to analyze the current situation regarding the number of parking spaces, we have chosen an area in the proximity of the Engineering Faculty. The situation of the number of parking places is presented in figure 2.

Fig. 2. Number of parking places around studied area.
Source: Google Maps https://www.google.com/maps/

To identify the occupancy level of the parking places, we have monitored the free places for 22 days on three daily intervals: morning, noon and evening. The results were collected in tables organized as follows (Table 1).

Table 1. Collecting data for free parking places

Parking name	Piața Teatrului			Cazarma 90			Piața Unirii – H. Continental		
TOTAL places	156			205			117		
Parking type	street			barier			street		
tax /tax free	tax			tax			tax		
Moment of the day	morning	noon	evening	morning	noon	evening	morning	noon	evening

Source: Author own work

In our study, the findings show that during noon period almost all parking places are occupied in a percentage of 80% to 100% and the little occupancy periods are during weekends, that is on Saturdays and Sundays. To vizualize the flow during a day we have collected data from one of the biggest parking from the central area, known as ”Cazarma 90”. The occupancy level is shown in figure 3.

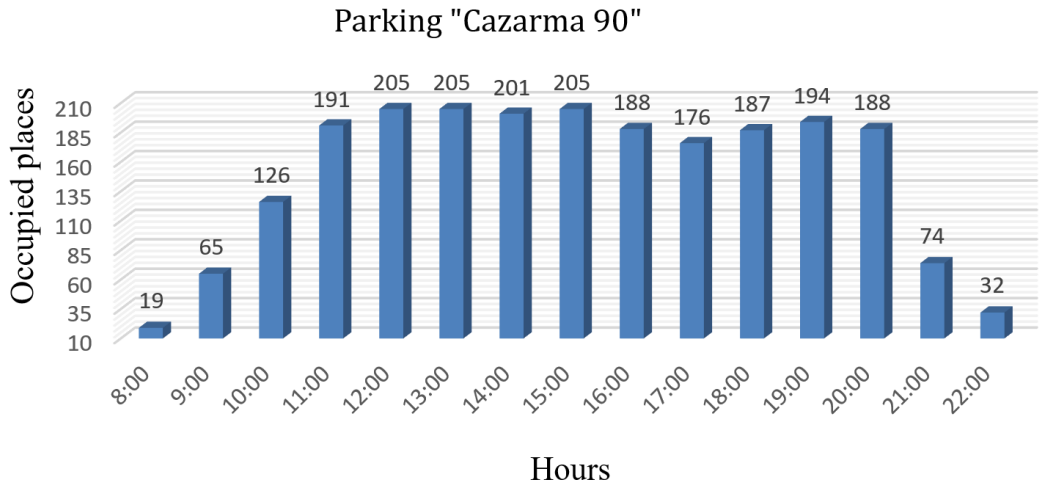

Fig. 3. Occupancy level during one day.

Analyzing the data, we can see that the parking is working at full capacity from 11.00 to 20:00 interval.

2.3.2 Traffic analysis

Since our area of interest for the location of the parking lot is in the area of the Faculty of Engineering, on Emil Cioran street, we have carried out a traffic analysis for two intersections that can produce a traffic load on this street, namely the roundabout in Piața Unirii and the intersection between Justitiei street and Emil Cioran street (fig. 4).

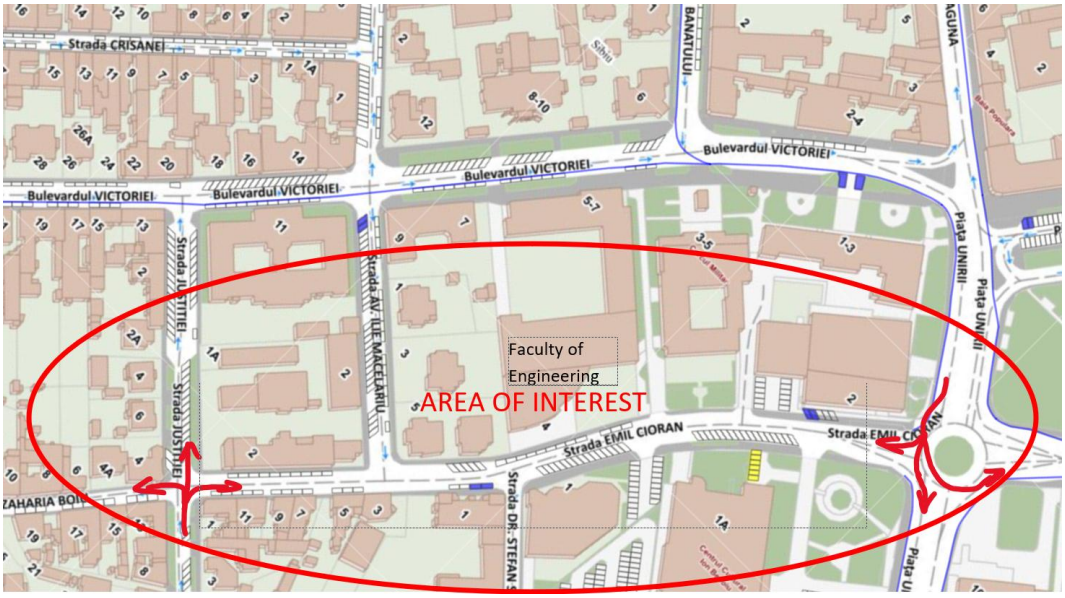

Fig. 4. Analyzed intersections.
Source: City Hall Sibiu https://www.sibiu.ro/hip/

The data were collected to establish the traffic volumes of the two intersections. To collect the necessary data we have quantified the hourly traffic volumes in the three periods of the day, morning, noon and afternoon, in one hour groups, split in pieces of fifteen minutes. The categories of traffic participants taking in consideration were: bicycle, motorcycle, car, microbus, bus. All the traffic participants were converted on passenger car unit based on SR 7348-2002 [15]. The results are presented in figures 5 and 6.

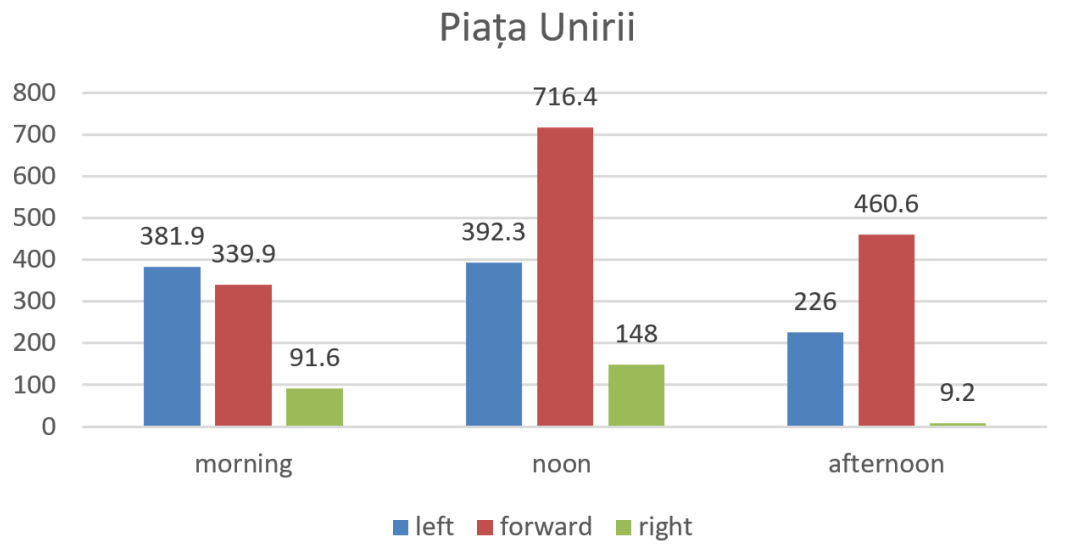

Fig. 5. Hourly traffic volumes – passenger car unit, Piața Unirii intersection.

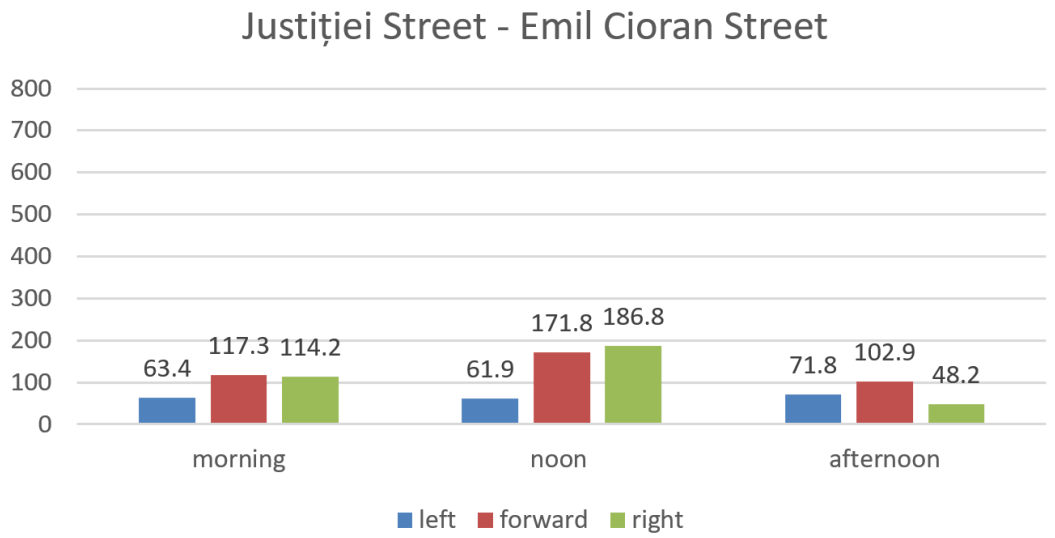

Fig. 6. Hourly traffic volumes – passenger car unit, Justiției street-Emil Cioran street intersection.

We were interested in vehicles turning right from the both analyzed intersections, and we have concluded that the number is pretty low from the Piața Unirii intersection, with higher values from Justiției-Emil Cioran intersection. The collected data were used to create a simulation in Synchro 8 software (fig. 7) [16]. The simulation confirmed us that the traffic on Emil Cioran street is low and the ideea of placing a parking on this street is the correct solution.

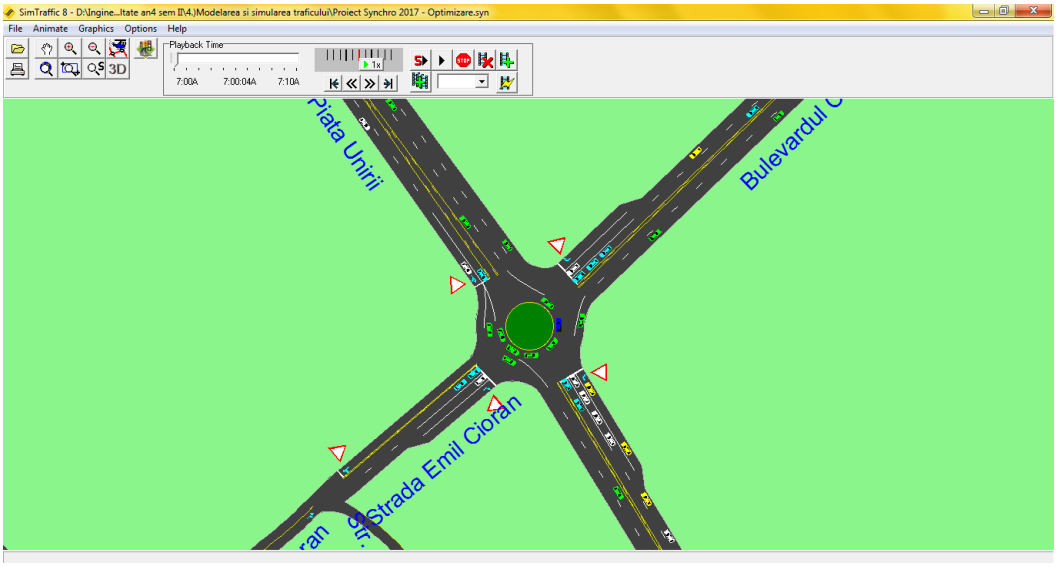

Fig. 7. Synchro 8 software simulation.

After analyzing the available areas on Emil Cioran street, we have chosen the location near the Faculty of Engineering, which currently is used as a street level parking place (fig. 8).

Fig. 8. Selected place for parking.

2.3.3. Parking design

The surface area for the parking is approximately 500 square meters. Because the space is narrow we have chosen a solution that best fit in a situation like this. Our solution is to design a smart, automated, multi-storey car park, which is based on a lift-type platform that moves in three directions to position the car at a certain level. In order to obtain the greatest possible capacity, the surface is occupied by three sets of tower parking lots of three rows each, on four levels. In our vision, the parking will have a structure based on steel beams. To determine the dimensions of the parking lot, we have analyzed the dimensions of several brands of vehicles. The maximum allowed dimensions and weight for one vehicle are: length 5 meters, width 2 meters, height 1.8 meters and weight 3 tons. According to our design, the new parking place will have 66 parking lots, which is almost triple the existing parking lot number. The solution we propose is presented in figures 9 and 10.

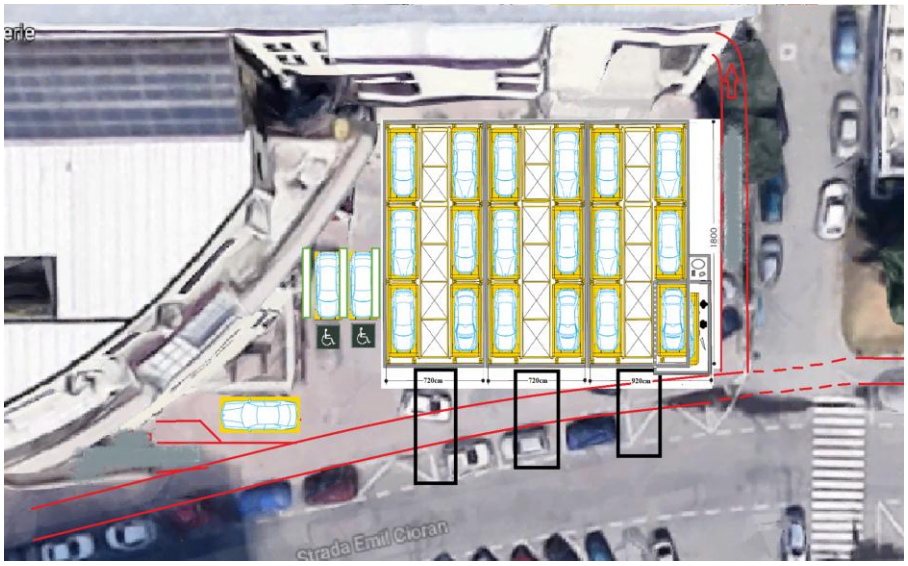

Fig. 9. Proposed parking design – top view.

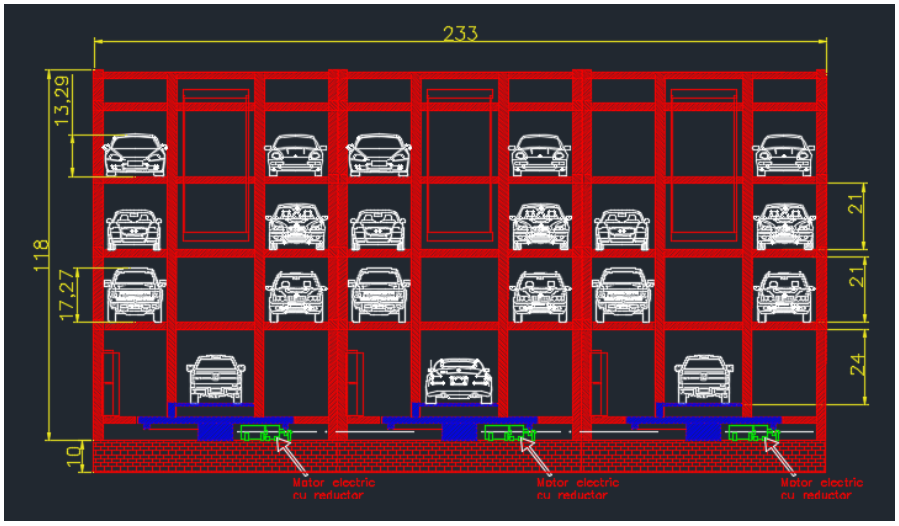

Fig. 10. Proposed parking design – front view.

The access to the parking lot can be done through one of the three entrances/exits. The car is entered through one of the access gates, after which the driver and passengers leave the vehicle. An automated lift system transports the vehicle to one of the available spaces. At each of the three entrances/exits there is a car turning platform, (fig. 11) so that the driver does not have to leave the parking lot backwards, which would increase the possibility of an incident.

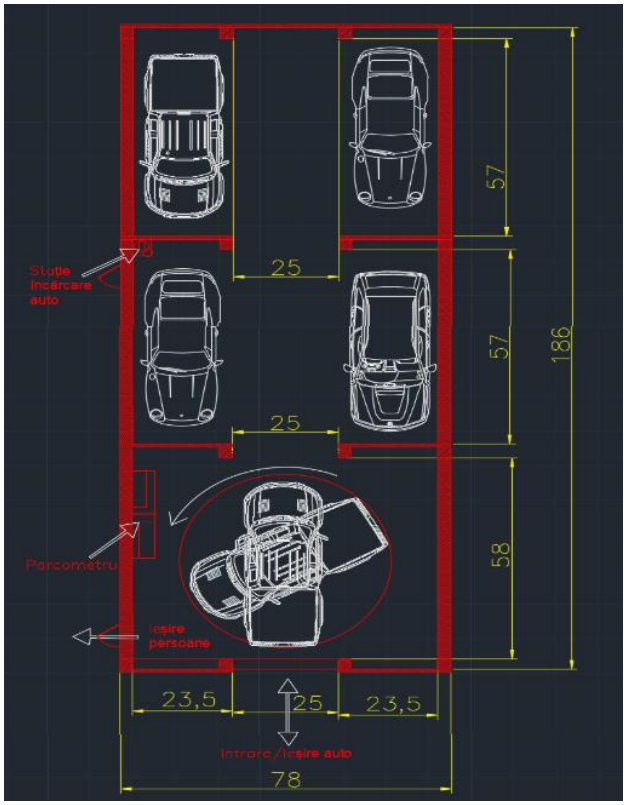

Fig. 11. Parking entrance/exit.

2.3.4. Parking facilities

We have taken into account that there are no parking spaces for disabled people in the area, so we will have two such special spaces at ground level.

The operation of the parking lot is ensured and coordinated by a command and control unit. This unit will manage the following parking systems and functions:

- displaying the number of available spaces on a display accessible at the entrance in the parking lot and on the adjacent roads;
- constantly updating the information available on an online software application that can be used by drivers;
- barrier access system that allows automatic vehicle identification based on the registration number;
- coordination of the sensors and mechanisms necessary for the automated functioning of the parking lot;
- safety system for parking lot users in order to avoid any type of incident;
- the charging and payment system that allows paying for parking, online, via SMS, with a bank card or cash;
- the monitoring and surveillance system provided by video cameras;
- six charging stations for electric vehicles located on the ground floor;

- the function of supplying electricity produced with the help of photovoltaic panels mounted on the roof of the parking lot.

3. Conclusions

The present study pursued a dual objective: to identify a practical solution to the problem of parking spaces and to present a methodology that can be used to generate other solutions of this type.

The solution we proposed aimed at the realization of the conceptual project of a modern parking lot that would solve the problem of insufficient parking spaces in the area of the Faculty of Engineering. We have designed a smart, automated, multi-storey car park, which is based on a lift-type platform that moves in three directions to position the car on the level where there is the availability of a parking space. The design thought by us presents the advantage of offering three times the number of parking spaces compared to the existing one. They can be used not only by students and teaching staff of the Faculty of Engineering, but are also useful for people who use the services of institutions in the area and for tourists. The car park has multiple facilities for users, all managed through a centralized system. The operation of the parking lot is designed to comply with environmental protection and sustainability standards, with part of the electricity required for operation being provided by means of photovoltaic panels.

One of the potential obstacles in the implementation of such a solution can be the cost of the parking lot, an aspect that was not the specific object of this research. Although the proposed solution generates an increase in the number of parking spaces in the area, it is still only a partial solution to the problem in question.

The modern parking lot designed in the framework of this research is currently a theoretical concept whose functionality needs to be verified and possibly optimized at a later stage, in the framework of future applied research.

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Dynamic Management of Traffic and Public Transport at the level of an Integrated Management Center of Urban Mobility

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Abstract

The Integrated Urban Mobility Management Center will ensure the takeover, centralization and offering of information and solutions in real time for all types of urban mobility problems: traffic management, public transport, bike sharing, ticketing, etc.; as well as information on the environment: temperature, pollution, high toxicity alerts, providing public information (weather data, travel times and routes, air quality, etc.) and secure / private information (on traffic accidents, ways of intervention, diversion of transport routes, additional means of transport, integrated solutions according to scenarios and legislation). Preliminary studies on European directives for urban mobility and emergency situations as well as national regulations. Approach: Analysis of the links between the command centers and the information provided for information processing in the Master Center – information system architecture, data sources, storage, processing, data utility, error handling, choosing / generating post-processing solutions to solve the problems encountered using predefined scenarios or using algorithms for generating solutions according to the legislations in force. Results: Creating scenarios for the integration in the Intervention Solutions of the Master Center, providing the two types of information: public and private (secured) reducing CO_2 emissions, increasing urban mobility by using public transport means and alternative mobility, increasing road safety, improving response times in case of an event by integrating communication with the Inspectorate for Emergency Situations.

Keywords: *Master Center, CO_2 reduction, alternative mobility, safety.*

1. Introduction

You might be surprised at the fact that, when you stroll through a typical medieval town in Europe with its surprisingly narrow streets compared to today's standards, a tourist guide might explain a curious fact: people used the size of a rider

and their horse to determine how tall and wide they were (people often crossed the street using beams above, arches or bridges). Whether the rider's arms could be spread out without touching the walls on either side indicated that the measurement was correct.

As towns and cities have developed, as have our economic and social progress, it has always been our mobility that determined their development. Innovations and structural changes have shaped the history of transportation, which takes us quicker and farther to our destinations. Several cities, including Venice, Amsterdam and Hamburg, began building their internal canal networks in the 15th Century, allowing river traffic between the different parts of the city to occur. These canal networks have been important in explaining the development of urban mobility.

Industrial development and globalization were stimulated by the development of an internal canal system. As a result of the development of railway networks in the 19th century, economic development was further stimulated, and large numbers of people were able to travel quickly and inexpensively [1]. International passenger and goods transport was influenced by the motor vehicle, road and motorway construction, and the advent of air transport during the 20th century. Motor vehicles' explosive growth in developed countries undoubtedly influenced the design and functioning of towns and cities; to the point that cars became more important than people. As a result of sustainable urban mobility, a new paradigm is emerging. Increasing motor vehicle traffic in cities led to a focus on finding the best way to move around. Promoting public transportation was the obvious solution. In comparison with personal vehicles, buses, trams, trains, and subways are much more efficient in using limited city space. As a result, they can accommodate a much greater number of passengers per trip than private vehicles. The solution was to create incentives for more sustainable forms of urban mobility in order to reduce citizens' reliance on their own vehicles. Traffic flow and people's health can both be improved with this measure. A change in perspective was generally accompanied by increased restrictions on car usage: parking restrictions in city centers, restricted access for air pollution prevention, etc. [2].

In the third phase, the concept of sustainable mobility was further developed and questions were posed such as: “Is your journey necessary?”. The debate centered on the fundamental objectives of transport policies. People moved constantly around the city to access goods and services. But what if those goods and services were more accessible and didn't require us to go get them [3]?

As a result of recent research, a group of sociologists and technologists have challenged this bounded approach to transport by studying change from a broader perspective of 'socio-technical systems', which integrates technology, social practices and business. Brand [4], for example, argues that the synchronization between technology and business practices contributes to changing behavior patterns; in contrast, Geels [5] said that the introduction of oil-based vehicle mobility systems at the beginning of the twentieth century resulted in a wide range of interests and organizations reuniting as a result of the development, adoption, and diffusion of this new socio-technical system than were thought to be relevant 'transport interests' during previous centuries.

To examine traffic's total management, this paper considers it as a single system [6],[7]. Methods of general optimization, sensing, technology, and processing of data. People and goods move from one place to another via all types of transport (bike, trains, inland water navigation, air transport, emergency transport) in one single system supported by transportation infrastructure, transportation services, logistics, or control elements. Single refers to all types of movement (from pedestrians to autonomous vehicles). With predefined optimization rules and hierarchically defined interconnected vehicles, the transportation management controls the single transportation system as a whole. As a solution, smart technology may be able to solve the problem (through the use of available technologies and theories), whereas intelligent technology may provide a different solution, based on the specific circumstances and characteristics. The paper outlines a method to bridge the gap between the solutions developed for the various elements (like junction control, smart parking, and optimizing the changing of means of transportation at multi-modal transport centers) and the management of the overall system. Ultimately, the purpose of this paper is to present a vision and concept of managing the total transportation system by defining the concept, the methodology, and the sub-models necessary to support the smart city vision of the future.

2. Materials and methods

The objectives of the study are correlated with the objectives of the strategic documents existing at the level of the municipality, at the county, regional, national and European level, as follows:

- European Green Paper on Urban Transport – "Towards a new culture of urban mobility"[8], the document sets out the main challenges to which urban mobility must respond, the proposed project having an impact on all 5 aspects mentioned: cities with fluid traffic, less polluting cities, smarter urban transport, accessible urban transport, safe and secure urban transport;
- Romania's Transport Master Plan, establishes the guidelines for a sustainable development, one of its estimated results being: "A long-term (sustainable) transport system"[10];
- Integrated Urban Development Strategy 2021-2027. The "Integrated Urban Development Strategy 2021-2027" is a reference framework document that sets clear strategic directions for the future of the city and its citizens, facilitating the taking of important decisions in all fields of activity and it's adapted for every city or area, based on general guidelines.

Identifying the existing deficiencies and carrying out a thorough analysis of the current situation regarding urban mobility, was crucial for establishing optimal solutions for the Integrated Management Center of Urban Mobility. Analysis of existing documents and field visits has resulted in a summary of the main weaknesses of the various systems examined, particularly from the perspective of sustainable urban mobility, and the conclusions have been used to determine the

areas for implementation to achieve optimal results. To test the scenery, field study data were entered into a transport model. This was followed by comparative analysis of the output data of the model for the reference year 2020, the first year of project implementation (medium-term forecast – 2024) and for the last year of the sustainability period (long-term forecast – 2029). Implementing an Integrated Management Center for Urban Mobility consists of the fusion data of the subsystems listed below in one command and control center. The system will be able to provide a single interface, front-office and back-office that integrates information from all the subsystems included:

- Intelligent traffic management system;
- Intelligent video surveillance system;
- Infrastructure monitoring system – bridges;
- Public transport management system;
- Intelligent lighting system;
- Road safety system;
- Alternative mobility system;
- Parking management system;
- Electric vehicle charging station system;
- Air quality monitoring system;
- Communication system;
- Monitoring system of the hydrographic network;
- Monitoring systems for utility networks;
- Emergency management system;
- Waste monitoring and collection system;
- Public address system.

The Center will provide the following main functionalities:

- arrangement and endowment of the command center for the integration of data from the other subsystems;
- arrangement of private control centers for systems not currently dispatched;
- integration of data from several subsystems and the distribution of relevant information to them in order to improve individual functioning but, above all, to correlate the actions in an integrated approach;
- integration with the traffic management system;
- ensuring the priority of passage for emergency vehicles and public transport through all traffic light intersections in the municipality;
- implementation of a center for monitoring moving weighing systems;
- implementation of a parking space monitoring center; - integration and extension of the passenger information system;
- ticketing system integration and extension;
- implementation of a road safety system;
- implementation of an emergency management system (integration with CCTV system (existing video monitoring center) and implementation of local emergency management subsystem;

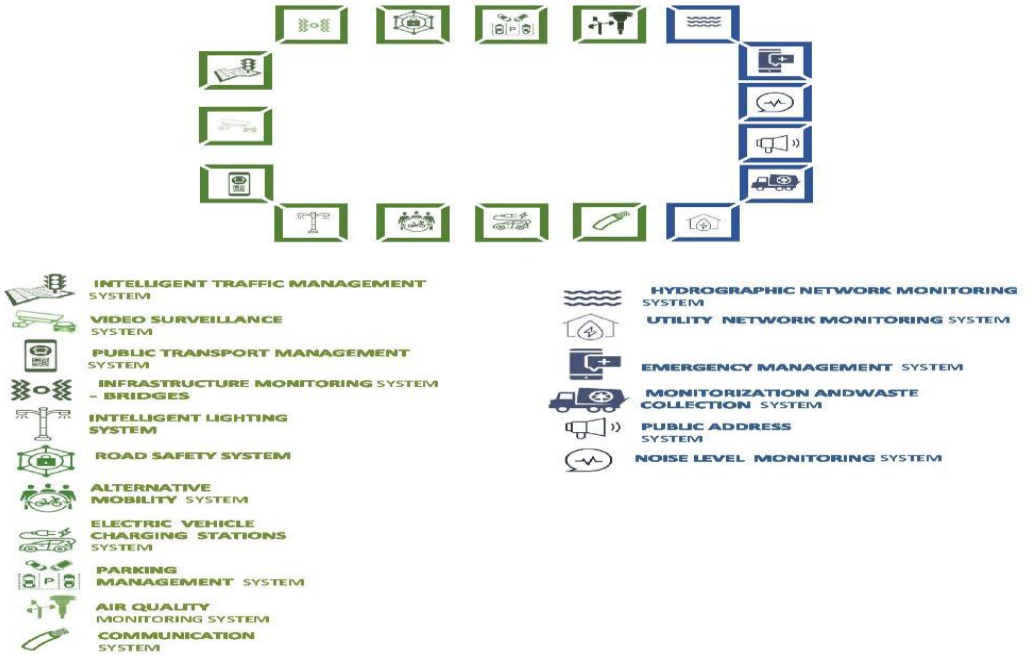

Fig. 1. Integrated Management Center of Urban Mobility

- implementation of an intelligent parking system for private bicycles;
- ticketing integration between all integrated urban mobility solutions;
- implementation of some modules for intelligent control of public lighting lamps;
- implementation of a system for monitoring the charging stations of electric cars;
- monitoring the CO_2 emission reduction indicators and noise indicators and proposing work scenarios according to the eco-mobility parameters set by the municipality;
- implementation of a system for the monitoring of utilities networks in the municipality (the networks of water supply and sewerage, district heating, gas supply, electricity supply are taken into account);
- hydrographic network monitoring;
- implementation of a system for monitoring waste;
- implementation of an urban mobility software application to facilitate the access of citizens and tourists to the transport system (including charging and passenger information). The application will also act as a travel system for defining optimal routes;
- a centralized IT solution that will ensure: integration of data from all the above mentioned systems, data analysis, generating and transmitting information relevant to each system, support for the decision, analysis of mobility parameters and proposing solutions to improve them, generating

estimates and predictions for estimating the future situation (for a short-medium time horizon);
- IT – AI solution for delivering predetermined scenarios for intervention in case of emergency or AI new scenarios based on machine learning capabilities; providing the two types of information: public and private (secured for the emergency authorities) ;
- call center for citizens and tourists.

3. Results

The IT solution for delivering predetermined scenarios for intervention in case of emergency or AI new scenarios based on machine learning capabilities will connect all the important factors based on information delivered by all the sensors centralized in the Integrated Management Center of Urban Mobility, based on that scenarios the police, ambulance, firefighters or other factors will improve the response times, because the system will guide them and prioritize the route to facilitate fast intervention; providing the two types of information: public and private (secured for the emergency authorities)

3.1. Private information of the Master Center will provide access to all authorities in the city, creating a user profile that will have certain restrictions depending on its degree of clearance, so that they will have access to the following data:

3.1.1. Traffic management:
- real-time information from intersections: number of vehicles, delays, vehicle blocks, incidents/accidents/events, real-time images from monitored intersections;
- information on the routes most used by different categories of road users ;
- reports on congested points, identifying the cause of congestion ;
- predictions of traffic jams;
- prediction of the impact of certain changes in traffic conditions;
- real-time generation of out-of-weight vehicle alerts.

3.1.2. Prioritization of public transport:
- generating reports on the reduction of vehicle delays through the ranking system (efficiency report);
- transmission to vehicles of information on the speed at which they should travel in order to reach the intersection in green.

3.1.3. Parking:
- information on the degree of use of the monitored parking lots;
- checking compliance with parking space reservations;
- elaboration of proposals for the modification of tariffs from the existing structure of tariff zones, according to the monitored degree of use;

- drafting proposals on moving a certain car park from one tariff area to another, based on the degree of use monitored;
- drawing up proposals on the realization of new tariff zones.

3.1.4. Emergency management:
- emergency assistance via the app;
- planning/management module for events/works;
- possibility of introducing into the system the planned events and works;
- develop proposals on when events/works have minimal impact on urban mobility;
- emergency situations;
- development of predictions and alerts reflecting traffic congestion;
- elaboration of predictions and alerts reflecting the travel request, for each mode of transport, on hourly intervals;
- elaboration of predictions and alerts reflecting on failures (based on historical statistics);
- develop predictions and alerts reminiscent of exceeding the pollution and noise thresholds.

3.1.5. Public transport:
- real-time information on the degree of identity of vehicles;
- real-time information on the loading rate of the stations;
- elaboration of statistical reports on the efficiency of the public transport system (degree of loading of vehicles, waiting time at the station, number of transshipments, etc.) ;
- identifying the causes of delays in vehicles on the route and drawing up proposals to remedy the deficiencies found;
- drawing up proposals on the temporary modification of public transport lines at occurrence of events (unforeseen or planned);
- drawing up proposals on new routes/modifications to existing routes to reduce the number of transshipments, depending on the historical data collected ;
- elaboration of proposals on the addition or reduction, temporary or permanent, of the transport capacity, by days/time intervals, depending on the information collected from the field, in conjunction with historical values;
- proposal to streamline the ticketing system by identifying areas with high travel demand that do not automatic sales of travel titles;
- generating statistical reports on the types of validations used;
- generating reports on the routes used by passengers, available at the time when it will be decided to validate the travel title both when boarding and getting off the vehicle.

3.1.6. Alternative mobility:

- information related to the degree of use of bike lanes, relative to the number of cyclists recorded by the system;
- elaboration of reports and proposals for the efficiency of the network of bike lanes (identification of unused lanes, streets with a significant number of cyclists on which no dedicated lanes are arranged, etc.);
- elaboration of reports and proposals for streamlining the location and equipment of bike sharing stations;
- elaboration of reports and proposals for streamlining the location and equipment of private bicycle stations.

3.1.7. Public lighting:

- monitoring the operation of the system in order to provide safe routes for passengers (with the generation of alerts in case of damage);
- generating proposals regarding the thresholds and time intervals considered in dynamic street lighting;
- possibility of generating alerts for the lighting system regarding the number of pedestrians and the identified crossings, in order to activate the appropriate lighting plans;
- possibility of generating alerts for the lighting system regarding cyclists present on the bike lanes, for their proper lighting.

3.1.8. Electric vehicle charging stations:

- provision of statistical information related to the use of stations;
- possibility of directing to charging stations (by integration with a geographical support).

3.1.9. Noise and air quality monitoring:

- generating dynamic pollution maps, with graphical representation suggestive of the identified problems and proposing solutions for remediation. predictions will be generated based on historical data and solutions will be proposed to keep levels below alert thresholds;
- generating dynamic noise maps with graphical representation suggestive of identified problems and proposing solutions for remediation. predictions will be generated based on historical data and solutions will be proposed to keep levels below alert thresholds.

3.1.10. Utility monitoring:

- Generating information on works with an impact on mobility.

3.1.11. Hydrographic network monitoring:

- information on the hydrographic network;
- generating alerts for intervention.

3.1.12. Waste monitoring:

- providing support for targeting for recycling.

3.2. Public information provided for citizens will be:

3.2.1. Used for private vehicles:

- network delays, based on detectors that collect real-time data, the history made and the planned events ;
- position, the number of parking spaces available at that time, with the possibility of booking the parking space and the payment of the tariff according to the desired duration.

3.2.2. Used for public transport:

- he opportune routes, considering both the length of the route and the possibility of prioritization along the route;
- appropriate vehicles, taking into account:
- specific preferences (e.g. ramp for people with disabilities, possibility of charging mobile devices, or other facilities selected by the user);
- the degree of loading, known in real time, also taking into account the demand at the stations through which the vehicle is to pass until it reaches the proposed boarding station;
- the appropriate embarkation station, taking into account:
- ease of reaching it;
- degree of congestion (of the station and of the vehicles to reach the station);
- the necessary facilities (e.g. automatic for the sale of tickets);
- the estimated time of arrival at the station of the vehicles, estimated both according to the position of the vehicles and based on other relevant data collected by the system (e.g. the existence of large queues of vehicles in front of the bus);
- the appropriate destination station, taking into account the way of continuing the journey;
- purchasing the travel ticket directly from the app, with multiple validation for attendants and selecting the most advantageous fare for travelers.

3.2.3. Used for bike-sharing:

- selection of the appropriate stations (with bicycles available at pick-up and with available seats in the drop-off station);
- booking the bicycle and making the payment directly from the application.

3.2.4. Used for pedestrian routes

The accessibility of the routes will be taken into account (e.g. for people with locomotor disabilities, no routes involving stairs will be selected) and the safety conditions (number of historically recorded incidents, appropriate lighting, etc.):

- provision of information on the resulting charges for each route;
- providing information on the degree of pollution achieved for each route;
- providing information on the route regarding the movements to be made next (e.g. get off the public transport vehicle at the next station);
- real-time update of route-to-follow information based on real-time data collected in the mobility operational center;
- possibility to upload subscriptions in the app;
- possibility of payment in a single action for all charges involved in the selected trip;
- generating alerts for the necessary actions (e.g. a subscription uploaded to the app is due to expire, the time for which the parking was paid, etc.).

3.2.5. Collection of anonymous data of:

- the routes followed;
- means of transport used;
- the selection criteria of the user, from the variants of the routes offered, with the possibility of estimating the reasons for which a certain route was chosen;
- actual delays, compared to estimates originally provided.

According to the present system, which is outlined and validated from a technical perspective, alternative urban transport solutions will be integrated to facilitate people's access to workplaces, service providers, or other areas of interest, reducing travel times, transportation costs, reducing pollution and energy consumption, decongesting traffic, and improving safety as a result.

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Automatic Number Plate Recognition using YOLOv5

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Abstract

Automatic number plate recognition (ANPR) is a system that uses a vehicle's number plate to identify it. The popularity of ANPR technology has increased over the past years as a result of its variety of applications in different fields. To build the ANPR system two stages are considered. In the first stage, to segregate the number plate from the rest of the image, we utilize the pre-existing open-source system YOLOv5. You Only Look Once (YOLO) is a state-of-the-art, real-time object detection algorithm that utilizes regression

to predict bounding boxes and associated class probabilities for the whole image using a single convolutional neural network (CNN). In the second stage, once the number plate is detected, it is cropped from the image and is passed on to detect characters using optical character recognition (OCR). OCR identifies text inside an image file and converts it into a machine-readable text form to be used for data processing. For license plate recognition, compact classifier models combined with YOLOv5 are experimented from the perspective of obtaining high efficiency of implementation in Raspberry-Pi embedded systems. Based on investigated compact solutions analysis, we determine the optimal solution with maximum accuracy in terms of minimum response time. The solution is integrated into the Raspberry Pi platform together with software modules that allow access via the Internet and the management of the database containing the recognized numbers. This paper aims to create an optimal ANPR system for embedded systems by implementing a solution that increases the performance, efficiency, scalability and accuracy of automatic license plate recognition software.

Keywords: *Optical Character Recognition (OCR), Automatic Number Plate Recognition (ANPR), YOLO, Real-Time Object Detection System, Convolutional Neural Network (CNN).*

1. Introduction

Over the past years, several cities throughout the world have placed the transformation of smart cities at the top of their priority lists. One of the most often used sensing technologies for providing huge data and fresh insights on observing vehicle movements and mobility patterns in controlling urban mobility is camera technology, in particular, Automatic Number Plate Recognition (ANPR) [1]. This technology represents an advanced and intelligent system that has gotten popular due to its various real-life use cases (such as traffic violation, parking management, toll automation, intelligent transportation etc.) without any human intervention [2].

Utilizing a camera, ANPR entails gathering footage of license plates from the intended scene. The acquired image is then further processed by a number of recognition algorithms based on image processing in order to convert the image into a text entry with alphanumeric characters [3].

This study aims to create an optimal ANPR system for Raspberry-Pi embedded systems by using object detection algorithms combined with different feature extractors for maximum accuracy in terms of minimum response time. The structure of this paper is as follows: we review some related works regarding ANPR systems in Chapter 2. Chapter 3 encompasses details of the proposed system. Then, we present the implementation in Chapter 4 and conclude our work in Chapter 5.

2. Literature Survey

In the past years, a variety of ANPR systems have been offered. License plates and characters were found using image binarization or grey-scale analysis, which were then followed by custom feature extraction techniques and traditional machine learning

classifiers. The state-of-the-art began shifting with the emergence of Deep Learning, and today, many works use convolutional neural networks (CNNs) because of their excellent accuracy for general object identification and recognition [4].

Venkatanaresh et al. [5] proposed research that used CNNs to deliver effective deep learning principally based on ANPR system for the detection and recognition of license plates (LPs). To simultaneously identify and classify LPs and characters, two fully convolutional one-stage object detectors were used, followed by an assembly module that outputs the LP strings. The VLPR model was employed, using YOLOv2 to detect license plates and optical character recognition (OCR) to identify characters on license plates. The suggested solution treats license plate detection and recognition as a single task accomplished using a single network.

Adak et al. [6] proposed a system divided into two regions of interest. In the 1st region of interest, the number plate was separated from the rest of the image using YOLOv3. After the license plate was located, it was clipped from the image and used to find the individual characters in the second region of interest. Filtering of content for plate license recognition was done using a variety of image processing algorithms. The program was created and put into use on images that were impacted by different environmental conditions (such as over-exposed image, blurred image, image with angular perspective, randomly chosen custom font, rotated image, shaded image, straight image, image with a coloured number plate background, multiline image). It provided good accuracy for images with a straight front, and for images affected by environmental factors, accuracy was hindered up to 12%, compared to other systems without the right pre-processing techniques that have up to 42% hindrance.

Baghdadi [7] presented a comparative analysis between ANRP systems implemented using one-stage object detection algorithms. The work consisted of analyzing the mean Average Precision (mAP) of Single Shot MultiBox Detector (SSD), and YOLOv4 on CENPARMI (Centre for Pattern Recognition and Machine Intelligence) and UFPR-ALPR (Federal University of Parana - Automatic License Plate Recognition) datasets. The CENPARMI dataset consists of license plates' images from the United States and Canada, while the UFPR-ALPR dataset consists of license plates' images from Brazil. Although they achieved good mAP results of 95.47 % (ResNet-SSD) and 95.45 % (InceptionV2-SSD) with the SSD model during the experiment, they reached the highest mAP of 97.46 % and 97.78 % with the YOLOv4 model on CENPARMI and UFPR-ALPR datasets, respectively. They closely examined the aforementioned object detectors to build a model that can balance mAP, speed, and memory and discovered that the more parameters a model has, the better the outcomes of detection. However, this also affects the speed of an object identification operation.

3. Proposed System

To build the ANPR system, two stages are considered, as shown in the following figure:

- Plate Region Detection and Extraction;
- Characters Segmentation and Recognition.

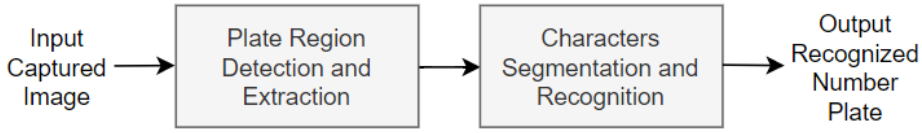

Fig. 1. Diagram of the ANPR system.

3.1. Plate region detection and extraction

In the first stage, to segregate the number plate from the rest of the image, we utilize the pre-existing open-source system YOLOv5. You Only Look Once (YOLO) is a state-of-the-art, real-time object detection algorithm that utilizes regression to predict bounding boxes and associated class probabilities for the whole image using a single convolutional neural network.

Three components make up the YOLO network:

- Backbone: a convolutional neural network that gathers and creates picture features on various scales;
- Neck: a number of layers that blend and mix visual characteristics before sending them on to prediction;
- Head: consumes neck features and performs class and box prediction procedures [8].

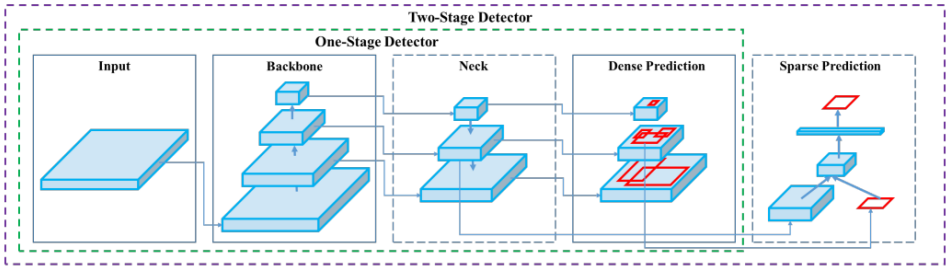

Fig. 2. Object detector.
Source: Figure from [9]

Every member of the YOLO family is based on an earlier model and aims to make that model better. For the backbone of the YOLOv5 model, the authors created CSPDarknet, which consists of an incorporated cross-stage partial network (CSPNet) into Darknet. By integrating the gradient changes into the feature map and resolving the issues with repeated gradient information in large-scale backbones, CSPNet reduces the model's parameters and FLOPS (floating-point operations per second), ensuring inference speed and accuracy while also shrinking the model's size. The authors used a path aggregation network (PANet) for the neck of the model to improve information flow. The transmission of low-level features is boosted by the use of a feature pyramid network (FPN) structure by PANet with an improved bottom-up path. In addition, adaptive feature pooling, which connects feature grid

and all feature levels, is employed to enable each feature level's important information to spread instantly to the subsequent subnetwork. In lower layers, PANet enhances the use of precise localization signals, which can obviously increase the object's location accuracy. The Yolo layer, which is the model's head, creates feature maps in three distinct sizes (18 × 18, 36 × 36, 72 × 72) to accomplish multi-scale prediction. This allows the model to handle tiny, medium, and large objects [7],[10].

3.1.1. The choice of feature extractor

Although YOLOv5 can do classification tasks by itself, using object detection alongside classification models can boost performance by around 5–25%.

A number of feature extractor models are available for each object detector. The accuracy of the model improves along with the number of parameters. However, when selecting one of the feature extractor models, there are still more aspects to take into account. Depending on the use of an ANPR system, one should attempt to strike a balance and make a decision between speed, accuracy, and memory [7].

3.1.1.1. MobileNet

The depthwise separable convolutions, a type of factorized convolutions that factorize a standard convolution into a depthwise convolution and a 1 × 1 convolution known as a pointwise convolution, are the foundation of the MobileNet model. Each input channel for MobileNet receives a single filter due to depthwise convolution. In order to merge the outputs with the depthwise convolution, the pointwise convolution is complemented by a 1 × 1 convolution. In one step, a standard convolution filters and combines inputs to create a new set of outputs. This is divided into two layers by the depthwise separable convolution: a layer for combining and a layer for filtering. The computation and model size are significantly decreased as a result of this factorization.

In comparison to other neural networks with the same accuracy, MobileNet uses 3 × 3 depthwise separable convolutions, which requires 8–9 times less processing [11].

3.1.1.2. EffNet

EffNet architecture is a variation of the MobileNet building block. Two linear layers are created from the 3 × 3 depthwise convolution. This enables pooling after the first spatial layer, saving calculations in the subsequent layer. Following that, the subsampling is divided along the spatial dimensions. A 1 × 2 max pooling kernel is then applied after the initial depth-wise convolution. The common pointwise convolution is swapped out for 2 × 1 kernels and a commensurate stride for the second subsampling. This almost equals the number of FLOPs while providing marginally higher accuracy [13].

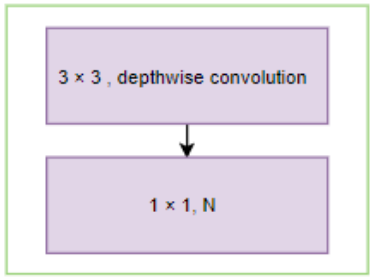

Fig. 3. MobileNet convolutional block.
Source: Figure from [12]

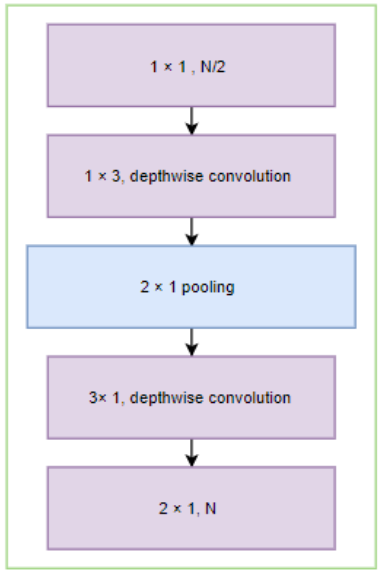

Fig. 4. EffNet convolutional block.
Source: Figure from [12]

3.2. Characters segmentation and recognition

In the second stage, once the number plate is detected, it is cropped from the image and is passed on to detect characters using optical character recognition. OCR software converts a two-dimensional image of text (which could be either handwritten or machine-printed) into text that is readable by machines. The optical character recognition process consists of multiple sub-processes [14].

The general sub-processes are:

- Pre-processing of the Image;
- Text Localization;
- Character Segmentation;
- Character Recognition;
- Post-processing.

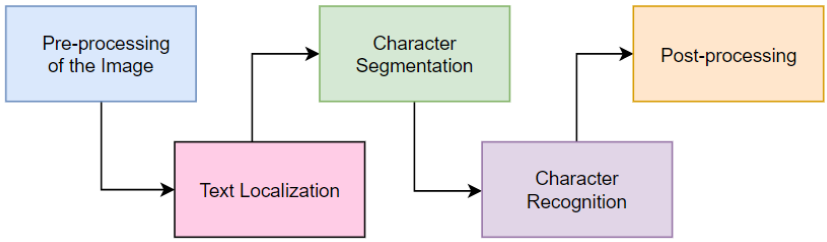

Fig. 5. OCR sub-processes.

3.2.1. Tesseract OCR

Tesseract is a free and open-source OCR engine that complies with the Apache 2.0 license. Using a command line or an API, Tesseract may be used to directly extract written text from images. Many different languages are supported. It is compatible with a wide range of programming languages and frameworks due to its fully featured API. Tesseract can be used in conjunction with the current layout analysis to identify text within a large document or with an outside text detector to identify text from an image of a single text line [14].

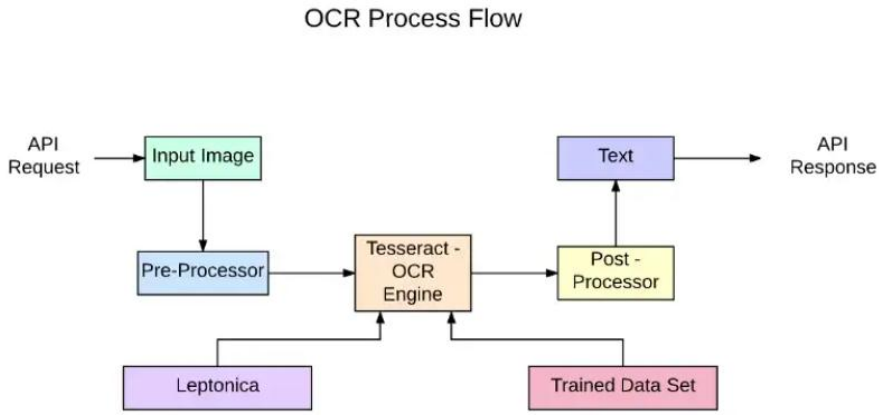

Fig. 6. Tesseract OCR process flow.
Source: Figure from [15]

4. Implementation

The main part of this work is purely software-based. Therefore, we only require a small amount of hardware to set up the text recognition for license plates. The following components are used: Raspberry Pi 4 (with installed software - Raspberry Pi OS), USB webcam and power connection (micro USB cable and USB adapter).

The Raspberry Pi is a credit card-sized computer that can perform a variety of low-power applications, including processing text and connecting to the Internet. The USB webcam is connected to the Raspberry Pi setup in order to give real-time input. And lastly, the power connection is used for power supplying the board.

The USB camera captures video frames. The taken image is sent to Raspberry Pi to process the data. To detect the vehicle license plate, we utilize YOLOv5 alongside compact classifier models (MobileNet and EffNet), which are greatly increasing the performance, efficiency, scalability and accuracy of the model. To train the model, we use a freely available dataset from Kaggle, which consists of nearly 500 images of vehicles. To extract the text, we apply OCR Tesseract for character recognition. The recognized number plate is then recorded in a database.

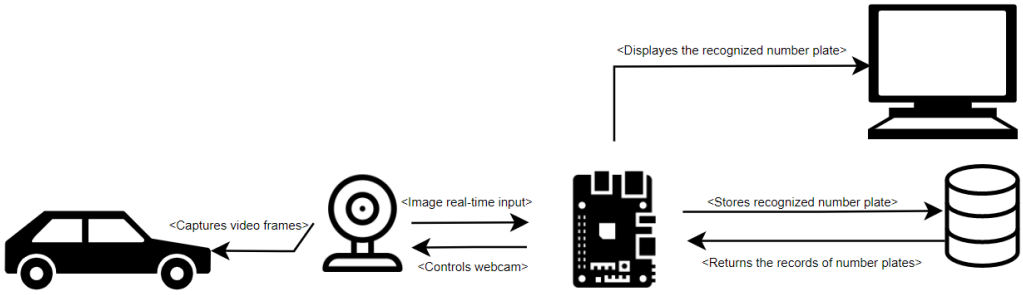

Fig. 7. Implementation diagram.

5. Conclusion

The popularity of ANPR technology has increased over the past years as a result of its variety of applications in different fields. The recent advances in Parallel Processing and Deep Learning have contributed to improving many computer vision tasks, such as Object Detection/Recognition and OCR, which clearly benefit ANPR systems. In fact, deep CNNs have been the leading machine learning technique applied for vehicle and license plate detection.

The first and most important phase in the ANPR system is object detection, which we examined in this research. High precision is no longer the only important criterion in object detection. But it's essential to use a model that can strike a balance between precision, speed, and memory. Since the ANPR systems are mostly useful in real-time applications, we evaluated the YOLOv5 model, known as one of the fastest real-time object detection models. Feature extraction is a sub-task of object detection; hence we examined different feature extractors with the YOLOv5 model and found out that algorithms perform similarly if tuned properly.

The goal of this work is to determine the optimal solution for embedded systems in terms of minimum response time. For this purpose, YOLOv5 with MobileNet as feature extractor does a better job, conditioning the reduction of parameters, thus reducing the size of the model and improving the interface time. However, in terms of performance, efficiency and accuracy, it is slightly exceeded by YOLOv5 combined with the EffNet classifier model.

Although we used pre-trained networks to train with the chosen models, we expect that more data will enable the model to generalize more effectively and deliver more accurate results. The dataset properties, the model, and the hardware

system's accuracy, speed, and memory performance should therefore be taken into account in order to have the required ANPR system.

Acknowledgements

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The role of small and medium enterprises in smart life and development

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Abstract

Small and medium enterprises are considered one of the most important sectors in the development of the Palestinian economy, in light of the continuous development with smart life and continuous technological intelligence in the world. This study focuses on the adaptation of small and medium enterprises to smart life in order to reach economic development and reduce the unemployment rate in Palestine. Where the aim of this study is to identify the reality of small and medium companies in Palestine and to pay attention to the danger of their inability to adapt to smart life in order to reduce unemployment and economic development This was done through the use of a simple random sample obtained from the Ministry of Economy. The sample is distributed among the cities of the West Bank. The sample size reached 150 economic projects. A questionnaire was used and the descriptive analytical method was used through the analysis using SPSS. One of the most important findings of the study is that small and medium-sized companies find their inability to adapt to smart life due to the occupation's restriction to the use of artificial intelligence, as the GPS service, for example, is prohibited inside the Palestinian territories, and the destruction of the economic components due to the closure between cities and dependence on the economy the Palestinian economy to the occupation.

***Keywords**: risk management, Small and Medium Enterprises, development, The unemployment.*

1.Introduction

The core definition of a smart city lies in its use of information and communication technology, As it enables you to manage the city in a more civilized, efficient, and effective manner, digital knowledge and sensors give you a more appropriate awareness of the existence of human capital in addition to increasing its effectiveness. In general, a smart city is a development whose goal is to achieve sustainable development and raise citizens' quality of life [1]. However, the restrictions imposed on the Palestinian government limit the transformation of its cities into smart cities [2].

Studies indicate that 65% of the world's population aspires to move to live in smart cities, given the difficulty of living in cities that do not have the infrastructure for communication and information technology, in addition to the problems that cannot be overlooked, such as population sprawl, traffic congestion, scarcity of resources and energy, in addition to To the government's lack of strategic planning, and not allowing the import or application of any of the elements of smart cities.

The current economic situation in Palestine is one of the most complex cases in the world, due to Palestine being considered a conflict zone over the long years, [3]where the Palestinian people and the Palestinian economy have constantly borne the burdens of foreign rule from the Ottoman rule, even the British, and the Jordanian administration of the West Bank and the Egyptian administration in the Gaza Strip. And the Israeli occupation since 1948 and 1967, where all these events resulted in the development of a mixture of economic legislation that serves the interest of the occupier, and this resulted in the expulsion and deportation of more than half of the Palestinians, depriving them of their lands and economic resources, and turning them into refugees scattered around the world, and after the peace process and the General Oslo Agreement 1993 and the advent of the Palestinian Authority, led by the Palestine Liberation Organization, the sole and legitimate representative of the Palestinian people [2].The peace process resulted in a state of uncertainty among the Palestinian people. Instead of the beginning of a stage of growth and economic development and evolution with the continuous technological life in the world, the Palestinian lands were classified according to the agreement into regions, A, B, C, which helped increase Israeli control over the Palestinian economy and give a legitimate cover for Israeli violations This resulted in the existence of a Palestinian state without sovereignty and control over its economy [4], and the existence of an occupation that controls 90% of the land area, in addition to complete control over the economy from the movement of goods and the transit of people between and outside the Palestinian regions, and restricting technological development, which resulted in A fragmented economy that depends on external factors and on a production base and infrastructure robbed of technological development and natural and intelligent life [5].

The Palestinian economy resorted to small and medium enterprises to protect itself in the economically complex situation, as the unemployment rate in Palestine reached 2021/2019.

Table 1.

	the year	Unemployment rate
1.	*2022*	*%25.9*
2.	*2021*	*%25.3*
3.	*2020*	*%26.2*
4.	*2019*	*%25.7*

Source: Unemployment rate according to the Palestinian Central Bureau of Statistics
Prepared by the researcher

The increase in the unemployment rate that Palestine suffered from during the successive years, small and medium enterprises had an important role in reducing its impact by employing workers and reducing the level of unemployment (Palestinian Monetary Authority, 2020).

According to the Palestinian Central Bureau of Statistics, small and medium-sized companies in Palestine accounted for 98.6% of the Palestinian economy, and workers in this sector accounted for 81% of the workforce. They focused on retail and wholesale trade and services during the period of 2020.

From here came the need to start thinking about the research problem, which is based on the fact that small and medium enterprises face many difficulties in order to reach a smart life in light of the current economic complexities in Palestine.

2. Literature review:

[1] The impact of using social media on the performance of small and micro enterprises run by young people in the districts of Abs and Bani Qais - Hajjah Governorate.

The study aimed to identify the use of technology and social communication in small projects, as it concluded that the level of use of social media is high and positively affects the performance of small projects and thus helps in all operations of small projects [6]. The Role of Small and Medium Enterprises in Reducing Unemployment,

It aims to identify the reality of small and medium-sized projects in one of the most important economic development and changes and requirements in the levels of technology, thus it was supportive of large projects, which is one of the most important pillars of development (Basir, 2021) The reality of small projects in light of the emergency (Corona pandemic) an applied study on the Bethlehem Governorate, It aimed to get acquainted with the reality of the micro-enterprise sector in Palestine in light of the situation of Corona and the various obstacles it faces under the state of emergency. Support for small projects.

Study [3] “Repercussions of the Corona Pandemic (Covid-19) on Small and Micro Enterprises Led by Women in the Gaza Strip”

This study indicates the importance of small projects in Palestine, where small projects constitute an important tributary to the Palestinian national economy, especially at the level of contribution.

Small and micro enterprises in the gross domestic product. In addition to absorbing the workforce of small and micro enterprises and reducing unemployment rates, especially among them guy. Small and micro projects represent an opportunity for the poor and those with limited income to provide a source of income, in addition to being considered the most important tools for economic development.

[7] this study refers to the legislative and institutional aspects as a basis for sustainable planning in the Palestinian territories. Problems in laws and procedures for dealing with disasters, and there is an absence of the regional level for the process of sustainable planning for disaster reduction.

[8] The global interest at the present time is represented in preserving life and human societies on Earth, which is one of the most important scientific trends towards which most studies and research are directed, especially in countries that are moving towards achieving sustainable development in all its aspects, especially in the insurance sector through sustainable risk management. It is noted that the rapid developments Which witnesses the world in terms of population growth and increase puts it in front of huge challenges that preserve their rights and ability for future generations to continue in a dignified life far from dependence in all its forms.

3. **Study analysis, results and recommendations:**

In this research, the focus was on three basic hypotheses related to the demographic variable through the questionnaire and answering the questions, which were briefly summarized and referred to as follows.

There are no statistically significant differences between the level of significance (0.05) between the variable of sex and smart life in small projects.

There are no statistically significant differences between the level of significance (0.05) between the age group at the level of life development on the project.

There are no statistically significant differences between the level of significance (0.05) between the academic qualification and between entering smart life and the level of development in the project and making profits.

These variables were analyzed as follows, in brief.

Test (Chi- squared test) according to demographic variables, age, gender, and educational qualification.

Table 2. Table Gender

Gender	Male	Female
	90%	10%

Source: Prepared by the researcher

Through the study, it was found that the ownership of smart projects and smart life in small and medium enterprises, according to the sample, belongs to

males more than females, as the percentage of males reached 90% and the percentage of females reached 10%. This is due to the fact that females work less for projects compared to males due to fear of risks

Analysis (Chi- squared test) showed us that there are no statistically significant differences at the level of significance (0.05) between the variable of sex and smart life in small projects, and that the two variables are independent of each other, and we reject the alternative hypothesis.

Table 1. Example of a table

Variants	Kai square	degrees of freedom	statistical significance	level of significance
Gender	1.22	3	34.	0.05
the age	10.3	14	6.	0.05
Qualification	19.1	7	0.05	0.05

Source: Prepared by the researcher

Through the study, it was found that the ownership of smart projects and smart life in small and medium enterprises according to the age group from 40-49 years old 40% from the ages of 50-60 30% from the age of 18-39 30%

It was found through (Chi- squared test) that there are no statistically significant differences at the level of significance (0.05) between the age group at the level of life development on the project, and thus we accept the null hypothesis that says that the percentage of profit achieved by the project is not due to age, and thus we reject the alternative hypothesis Which is based on the development of smart life due to the age group of the project.

Analysis (Chi- squared test) showed us that there are no statistically significant differences at the level of significance (0.05) between the variable of sex and smart life in small projects, and that the two variables are independent of each other, and we reject the alternative hypothesis.

With regard to the educational level, the study indicates that those who hold a university degree with a bachelor's degree or higher are more developed for smart life within the project and technological development, by 50% of the total number of al-Maliki, and they have continuity with the state of development, and the increase in this percentage is due to the accumulation of unemployment among university graduates, which leads them to open Small projects that suit their economic situation, followed by holders of a general secondary certificate with a percentage of 27%, then an intermediate diploma with a percentage of 14%, then a high school with less than 9%.

Through the use of (Chi- squared test) it was found that there are no statistically significant differences at the level of significance (0.05) between the academic qualification and between entering smart life and the level of development in the project and making profits, thus we accept the null hypothesis that says that the level of smart life within the project does not accrue to the qualification Scientific, that the two variables are independent of each other, we reject the alternative hypothesis that says that the intelligent life achieved by the project is due to the scientific qualification of the project.

The results formed after the above-mentioned analysis process are that gender, age, and educational qualification, we do not deny their importance in small and medium projects in terms of development, leading to smart life in smart projects and projects, as age and years of experience are sufficient to help reach smart life in projects in addition to the specialized scientific qualification In the field of life intelligence that keeps pace with development, it helps, as the largest example in Palestine is the city of Rawabi, which is the first city located in Ramallah in the West Bank to be within the developed modern model that relies on life intelligence in its designs and in the companies operating in it and in the small and medium companies in it.

However, despite the development, the measures taken by the Israeli occupation impede the process of development and life development in order to reach a smart life and design smart cities and smart small and medium projects because of the continuous closures and barriers on various Palestinian areas that cut off Palestinian cities between each other and reduce trade exchange between different regions Which affects huge losses for owners of small and medium enterprises and hinders the development process and the high risks in projects.

In addition to the weak use of technology due to the restrictions on technology by the Israeli occupation and the weakness of the Internet in the Palestinian areas compared to the areas under full Israeli control, which does not save time and effort and increases the cost of the small project.

In addition to the problem of infrastructure and wasting time in not completing public projects related to the basis for access to adequate living and not only to smart cities.

It is important to reach recommendations that are based on interest in small and medium enterprises and try to adapt to the existing divisions of the Palestinian territories in order to reach small and medium projects that depend on smart and technological life, as the Palestinian economy includes a large part of it small and medium enterprises, with governmental and international support for projects to reach life Smart cities and smart cities are a starting point, while providing an infrastructure that includes roads, electricity networks, and fast internet for the development of smart projects, in addition to paying attention to unemployment to keep pace with development and create job opportunities through technological development that depends on life intelligence to reduce unemployment and increase the rate of dependence on smart life.

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Shaping smart sustainable urban futures

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Abstract

Smart, sustainable, liveable, healthy, energy use-efficient and environmental-friendly cities shape the urban future. Cities are developing the potential of information and communication technology in order to ensure high quality of life, shaping smart and sustainable urban development, rediscovering a pathway for sustainable growth and smart energy city development. Smart and sustainable cities contribute to urban sustainability issues and future development, focusing on smart efficient energy management and solutions to reduce the negative aspects of urbanization. As healthy, liveable and safe communities, cities adopt a smart-driven and efficient energy use-led view to urban growth and sustainability.

Keywords: *urban future, sustainable urban development, smart sustainable cities, smart energy city.*

1. Introduction

Future cities preserve the wellbeing of citizens and ensure better quality of life [1], using the information and communication technology to identify a virtuous pathway to achieve urban sustainability [2]. Sustainable urban development relies on cities that are shaping healthy and liveable urban spaces, designing visions of the urban future [3]. Contemporary cities have to combine the benefits of a smart city approach and the advantages of building a sustainable city, shaping a data-driven smart sustainable city [4]. As a strategic approach to urban growth, the smart sustainable city helps cities to address a pathway for sustainable urban development, using the potential of advanced, innovative and smart technologies to facilitate a good life, improving the well-being of people living within urban

communities [5]. Cities adopt a smart mind set, using the potential of information technology to achieve long-term urban sustainability and improve the quality of life [6], advancing towards a smart sustainable city and improving energy infrastructure efficiency [7]. The smart city model seems to be a satisfying response to pollution as a consequence of the urbanization. A smart city vision enables cities to face organizational and social challenges emerging within the urban environment [8]. Smart energy city development is emerging within the wider concepts of smart city and sustainable city [9]. Smart energy systems help to support the rise and implementation of smart sustainable cities [10].

Sustainable urban development relies on smart cities and communities as better places for work and life [11]. Smart cities improve the quality of life and contribute to achieving long-term urban sustainability [6]. Cities help to drive future urban development, becoming smart, sustainable and liveable communities [12], formulating intentional strategies, promoting knowledge sources and humanising technology [13]. The smart sustainable city relies on advanced information technology to ensure a better quality of life [14], developing technology, policy and community as key drivers of sustainable urban futures [15]. Despite of unsatisfying issues, the role of smart city agenda, strategies and policies is to drive actions and behaviours leading to sustainable outcomes, enabling appropriate practices for city management and development that drive communities to build future urban ecosystems [16].

Smart and sustainable cities contribute to healthy and liveable urban spaces. Even if the themes of smart sustainable cities and communities are well investigated in their technological features, there are still few studies that elucidate the role of a smart and sustainable urban vision as a driver that helps cities to build conditions to achieve sustainable urban development and future. The aim of this study is to elucidate how cities are shaping the sustainable urban future, rediscovering the smart and sustainable city as a vision for future city development. Smart sustainable cities shape the city as an engine of social and economic growth, and intelligent driver of efficient energy use and consumption. The study relies on literature analysis and review regarding the main articles concerning the aspects related to smart and sustainable cities as drivers of sustainable future for urban growth and efficient energy usage. The paper is organized as follows. After introduction and methodological section, the literature review and theoretical background related to cities shaping future sustainable urban development are presented. In the fourth paragraph, cities are shaping the sustainable urban future, using the potential of information technology to drive smart and sustainable cities and communities as engines of urban sustainability and efficient energy management. Finally, discussion and conclusions are outlined.

2. Methodological section

The study is theoretical and analyses the literature that is related to the understanding of the concept of sustainable smart energy city that helps the cities to rethink and shape sustainable urban future development. The review of considered

articles helps to focus on smart city as driver of a city which aims to proceed towards urban sustainability. A smart sustainable city shapes the city as energy management-efficient and natural environment-friendly urban community prone to support sustainable urban development. The selected contributions are interpreted in a narrative synthesis in order to elucidate new perspectives and advance theoretical frameworks on emerging issues [17], [18].

3. Cities shaping sustainable future urban development

The urban future relies on cities that are designing itineraries for sustainable urban development in order to achieve urban wealth and improve the quality of life within urban communities. Following the *UN 2030 Agenda for sustainable development*, cities will be conceived as safe, healthy and sustainable communities [19]. Sustainable urban development refers to cities that provide liveable and healthy human environments, improving quality of life, reducing both the negative environmental impacts and demand of resources too [14]. Today, the challenge is to make the city as a driver of sustainable, social and economic development within urban spaces. Sustainable urban communities contribute to healthy urban ecosystems, facing environmental, social and economic challenges that affect the contemporary and future urban development. As engines of public value creation [20], smart cities drive sustainable urban development, integrating various urban systems to enhance urban sustainability [9] which is considered as a desired state in which a city aims at balancing the socio-ecological systems through adopting and executing sustainable development strategies [5], promoting environmental protection and integration, economic development and regeneration as long-term goals [14]. Smart and sustainable cities use the potential of digital innovation for economic development, environmental protection and social equity [21]. Smart cities contribute to achieving urban sustainability. A city not really smart is not sustainable [22]. Cities identify smart solutions and policies to achieve urban sustainability, and ensure high quality of life coherently with limits of the environment [3]. Smart sustainable cities are integrating the strengths of sustainable cities and smart cities, developing innovative data-driven technologies and smart solutions [4]. As a vision for the future, the smart city aims to shape the sustainable and ideal city [16]. With the rise of smart sustainable cities, the city is shaping dynamic, adaptive and evolving urban systems [14]. Designing a smart vision for urban growth enables responsive cities to develop smart solutions to build sustainable living standards for better quality of life. As cities changing by reinterpreting the relationship between human and natural environment, truly smart and sustainable cities are developing as post-anthropocentric cities [15].

4. Building the urban future by smart sustainable cities managing efficiently energy use

The future of sustainable urban development relies on cities that use technologies in order to shape a smart and sustainable urban community, and promote efficiency management in urban energy development. Smart sustainable

cities contribute to social, inclusive and economic growth [6]. Smart city is an important future-oriented concept by integrating technologies, social systems and ecological concerns [8]. Sustainable urban future development relies on cities that are promoting technology, community and policy as key smart city drivers [23], and revitalizing the role of smart urban communities as engines of innovation processes [24]. A sustainable city is also really smart [22]. Future urban communities adopt a smart energy vision to achieve both urban sustainability and energy efficiency through smart applications and solutions for sustainable urban growth and better quality of urban life. Future urban development relies on smart cities that are managing efficiently the use of energy leading to less consumes of resources [3].

As ideal places for work of life, future cities identify a digital and smart vision for urban growth. As digital spatiality embedded into the physical spaces of cities, the smart city is an engine of the future [25]. The urban future relies on cities adopting a smart view as a vision to ensure high urban quality of life, sustainability and innovation. Smart city refers to an urban environment that utilizes technologies to enhance urban performance efficiency and quality of services for citizens. Smart cities improve the living standards of urban community with regards to economic, social and environmental aspects [26]. Sustainable urban future relies on smart cities shaping a human-centred community and promoting the well-being of people [11]. Cities adopt a smart mindset, designing smart applications and solutions for sustainable future city development [27], improving everyday urban life [28].

Sustainable cities use economic, social and cultural achievements to benefit their inhabitants without threatening the viability of the natural and social systems [29]. Smart and sustainable cities identify new ways to address urban development, meeting the needs of their inhabitants, using the technology to support a good life for citizens, preserving capabilities for meeting the needs of future generations [30]. Smart sustainable urbanism relies on cities that are bridging both the impact of human activities and the protection of the natural environment. As urban healthy system of systems, a smart sustainable city develops balanced practices of economic, societal, environmental and governance activities that produce benefits and desired outcomes for people and non-humans [31]. A smart sustainable city supports sustainable urban development through advanced technologies. Smart sustainable cities shape a long-term image of the future, and help to address sustainable urban development, integrating strategies and technological innovations to support urban policy and planning [5]. In particular, the vision of a smart sustainable city relies on cities that are using digital technologies to make efficient service infrastructures, to drive lower resource consumption, to ensure high environmental quality, and to reduce carbon emissions [21]. The smart sustainable city relies on massive use of advanced technologies in connection with various urban systems in order to enable the city to manage resources efficiently, improving economic and societal outcomes, and monitoring city management for urban sustainability [14]. Driving the smart and sustainable transformation of cities helps to support urban change design coherently with a continuous long-term process. In particular, driving cities into smart sustainable cities relies on technologies as a means to shape healthy and sustainable urban spaces, improving living conditions, facing environmental and

social challenges of urban communities [32]. Smart sustainable cities contribute to managing efficiently the use of energy. The benefits of smart and sustainable cities regard the efficient management of energy in order to reduce pollution and support liveable and environment-friendly urban spaces. Constructing a smart city helps to drive sustainable urban development, and to support the efforts to alleviate negative effects of the urbanization [33]. Smart sustainable cities contribute to developing greener policies to mitigate negative impacts of urbanization and improve environmental quality, shaping natural environment-friendly cities, employing technologies to develop intelligent infrastructures that enable energy safety and control pollution [34]. The vision of a smart sustainable city supports smart energy city policies and applications that incentivize the urban actors and stakeholders to reduce the negative impact of climate change and support efficient energy management systems. A smart energy city helps cities to develop technology and economy to ensure both a better quality of urban life and urban energy efficiency and sustainability [9], advancing towards more sustainable growth [35], by removing barriers that obstacle the successful implementation of sustainable smart energy projects [36].

5. Discussion and conclusions

Future smart and sustainable cities contribute to shaping healthy, energy efficient and environment-friendly urban communities, identifying a pathway for driving sustainable urban growth. The urban future relies on cities developing smart solutions to reduce pollution and build sustainable and healthy urban communities. The use of technology helps cities to improve the quality of life, opening up to new services for citizens and social innovation for sustainable urban change and prosperous growth. Cities of the future contribute to shaping sustainable urban development, using technologies to promote healthy and inclusive urban growth. Cities are advancing as smart and sustainable communities that contribute to future urban development. The adoption of a smart energy and sustainable city vision helps cities to drive sustainable and energy efficient urban growth, making healthy and safe urban communities. Smart sustainable cities and communities contribute to identifying an intelligent city which is able to build prosperous urban futures and support continuous processes of innovation and change. Smart sustainable cities mitigate and reduce the negative impact of pollution, by using the potential of information technology in order to ensure high standards of living within urban communities. There are organizational, social and managerial implications. Cities have to design adequate organizational patterns to implement the smart and sustainable city that empowers citizens who play a proactive role as co-producers of urban value. A smart sustainable city helps cities to develop managerial capabilities in designing and shaping the urban future to drive sustainable growth and contribute to urban value creation. The study is descriptive and provides only a theoretical analysis without empirical research. Further research implies to investigate how Italian cities are developing urban intelligence for building long-term sustainability within urban spaces.

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Blockchain applications in smart grid

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Abstract

The rising demand for electrical energy, the vast expansion in sources of renewable energy, and the emergence of cyber-physical security threats are some of the issues and risks that modern power systems face. These difficulties highlight how crucial it is to create a method for the power system to run securely and consistently. With the introduction of blockchain, innovative concepts for smart grid solutions have been invented and implemented. As one of the most secure technologies of recent years,

blockchain can be adapted in different applications such as smart grid. Blockchain technology has numerous potential applications and solutions for the issues that smart grids are currently experiencing and will face in the future. Some of these issues stem from the lack of security and privacy of data collected by smart meters. This article will present some of the advantages and drawbacks of the blockchain-controlled smart grid as well as energy trading.

Keywords: *Renewable Energy, Internet of things, Cryptocurrency, Distributed Ledger.*

1. Introduction

The Internet of Things (IoT) is regarded as the most uncontrollable innovation in today's world; it improves our everyday lives by transforming the physical items that surround us into a data ecosystem. Security, transportation, industrial, retail, healthcare, home automation, military, agriculture, surveillance, and good infrastructure are just a few of the many applications of IoT and big data in everyday life. Indeed, IoT and big data have heavily influenced current smart grid developments, and smart meters are evolving to include more vital sensing capabilities and higher connectivity. In the smart grid, ICT devices such as Wide Area Management System and Control (WAMS), Intelligent Electronic Devices (IEDs), and Remote Terminal Units (RTUs) for service systems, as well as Advanced Metering Infrastructure (AMIs) for smart building/home management, control and explicitly maintain the smart electricity generation, transmission, and distribution system, as well as SG. By combining blockchain control and field quantification with smart communication to these ICT devices in Home, Neighbourhood, Wide Area Networks (HAN/SN, NAN, WAN), IoT-enabled wide - area monitoring data can be safely and automatically collected . Furthermore, blockchain-enabled AMIs can use Decentralized Applications (DAPPS) services in a cyber-secured environment to perform decentralized capacity of the system, local power management, and trading.

Science is becoming more powerful over time. In addition to the problems that the modern world presents, scientists and engineers face challenges in meeting market demand at various levels for a variety of reasons. Due to a lack of raw material supply, raw electricity generation, corruption on both the transmitting and receiving ends, transmission line and distribution system losses, the total electricity generation, transmission, and distribution system is not generating profits. Therefore, the SG technology was created to meet consumer demand, improve the efficiency of the electricity generation and distribution systems, protect customers, and monitor and regulate the entire system via communication (generating and receiving end). As a result, the paper's primary focus is to provide an overall view of blockchain (BC) in smart grid and energy trading.

The remainder of this paper is outlined as follows. Section 2 gives an overview of blockchain technology background. Section 3 presents Secure Energy Trading Framework for Smart Grid. Section 4 summarize Distributed Generations. Section 5 discusses the Related Work. Finally, section 6 concludes the paper. The acknowledgments are highlighted in section 7 and the references in section 8.

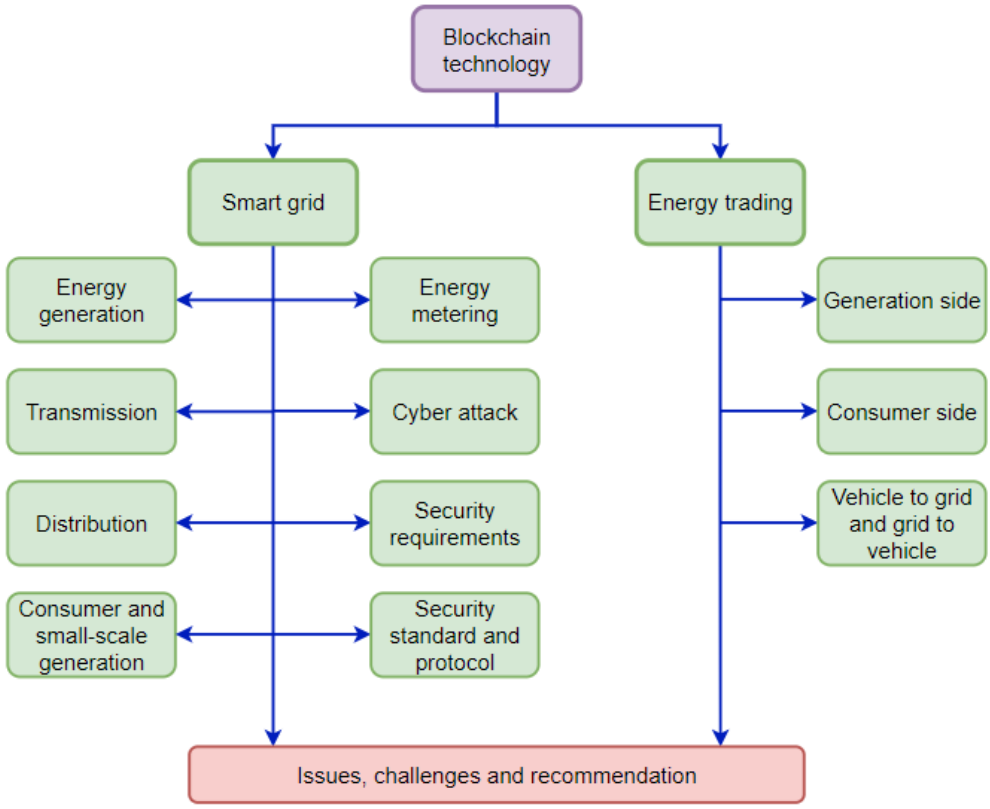

Fig. 1. Blockchain Technology

2. Blockchain

In simple terms, blockchain is a distributed database that contains an ordered list of various records that are linked together via links known as chains. These blocks store information about individual transactions, and only authorized users have access to them. User authorization is maintained by a complex set of self-managed encryption keys: each authorized user receives a time-sensitive unique key that autoblocks it if the time for decryption runs out. Blockchain technologies enable a distributed computing environment in which no central authority is required. Blockchain is used for more than just cryptocurrency. It has a wide range of applications in businesses, including information storage and exchange in a variety of organizational settings [8]. Also, Blockchain technology has a wide range of applications in the field of Smart Grid, particularly in the distribution and transmission of power. This is due to the involvement of an interconnected power network, advanced communication control technologies, and advanced metering infrastructure, all of which are commonly used to improve the use of green energy resources and to mitigate energy scarcity [9].

3. Secure energy trading framework for smart grid

A private blockchain is a peer-to-peer (P2P) connected and distributed ledger in which each node communicates with one another and shares information without the involvement of a trusted third party (TTP). It is made up of several blocks that are linked together, and each block contains a number of Energy Trading (ET) transactions. The primary function of blockchain technology is to secure energy data, record each trading event, manage transactions, and prevent faults. SMs can participate in ET by using blockchain-based ET to buy or sell energy from other SMs or utility providers (UPs). These ET transactions must be secured in order to balance energy demand and supply at the UP. As a result, before communicating with one another, these ET transactions in the form of cryptocurrency (i.e., ETCoin in Indian Rupee (INR)) are stored in the distributed ledger. There are numerous trustworthy platforms where ET participants can purchase cryptocurrency for ET purposes. Platforms such as ZebPay, Unocoin, Coinsecure, and others allow anyone to purchase cryptocurrency.

The traditional ET scheme (TETS) workflow, in which energy is generated from various sources such as solar photovoltaics (PV), wind, coal, and other non-RES/RES. The energy is then transmitted and distributed to consumers via power stations and UPs. TETS has a number of problems, including imbalanced energy flow (high demand and low supply, high supply and low demand), technical loss, non-technical losses (energy theft), privacy and security concerns. TTP plays a critical role in addressing the TETS system's issues, but data privacy and security are not fully guaranteed. As a result, incorporating blockchain into the existing SG system provides high security and resolves other TETS issues. Nodes in the proposed Smart Energy Trading Scheme (SETS) framework are in charge of maintaining the ETCoin and the flow of ET transactions.

The energy generation process at the power/grid station is the same in SETS as it is in TETS. This is the supply side DRM system, in which energy is transmitted and distributed to meet consumers' energy needs. The ideology of the SETS framework is to manage the demands locally at the demand side DRM system without requesting the required amount of energy from the grid.

Table 1. TETS and SETS comparison

Issues and challenges	TETS	SETS
Demand response management	Centralized (using trusted third party)	Self Governing (using smart contracts)
Customer data security and privacy	No	YES
Load profile aggregation	Centralized system	Distributed Ledger between all peer nodes
Load Aggregation verification	Centralized System	Consensus between all peer nodes
Single point of failure	Yes	No
Energy load secrecy	No	Yes
Payment settlement	Within 60 days (depending on settlement policy)	Real time settlemenet

Source: Author own work

In TETS, an electricity producer will attempt to meet local demand by generating electricity, with the risk of causing overvoltage during peak consumption hours (around 5-8 pm, when people come home from work). As these hours are not in sync with the peak electricity production hours, a method for storing and releasing the excess energy into the power grid is required. Currently, there are a lot of methods for power storage, each of them with its own ideal use case, benefits and disadvantages [10], [11], which will be explored in the following paragraphs:

- Pumped Hydroelectric Facilities account for more than 90% of energy storage in the electrical grid, because of their efficiency (70 – 85%) and reliable long-term storage capacity, despite their small power density (0.2 – 2 Watt-hour / liter).
- Lithium Ion batteries [12] have been developed in 1991 and have been the subject of the latest trends in energy storage for portable electronics and electric vehicles, electrification in rural areas as well as a method to restore energy to areas affected by natural disasters. This is because of their high power density (200 Watt-hour / liter), efficiency (85-95%) and their fast discharge and recharge time, which makes them a portable source of energy. Their main disadvantage is their short lifespan (only 1 000- 10 000 life cycles) and power degradation.
- Other methods include compressed air facilities, molten salt (thermal), hydrogen, flywheels (which are used mostly for energy regulation), lead-acid and solid-state batteries. These alternative battery storage methods are now under research, as the Lithium Ion battery technology is approaching its Physicochemical limits in terms of efficiency and degradation.

Because a malicious user can infiltrate unsecured local ET transactions and use energy without paying, a secure method of registering electricity consumption is needed. Smart grids and respectively, blockchain are a viable solution for these problems. Each consumer becomes a prosumer and can generate their own energy using renewable energy sources such as PV solar panels. If a prosumer has excess energy that they want to sell to other consumers, they can participate in ET by using SETS. The entire ET transaction can be broken down into several steps:

- ET transaction storage: Insert a new transaction into the SETS distributed ledger.
- Acceptance of the energy trading transaction: To view the stored transaction in the SETS distributed ledger.

4. Distributed generations

The smart grid technology heavily relies on distributed generation (DG). Electricity generation from various small energy sources is referred to as "distributed generation." Massive power plant generation has unavoidable consequences, including environmental effects on transmission and distribution, as well as a very stable electricity supply via the grid [7]. The current electricity networks are becoming increasingly overburdened as demand rises on a regular

basis. As a result, traditional approaches add to the complexity of existing networks. A requirement for customer expectations on the distribution side comprehensive analysis of smart grid components such as distributed generation is required to meet customer expectations on the distribution side, such as lower power bills, increased comfort, reliability, and data security. In distributed generation, integrated minor nonconventional power resources can be used to generate electricity at the load end. This technology increases power quality, effectiveness, reliability, and security while reducing operational costs and impact on the environment .

5. Related work

5.1. Blockchain for Advanced Metering Infrastructure

As new regulation has made advanced metering infrastructure (AMI) mandatory in a large percentage of household applications in Europe, the traditional way of data storage and processing has remained the same, lagging behind the newly introduced technologies. Data servers (the third party managing all the stored data) have remained the traditional single points of failure in this system, while transparency and privacy risks have been introduced to the equation [13].

As presented in [14], Blockchain technology offers a solution for these challenges mainly through the use of smart contracts and the proof of work concept. The scope of the Smart contracts is to be the intermediary between the consumers and producers in the utilities sector; the smart contracts will increase the transaction rate and then the transaction information will be stored as a block on the network for future verification. Although lacking in technical detail, this work has seen implementation and testing in the upcoming years after its release.

In order to increase the functionality and energy security of smart grids [11], Blockchain ensures that the sensitive user information remains private, and decentralized data storage helps shield against malicious activities within the network and cloud. Three entities (edge devices, super nodes and smart contracts) are introduced in order to assure trustworthiness in the blockchain network.

The edge devices are similar to typical nodes in a blockchain network, while super nodes have the permission of selecting and authorizing edge devices to participate in the consensus and voting process. The study has found that by using super nodes for authorization, there is a 51% decrease in the likelihood of being compromised by an attack. However, if a malicious user manages to jeopardize the super node, the entire network can be rendered compromised.

5.2. Blockchain Mechanisms for Smart Grid

The integration of Blockchain in Smart Grid technology is becoming so sophisticated that key solutions for facilitating comprehensive security functionality SG technology are becoming available. In analyzing the key requirements, the core related interfaces, components, and applications of SG that are critically security

dependent are discussed. Because of the public key algorithm, BC technology can convert the existing centralized ledger system into a distributed ledger. It also has end-to-end encryption technology and guarantees low costs due to the distribution processing structure. The concept of blockchains is currently generating a lot of research and functional attention. A BC is a cryptographic collection of node blocks that secures the headers, transaction data, and auxiliary protection metadata for each block .The BC fundamentally supports free connectivity, incorruptibility, openness, and secure data storage and transfer. Beyond the initial cryptocurrency applications, such as Bitcoins, several BC implementations have emerged in recent years.

The Bitcoin BC system is a public data database that saves the history of Bitcoin value transfers and keeps it up to date. This ledger is created using cryptographic technology to prevent forgery. The BC technology could aid in the resolution of a number of complex issues concerning the transparency and dependability of fast, distributed, and complex data exchanges and energy transactions. Smart contracts built on the BC frequently eliminate the need to negotiate with third parties, making it easier to monetize distributed and implement energy transfers and connections that include both energy flows and financial transactions.

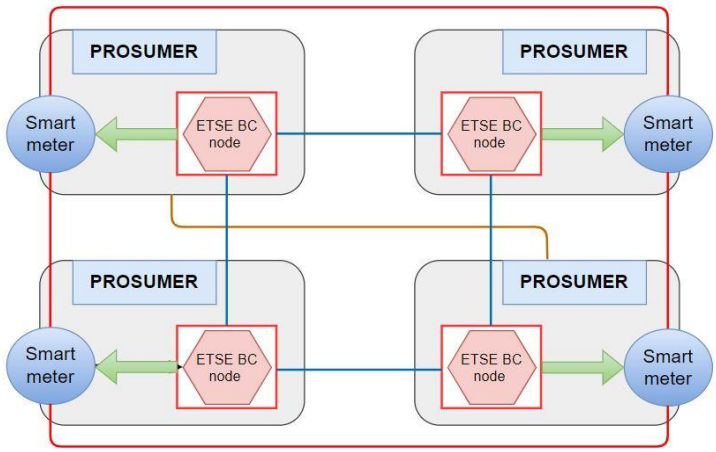

Fig. 2. Prosumers in Smart Grid

5.3. Blockchain Mechanisms for Energy Trading

Energy trading is required in BC technology for academic research and industrial application with emergency SG electricity generation and distribution. BC technology is used to reduce fraudulent activity. A certificate is issued in order to gain the trust/guarantee of the generators/consumers in this energy trading. Implementing BC technology simplifies the energy trading system and helps to reduce marketing effort and time. Conventional energy sources such as fossil fuels are rapidly depleting, and researchers and governments around the world are

looking for suitable alternative energy sources, such as renewable energy. Many smaller generated companies produce energy on a smaller grid scale and must connect to the national grid in order for consumers to buy.

In addition, an individual who both consumes and generates energy (usually through solar panels) is called a prosumer. Prosumers are very useful in smart grids, as they can generate energy exactly during the peak consumption hours and ease the load off the power grid, in turn helping avoid power outages. The BC system provides an efficient peer-to-peer trading process for local consumers and prosumers while consuming very little energy and requiring a fraction of the communication infrastructure that a centralized system would need in order to be operational. The peer-to-peer topology handles this data automatically and stores it on the public ledger, where all copies are mirrored across the network. In a block node, the BC technology transmits data and communicates with the SG network. Every node is linked, and each device shares its address and information with previous devices.

5.4. Blockchain in IOT

The Internet of Things development and adoption has skyrocketed within the last decade [2] as a result, there are demands for increased scalability. These have caused bottlenecks to servers collecting data and these servers are prone to Distributed Denial of Service (DDoS) attacks.

Blockchain aims to alleviate this, by creating transparent methods through which the past transactions can be viewed by anyone on the network and by offering a robust level of encryption. Additionally, the client - server model poses a big security risk and that is why blockchain is proposed as a solution. As for the sensors, their biggest security flaw is that they can be altered by external interventions. Efforts are already undergoing for this project.

6. Conclusion

This article reviewed the most recent research progress on applying blockchain technology to smart grids. It begins by summarizing blockchain system characteristics, the smart contract paradigm, and the benefits of blockchain technology. Blockchain technology appears to have many desirable properties that can be used to build a better smart grid. Collaborations among professionals from various fields are critical in this regard. This survey will serve as a foundation for future development of blockchain-enabled smart grids. Research gaps were discovered based on the survey, which require more attention and improvement for a sustainable BC-based SG and energy trading system.

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Smart Cities: linking cyber resilience to outer space security

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Abstract

This research aims to investigate the multidimensional linkages between cyber resilience in smart cities and outer space security. The objective is to provide insights into the challenges, opportunities, and policy implications for ensuring the security and resilience of smart cities in an increasingly complex geopolitical context. The study builds upon prior research on smart cities, cybersecurity, and outer space security, recognizing the criticality of outer space infrastructure and its interdependence with the cyber sphere. The approach used in this research involves a comprehensive analysis of existing literature, case studies, and empirical evidence. The results highlight the potential consequences of cyber incidents on outer space infrastructure and the subsequent disruptions to critical services in smart cities. This study underscores the importance of robust cybersecurity measures to safeguard space-based infrastructure and emphasizes the need for proactive approaches to enhance cyber resilience in smart cities. The implications of this research extend to academics, researchers, policymakers, and practitioners involved in smart city planning, cybersecurity strategies, and the integration of outer space security frameworks. The key contribution of this study lies in its exploration of the interdependencies between cyber resilience and outer space security, providing valuable insights to protect smart cities from cyber threats and ensure the reliability and security of urban environments in an interconnected world.

Keywords: *Cyber resilience, Smart cities, Outer space security, Cybersecurity, Interdependencies.*

1. Introduction

The concept of smart cities has gained significant attention in recent years as urban areas around the world seek innovative solutions to address the complex challenges of urbanization [1]. These cities leverage advanced technologies and data-driven approaches to enhance the quality of life for their residents, improve sustainability, and optimize resource management [2]. However, with the increasing reliance on interconnected systems and digital infrastructure, smart cities face new and evolving threats, particularly in the realm of cybersecurity [3, 4, 5].

Simultaneously, the security of outer space has emerged as a pressing concern in the geopolitical landscape. Outer space is integral to various critical functions, including satellite-based communications, navigation, and surveillance systems, and these services represent the backbone of those urban areas that are technologically advanced. Consequently, the security vulnerabilities associated with outer space activities have significant implications for the functioning of smart cities [6, 7].

In this convoluted context, the purpose of this academic article is to conceptually explore the multidimensional linkages between cyber resilience in smart cities and outer space security. By examining the interdependencies between these two domains, this research aims to provide insights into the challenges, opportunities, and policy implications for ensuring the security and resilience of smart cities in an increasingly complex geopolitical context. In other words, this paper argues that constructing cyber resilience reduces the impact of threats from outer space from being transmitted to the critical services that form the smart cities of the West.

This article seeks to contribute to the knowledge base of both scholars and policymakers in the field of urban geopolitics, intellectually preoccupied with system of system engineering and cross-sectoral risk assessment. The findings and recommendations presented here aim to inform discussions and decision-making processes related to smart city planning, cybersecurity strategies, and the integration of outer space security frameworks. By addressing these issues, we can better understand the evolving nature of keeping urban space secure and safe from interference, and contribute to the development of comprehensive approaches that safeguard smart cities and their residents in an interconnected world.

2. The role of cyber environments in enhancing smart cities' resilience

Smart cities encompass urban environments that leverage advanced technologies, data analytics, and interconnected systems to enhance the efficiency, sustainability, and quality of life for their residents. These cities integrate various components, such as Internet of Things (IoT) devices, intelligent infrastructure, and advanced data analytics, to create a responsive and adaptive urban ecosystem. Various cyber components may contribute to building a resilient smart city, inter alia, advanced data analytics, real time monitoring, autonomous systems, as well as sharing data among stakeholders [8].

Firstly, smart cities employ sophisticated data analytics techniques to analyze vast amounts of data collected from diverse sources. Machine learning algorithms are utilized to identify anomalies, detect potential cyber threats, and predict emerging risks, enabling proactive response and mitigation measures.

Secondly, The IoT forms the foundation of smart cities, with interconnected devices and sensor networks gathering real-time data from various urban systems. These networks provide continuous monitoring capabilities, allowing prompt identification of cyber threats and vulnerabilities in critical infrastructure, transportation, energy grids, and other essential services [9, 10].

Thirdly, smart cities incorporate intelligent infrastructure, including smart grids, transportation systems, and buildings, that can autonomously respond to cyber incidents. By integrating self-healing capabilities and adaptive controls, these systems can detect and mitigate cyber attacks in real-time, ensuring the continuity and reliability of urban services.

Lastly, effective cyber resilience in smart cities relies on collaboration and information sharing among various stakeholders, including government agencies, private sector entities, academic institutions, and citizens. By fostering partnerships, cities can collectively identify and address cyber threats, share best practices, and develop robust incident response strategies.

Some case studies illustrating successful implementations of smart city technologies in enhancing cyber resilience are Singapore's Smart Nation Initiative as well as Barcelona's Smart City Strategy. Singapore's Smart Nation Initiative is a prime example of how a city-state has integrated advanced technologies to enhance cyber resilience. Through comprehensive data analytics, real-time monitoring, and collaboration with industry partners, Singapore has established robust cyber defence mechanisms, ensuring the security of critical infrastructure and citizen data. Barcelona's Smart City Strategy emphasizes the integration of technology, citizen engagement, and open data to enhance cyber resilience. By implementing smart grids, intelligent transportation systems, and cybersecurity awareness programs, Barcelona has improved its ability to detect and respond to cyber threats, making the city more resilient in the face of evolving challenges.

These case studies highlight the tangible benefits that smart city technologies can bring to enhancing cyber resilience. By leveraging advanced analytics, IoT, and collaborative approaches, smart cities can proactively address cyber threats, mitigate risks, and ensure the reliable and secure functioning of urban environments.

2.1. Outer Space Security and Smart Cities

Outer space has become increasingly crucial for global communication networks, satellite-based navigation systems, and surveillance capabilities [7, 11, 12]. It plays a vital role in supporting a wide range of activities, including telecommunications, weather forecasting, disaster management, and national security operations. The reliance on outer space assets has heightened the need for robust security measures to safeguard these critical infrastructures [13].

Outer space activities face an array of security threats and vulnerabilities that can impact both the space-based systems and their applications in smart cities [14, 15]. These threats include:

- Jamming and spoofing: Intentional interference with satellite signals or manipulation of data can disrupt communications, navigation systems, and other space-dependent services.
- Cyberattacks: Outer space infrastructure, including satellite networks and ground stations, can be targeted by malicious actors seeking unauthorized access, control, or disruption of operations.

- Physical attacks: Deliberate acts of physical destruction or sabotage against satellites or space launch facilities pose significant risks to space-based assets and their functionalities.
- Space debris: The accumulation of space debris and the potential for collisions with operational satellites pose threats to the sustainability and reliability of outer space systems.

Security breaches in outer space can have far-reaching consequences for smart cities' cyber resilience capabilities [16, 17]. The impact includes:

- Disruption of critical services: Smart cities rely on satellite-based technologies for various functions, such as telecommunications, navigation, and remote sensing. Outer space security breaches can lead to disruptions in these services, impacting the reliability and availability of essential urban functions.
- Compromised data integrity: Manipulation or interception of satellite data can compromise the integrity and accuracy of information used in smart city systems, affecting decision-making processes and potentially leading to incorrect or harmful actions.
- Cascading effects: As smart city systems become increasingly interconnected, a security breach in outer space can have cascading effects on other urban infrastructures and sectors, exacerbating the vulnerability and disrupting the overall functioning of the city.

Understanding the interdependencies between outer space security and smart cities is essential for effectively addressing the evolving challenges posed by potential security breaches. By recognizing the vulnerabilities and potential impacts, policymakers, urban planners, and stakeholders can develop comprehensive strategies to enhance the resilience of both smart cities and outer space systems, ensuring the continued reliability and security of urban environments.

2.2. Cyber incidents disrupting smart cities

Cyber incidents have posed significant challenges to the infrastructure of smart cities. Several notable examples include the 2018 ransomware attack on Atlanta, USA, which disrupted city services and resulted in financial losses. In 2017, the Ukrainian capital, Kiev, suffered a cyber attack targeting the power grid, causing a widespread power outage. Baltimore, USA, experienced a ransomware attack in 2019, impacting essential services and incurring substantial recovery costs. The Navi Mumbai Municipal Corporation (NMMC) faced a cyber attack in 2020 that affected online services and COVID-19 patient data. Vienna, Austria, fell victim to a serious cyber attack in 2021, disrupting multiple services. These incidents highlight the vulnerability of smart city infrastructure and emphasize the need for robust cybersecurity measures, risk assessments, and preparedness within smart city initiatives.

To mitigate these risks, smart cities must prioritize cybersecurity by implementing strong network security, regular software updates, employee training, incident response plans, and collaboration with cybersecurity experts. While cyber-attacks on outer space infrastructure, such as satellites, have primarily focused on espionage or disruption of satellite services, there have been no reported direct impacts on smart cities. However, disruptions to satellite-based communication services can indirectly affect certain aspects of smart city functionality, such as transportation management and logistics. Maintaining robust cybersecurity measures, redundancy, backup systems, and collaboration among stakeholders is essential to mitigate potential cyber threats to both outer space infrastructure and smart cities.

2.3. The Stuxnet worm

The Stuxnet worm, discovered in 2010, is a prominent example of a highly sophisticated cyber weapon that targeted industrial control systems. While Stuxnet was primarily aimed at disrupting Iran's nuclear program, there is no publicly available information indicating direct impacts on the well-functioning of smart cities. However, the case of Stuxnet underscores the potential risks associated with cyber threats to critical infrastructure systems, including those within smart cities.

Smart cities rely on interconnected technologies and data analytics to optimize efficiency and improve urban experiences. While smart city infrastructure can be vulnerable to cyber threats, there is no evidence suggesting that Stuxnet specifically impacted smart cities. The worm was designed to exploit vulnerabilities in industrial control systems, particularly programmable logic controllers (PLCs), commonly used in critical infrastructure sectors such as energy, water, and transportation.

Nevertheless, the case of Stuxnet highlights the importance of robust cybersecurity measures for smart cities. Cyber attacks on interconnected systems can have significant consequences. To mitigate such risks, governments, city authorities, and infrastructure operators implement measures such as secure network architectures, software updates and patches, security audits, and incident response plans. Strong encryption, user authentication protocols, and access controls are also crucial for protecting critical systems from unauthorized access.

While Stuxnet did not directly impact smart cities, disruptions to nuclear power plants can have indirect consequences due to their interconnectedness with critical infrastructure systems. Nuclear power plants are a significant energy source for many cities and regions, and disruptions or outages can lead to power shortages or blackouts, affecting the reliable operation of smart city systems.

Smart cities heavily rely on a stable and continuous electricity supply to power various components, including smart grids, transportation systems, street lighting, and communication networks. Disruptions to the power supply can result in service disruptions, reduced efficiency, and potential safety concerns. Robust contingency plans, disaster recovery protocols, and redundant power supply systems are crucial to mitigate the potential impact of nuclear power plant disruptions on smart cities.

In addition, improving the cybersecurity of critical infrastructure systems, including nuclear power plants and smart city components, is vital. Strengthening defenses against cyber threats and implementing proactive monitoring and response mechanisms can reduce the risk of unauthorized access, tampering, or disruption of critical systems.

In summary, while there is no direct connection between Stuxnet and the functioning of smart cities, the potential impacts of disrupting nuclear power plants on smart city infrastructure lie in the reliance on a stable power supply. Disruptions in electricity distribution can lead to service interruptions, reduced efficiency, and safety concerns. Proactive planning, resilient energy systems, and robust cybersecurity measures are essential to ensure the continuity and reliability of smart city operations, even during potential nuclear power plant disruptions.

2.4. Galileo Satellite System Outage

The Galileo Satellite System outage that occurred in July 2019 serves as an illustrative example of how disruptions to satellite-based services can have indirect effects on the essential functions and services of smart cities, although the impact extends beyond smart cities alone. The Galileo system, operated by the European Union, is a global navigation satellite system widely utilized for positioning, navigation, and timing services [18, 19].

During the outage, a technical problem caused a complete disruption of the Galileo system for several days. This interruption had far-reaching implications for various sectors and applications that rely on accurate positioning and timing data, including transportation, logistics, aviation, maritime operations, and emergency services [20].

Smart cities heavily depend on precise positioning and timing data for numerous purposes, such as intelligent transportation systems, location-based services, and synchronization of smart grids. Consequently, the Galileo system outage indirectly affected the functionality and efficiency of these systems within smart cities.

Transportation management systems in smart cities rely on GNSS data for navigation, route optimization, and real-time traffic monitoring. The loss of Galileo services could have resulted in reduced accuracy in vehicle tracking, inefficient rerouting, and reduced effectiveness of traffic management strategies.

In addition, smart city applications dependent on precise location information, such as ride-sharing services, delivery logistics, and emergency response systems, may have encountered disruptions or delays during the Galileo outage. This could have had implications for the overall performance and responsiveness of these services within smart cities.

Moreover, the synchronization of smart grids, which optimize energy distribution and consumption, often relies on accurate timing data provided by GNSS systems. The Galileo outage could have affected the precision of timing data used in smart grid operations, potentially impacting the efficiency of energy distribution, load balancing, and demand response mechanisms in smart cities.

While the impacts of the Galileo outage were not limited to smart cities, the indirect consequences on their essential functions and services highlight the reliance on satellite-based positioning and timing systems. This emphasizes the significance of backup systems, redundancy measures, and resilient communication networks to mitigate the effects of such disruptions. Furthermore, it underscores the importance of comprehensive risk assessment, contingency planning, and diversified data sources to ensure the resilience of smart city infrastructure when satellite-based services are disrupted.

3. Policy Implications and Recommendations for Securing Smart Cities

As cities around the world embrace the transformative potential of smart technologies, the rapid deployment of interconnected devices and data-driven systems has introduced unprecedented challenges in ensuring the security and resilience of urban environments. Smart cities, while offering a wide array of benefits, are also susceptible to various cyber threats and privacy breaches. In this section, we examine the policy implications and provide recommendations for effectively securing smart cities. By exploring the interplay between technological advancements, urban governance, and cybersecurity strategies, this article aims to offer insights for policymakers, city administrators, and other stakeholders to develop comprehensive policies that safeguard the integrity, privacy, and safety of smart cities in the face of evolving threats.

3.1. Policy considerations for integrating outer space security into smart city planning

- Collaboration and information sharing: To effectively address outer space security threats, it is crucial to foster international collaboration and information sharing mechanisms. Governments, space agencies, and smart city stakeholders should establish platforms for sharing best practices, threat intelligence, and lessons learned. This collaboration will enhance preparedness and response capabilities, allowing cities to proactively identify and mitigate potential risks. Regular dialogues, workshops, and joint exercises can be organized to promote cross-border cooperation and build trust among stakeholders.
- Regulatory frameworks: Developing and enforcing robust regulatory frameworks is essential for ensuring the security of outer space systems integrated into smart city infrastructure. Governments should establish comprehensive regulations that govern the secure operation and integration of space-based technologies. These frameworks should cover areas such as secure communication protocols, encryption standards, authentication mechanisms, and resilient infrastructure design. By implementing and enforcing these standards, cities can mitigate cyber and physical threats originating from outer space, safeguarding critical infrastructure and sensitive data.

- Cybersecurity awareness and training: Promoting cybersecurity awareness and providing training initiatives is vital to enhance the resilience of smart city systems that rely on outer space assets. Smart city administrators, employees, and citizens must be educated about the potential risks and best practices for securing these systems. Public awareness campaigns can be conducted to raise understanding about the importance of outer space security and encourage individuals to adopt safe cybersecurity practices. Training programs should be developed to equip relevant stakeholders with the necessary skills and knowledge to identify and respond to emerging threats.
- Resilient infrastructure design: Smart city infrastructure planning should incorporate resilient design principles that account for potential outer space security breaches. This involves implementing redundancy, fail-safe mechanisms, and backup systems to ensure the continuous operation of critical services in the face of an attack or disruption. Infrastructure components should be designed to withstand potential physical and cyber threats, including space-based risks such as electromagnetic interference or satellite communication disruptions. By adopting resilient design practices, cities can minimize the impact of outer space security incidents and maintain essential services for their residents.

By implementing these policy recommendations, policymakers and smart city stakeholders can significantly enhance the security posture of cities integrating outer space technologies. Collaboration, regulatory frameworks, cybersecurity awareness, and resilient infrastructure design are key components in ensuring the long-term viability and security of smart cities in the era of space-based threats. These policy considerations pave the way for effective planning and implementation, allowing cities to navigate the complex landscape of outer space security while reaping the benefits of smart technologies for their citizens.

3.2. Technological advancements and innovation for enhancing cyber resilience in smart cities

- Secure communication technologies: It is essential to invest in the development and adoption of secure communication technologies that can effectively protect the integrity and confidentiality of data transmitted between smart city systems and outer space assets. Quantum-resistant encryption algorithms should be researched and implemented to ensure long-term security against quantum computing threats. Additionally, exploring blockchain-based solutions for secure data transmission and storage can enhance the trustworthiness and tamper-resistance of smart city communication networks. Governments and industry stakeholders should collaborate to support research and development efforts in this domain, encouraging the adoption of state-of-the-art encryption and communication protocols.

- Intrusion detection and incident response systems: Deploying advanced intrusion detection and incident response systems can significantly enhance the cyber resilience of smart cities. Leveraging artificial intelligence and machine learning algorithms, these systems can continuously monitor network traffic, detect anomalous patterns, and swiftly respond to cyber threats in real-time. Governments and smart city administrators should prioritize the adoption of such systems and encourage collaboration with cybersecurity experts and technology providers to develop customized solutions for the unique requirements of smart city environments. Regular testing and evaluation of these systems should be conducted to ensure their effectiveness and maintain an up-to-date defense posture against emerging cyber threats.
- Space situational awareness: Enhancing space situational awareness capabilities is critical for safeguarding outer space assets and the smart city infrastructure that relies on satellite systems. Governments and space agencies should invest in the development and deployment of advanced monitoring technologies to track and identify space debris, accurately predict potential collisions, and mitigate associated risks. By monitoring the space environment, cities can proactively plan for and respond to space debris threats, reducing the likelihood of disruptions to satellite-based services. Collaboration between space agencies, research institutions, and smart city authorities is crucial to share data and develop effective risk mitigation strategies.
- Resilient satellite systems: Governments and space industry stakeholders should prioritize the development and deployment of resilient satellite systems with built-in cybersecurity features and robust communication protocols. These systems should be designed to withstand and recover from cyber attacks, minimizing the impact on smart city operations. Implementing strict measures for authenticating and securing satellite command and control channels is essential to prevent unauthorized access and ensure the integrity of satellite operations. Additionally, continuous monitoring and regular security assessments of satellite systems should be conducted to identify vulnerabilities and address them promptly. Collaboration between satellite operators, cybersecurity experts, and smart city administrators is vital to develop and enforce industry-wide standards for secure satellite systems.

By implementing these policy recommendations, policymakers and smart city stakeholders can leverage technological advancements to enhance cyber resilience. Secure communication technologies, advanced intrusion detection systems, improved space situational awareness, and resilient satellite systems are crucial components in safeguarding smart cities from cyber threats originating in outer space. By investing in research, fostering collaboration, and promoting the adoption of innovative solutions, policymakers can create a secure and resilient foundation for the future development and growth of smart cities.

3.3. International cooperation and governance frameworks for outer space security and smart city resilience

- Multilateral agreements: Policymakers should actively encourage the development of multilateral agreements and international treaties that address outer space security and promote the responsible and peaceful use of outer space resources. These agreements should recognize the interdependencies between outer space systems and smart city infrastructure and provide a framework for collaboration and information sharing among nations. Governments should engage in diplomatic efforts to foster dialogue and consensus-building among stakeholders, emphasizing the importance of cooperation in addressing outer space security threats. By establishing international norms and rules, countries can work together to enhance the security and resilience of both outer space assets and smart cities.
- Standardization and best practices: Policymakers should facilitate the development of international standards and best practices for securing outer space systems and smart city infrastructure. Collaboration with international organizations, industry associations, and academic institutions is crucial to establish guidelines and frameworks that promote cyber resilience in the context of outer space security. These standards should cover areas such as secure communication protocols, encryption algorithms, incident response procedures, and risk assessment methodologies. Governments should actively participate in standardization efforts, leveraging their influence to drive the adoption of best practices at the global level. By promoting harmonized approaches to security, smart cities can benefit from interoperability, consistency, and improved cyber resilience.
- Public-private partnerships: Policymakers should foster public-private partnerships to enhance cyber resilience in smart cities and outer space systems. Collaboration between governments, space agencies, private sector entities, and academic institutions is essential to pool resources, expertise, and technological advancements in addressing cyber threats and vulnerabilities. Governments can create incentives and establish frameworks for collaboration, encouraging private sector entities to invest in research and development, and contribute to the cybersecurity capabilities of smart cities and outer space systems. Public-private partnerships can facilitate the exchange of knowledge, promote innovation, and drive the implementation of effective cybersecurity measures. By leveraging the strengths of each sector, smart cities can enhance their cyber resilience in a comprehensive and sustainable manner.

By implementing these policy recommendations and embracing international cooperation and governance frameworks, policymakers can enhance the cyber resilience capabilities of smart cities in the face of outer space security challenges. Multilateral agreements, standardization efforts, and public-private partnerships

will foster collaboration, promote knowledge sharing, and enable a coordinated response to emerging cyber threats. This proactive approach will contribute to the security, reliability, and sustainable development of smart cities, ensuring the well-being and safety of their residents in an increasingly interconnected world.

4. Conclusions

The concept of smart cities has gained attention as urban areas strive to address challenges through advanced technologies and data-driven approaches. However, the increasing reliance on interconnected systems exposes smart cities to evolving cybersecurity threats. Simultaneously, the security vulnerabilities in outer space activities have implications for smart cities that heavily depend on satellite-based services. This article explores the linkages between cyber resilience in smart cities and outer space security, aiming to provide insights, challenges, and policy implications for ensuring security and resilience in an interconnected geopolitical context. The findings contribute to urban geopolitics and inform discussions on smart city planning, cybersecurity strategies, and the integration of outer space security frameworks, enhancing the security of smart cities in an interconnected world.

Smart cities utilize advanced technologies, interconnected systems, and data analytics to enhance urban efficiency, sustainability, and quality of life. They employ sophisticated data analytics techniques to analyze vast amounts of data, identify anomalies, and predict emerging risks. The Internet of Things forms the foundation of smart cities, enabling continuous monitoring and prompt identification of cyber threats. Intelligent infrastructure, such as smart grids and transportation systems, autonomously responds to cyber incidents, ensuring continuity and reliability. Collaboration and information sharing among stakeholders foster robust cyber resilience. Successful implementations in Singapore's Smart Nation Initiative and Barcelona's Smart City Strategy demonstrate the tangible benefits of smart city technologies in enhancing cyber resilience. By leveraging analytics, IoT, and collaboration, smart cities can proactively address threats and ensure secure urban environments.

The increasing reliance on outer space for communication networks, navigation systems, and surveillance capabilities has necessitated robust security measures to safeguard critical infrastructures. Outer space activities face various security threats, including jamming and spoofing, cyberattacks, physical attacks, and space debris. These threats can have significant consequences for smart cities, such as disruptions in critical services, compromised data integrity, and cascading effects on interconnected urban infrastructures. Recognizing the interdependencies between outer space security and smart cities is crucial for developing comprehensive strategies to enhance resilience and ensure the continued reliability and security of urban environments.

Cyber incidents have posed significant challenges to smart city infrastructure, as exemplified by notable cases such as the 2018 ransomware attack on Atlanta, the 2017 cyber attack on Kiev's power grid, the 2019 ransomware attack on Baltimore,

the 2020 cyber attack on the Navi Mumbai Municipal Corporation, and the 2021 cyber attack on Vienna. These incidents highlight the vulnerability of smart cities and the importance of robust cybersecurity measures, risk assessments, and preparedness. While there have been no reported direct impacts on smart cities from cyber attacks on outer space infrastructure, disruptions to satellite-based services, such as the Galileo Satellite System outage in 2019, can indirectly affect transportation, logistics, and energy distribution within smart cities. To mitigate these risks, smart cities must prioritize cybersecurity, implement backup systems, foster collaboration, and ensure resilient communication networks.

The article provides policy implications and recommendations for securing smart cities in the face of outer space security challenges. The text emphasizes the need for collaboration and information sharing among governments, space agencies, and smart city stakeholders. It highlights the importance of regulatory frameworks to govern the security of outer space systems and the integration of such systems into smart city infrastructure. Cybersecurity awareness and training initiatives are recommended to educate stakeholders on best practices for securing smart city systems reliant on outer space assets. Resilient infrastructure design, including redundancy and fail-safe mechanisms, is proposed to ensure critical services continue functioning during attacks or disruptions. The article also discusses technological advancements and innovation for enhancing cyber resilience, such as secure communication technologies, intrusion detection and incident response systems, space situational awareness, and resilient satellite systems. The section concludes by emphasizing the importance of international cooperation and governance frameworks, including multilateral agreements, standardization efforts, and public-private partnerships, in enhancing the security and resilience of smart cities. Implementing these policy recommendations and embracing technological advancements will contribute to the long-term viability and security of smart cities in an interconnected world.

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The Symbiotic Threat of Human Error, Intended Action and Cybernetic Security System

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Abstract

Human error plays a significant role in cyber security breaches. In fact, according to a study by IBM, human error is responsible for 95% of all cybersecurity breaches. This can include unintentional actions or even lack of action by employees that cause, spread, or allow a security breach to occur. While software can sometimes be responsible for cybersecurity, human error still remains the leading cause of cybersecurity breaches. Intended actions, such as deliberate actions taken by individuals or groups to compromise security, are another type of cybernetic security threat. These actions can include hacking, insider threats, information sabotage and cyber espionage. This symbiotic threat between human error and cybernetic security highlights the crucial need to understand the relationship between the two in order to develop stronger cybersecurity behaviors and reduce cyber risk. Training and technology can help reduce the likelihood of human error by increasing awareness and knowledge of cyber security best practices. Additionally, cybersecurity awareness training is predicted to be worth $10 billion by 2027, further emphasizing the importance of addressing human factors in cyber security. By understanding the different types of cybersecurity threats, organizations can better prepare and protect themselves against potential breaches. We will present a real case example of human deliberate act - cybernetic attack of compromising an important architectural project designing process that took place in Athens in 2003, the repercussions of this act and what could be done today in order to avoid a similar situation.

Keywords: *cybersecurity, cybernetic attack, cyber management, information sabotage, data security.*

1. Introduction

In 2005 a famous architectural office in Athens (Greece), was working hard at the final phase of a massive 5000 seats Spots Palace for the Municipality of the Island of Rhodes. Two weeks before the final presentation the team of architects encountered a difficult situation. Overnight, the entire project has been manually removed from the computer systems of the office. Next morning seven computers and a password-protected server did not have any trace of the dozens of blueprints, CAD detailed drawings, site analysis a.s.o.

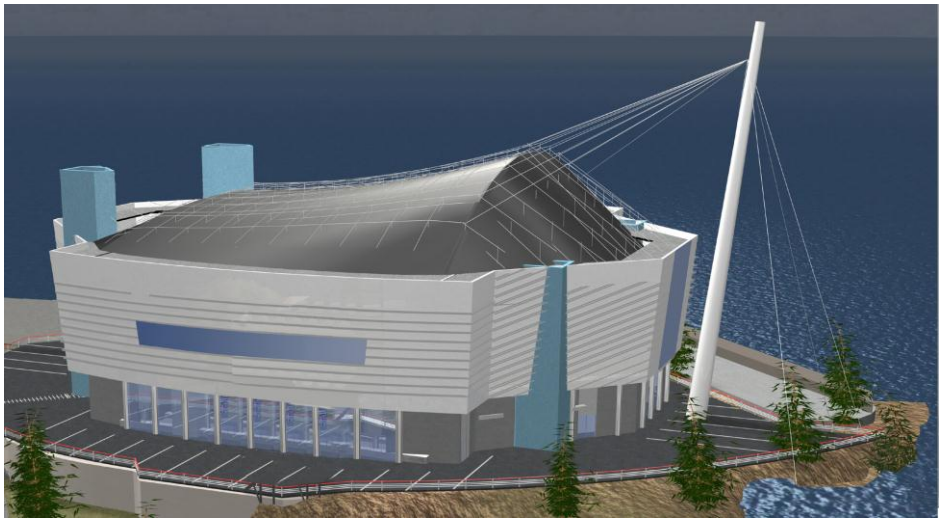

Fig. 1. Palace des Sports project for Rhodes, Greece
Source: Monica Frangulea, main architect of G. Andriotakis D.P.L.G. Comp.

At a closer look and deeper investigation, the evidences showed that one member of the architectural team have deliberately done this from unknown reasons and ran away from the city. The team of architects had to do a tremendous amount of work in order to remake the entire project, starting from a set of recovered older drawings that was previously sent to a structural engineering office. At that point we have understood that even if all architectural work was done digitally, the main threat remained in the real world, before the digital world menaces of remotely hacking, stealing copying or deleting hard work from the computers.

As a Romanian architect working abroad, Monica Frangulea, the head architect of the company, realised that the context of cyber security is much wider that she understood before and the solutions for data and digital work safety are not as simple as professionals in her line of work believed.

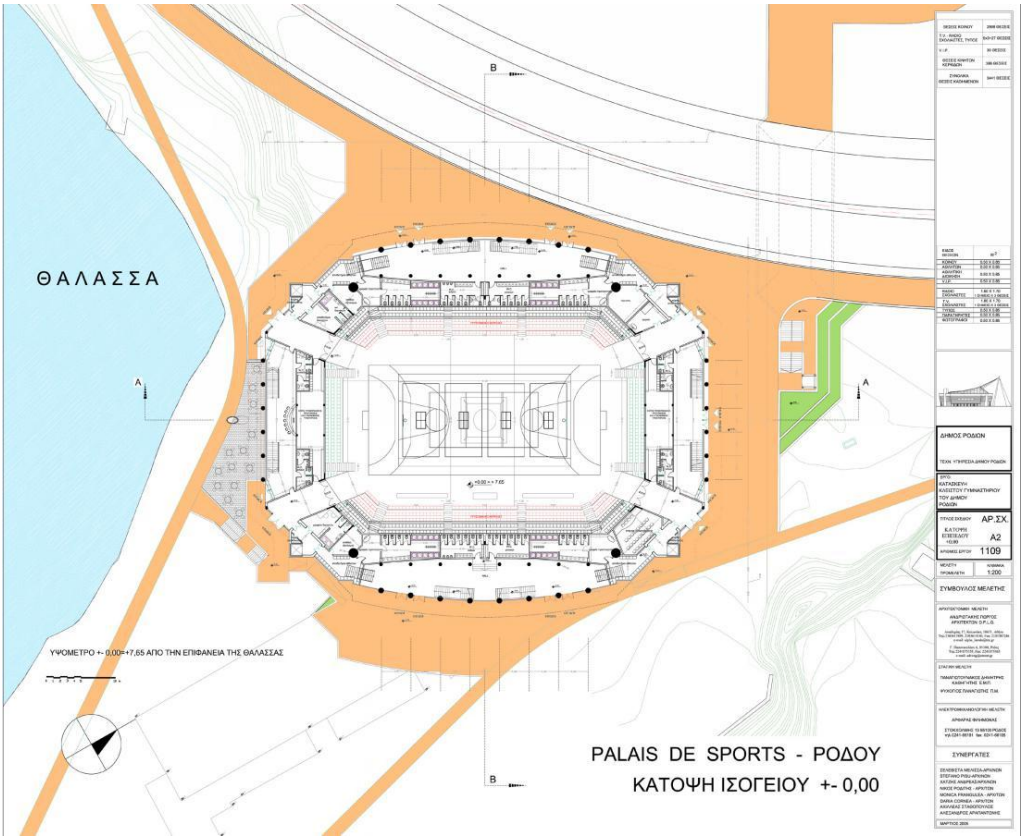

Fig. 2. Palace des Sports project for Rhodes, main floor plan, Greece
Source: Monica Frangulea, main architect of G. Andriotakis D.P.L.G. Comp.

2. Romanian cyber security in the international context

In 2020, under mandate as Minister State Secretary for Telecommunications, part of the governmental committee in charged with the successful mission as of 10th of December 2020 to determine our country hosting the European Cyber Center of Excellence, I stated publicly that "a restart was given in terms of cyber security, and Romania is at the starting line with an extraordinary potential" [1]. It was a teamwork and a national objective.

"In 2020 there was a restart. Romania is at that starting line (in terms of cyber security) and has an extraordinary potential. We have brilliant people. Helsinki Smart City was made by the people from RoboHub. We have examples how we, as Romanians, already implement these things at the international level. So, we have the human resource. We are also in discussions with the academic environment precisely to feed this human resource that we will need to implement and to absorb the reconstruction funds (PNRR and PODD) and not only that. So, we have all the resources, we just need to move from the area of debates to the more pragmatic and applied area and implement them. Only if we join all our forces, cross-party, will we manage to absorb these funds" [2].

I always stated that infrastructure security can include permanent assets such as real estate, but conceptually it is most used to refer to technology assets.

As CEO RADIOCOM I also prospectively focused the future activity of the new EU cyber security center that will be located in Bucharest on the concept of "zero trust".

The development of the European Cyber Security Center in and for Romania it's not just about the two billion dedicated to this Center, but it is about an exponential research-development-innovation and entrepreneurial dynamic thus naturally determined in this regional market – Romania being the regional pillar for everything IT&C means … and here we talk about more than 20 billion EURs. We have all the justifications for accessing all the funds, and I am also referring to the dynamics in the private sector that must integrate with these developments. In this advance you can only work in a very congruent way to absorb these funds and indeed to justify all these successes that Romania has achieved in recent years.

Regarding my insightful debates with companies such as Palo Alto I was always a promoter of the "zero trust", of total mistrust, of permanent verification. I know that these things often scare, but these are the developments at the international level and going beyond the moment of implementation or including this moment, the Cyber Center of the European Union must use in its development the concept of zero trust, a concept that is currently imperative and of great relevance in this dynamic [3].

Organizations are pursuing zero-trust network principles to help address the security requirements driven by digital transformation. We are no longer experiencing digitization. Currently, all entities, both public and private, must have a digital transformation strategy and a CIO/CTO. We cannot do without these elements nowadays, including for attracting brains in our countries. Back in 2020 I already started a series of talks with Prince University in Belfast, the main European academic pillar in cyber security area of expertise and training. All these steps must be correlated and put into this dynamic.

Furthermore, infrastructure security includes not only protection against a traditional cyber-attack but also protection against natural disasters and human errors. Returning to this part of the infrastructure, which is imperative: if we want to experience this digital transformation, we must talk about connectivity and a common European calendar of connectivity, and here reference was also made to the transposition of 5G. This is to be able to have the same opportunities. In history, when we recovered from the crisis, we recovered through investments in infrastructure: previously in railways, roads, and classic ones, currently the dynamics is on digital ones, including data infrastructure. Infrastructure security can include permanent assets such as real estate but is most used to refer to technological assets: computers, network systems, cloud resources, both hardware and software. The actual concept of infrastructure security includes not only protection against a traditional cyber-attack but also the protection against natural disasters, again an extremely important thing that I highlighted also at the level of such entities as the National Radiotelecommunications Society, the company I used to manage and built in some historical achievements and restored it from a 18

million deficit back in 2019 to a 122 million in accounts by the end of 2021 and a 25 million profit at a 246 million turn over with a 15% raise on salaries for 1251 employees. It is imperative to create these future-proof systems, which have been active for almost 10 years at the international level [4].

The goal is to enhance security measures and minimize downtime and associated wear and tear for both customers and the potential loss of a brand reputation, to reduce compliance costs faced by companies and of course the state. Fundamentally infrastructure security describes a highway of thinking about the protection of the entire technological perimeter of the organization. Several tactical plans must be made how do we protect the data on employees' laptops, how do we educate them, the training of the end user, each individual citizen is a major topic in this new cyber security thinking. For example, in a company, a common way of looking at security includes securing the following 4 levels: firstly, the physical level, the infrastructure has need for physical protection, we are talking about backup generators, security cameras and the like, also fail-over plans that locate the backup equipment, after that is the network level. At its core, network security protects data as it is transported within the network, this includes traffic encryption, whether local or cloud, proper firewall management, the use of authentication and authorization systems, and then the application/ apps level: this includes protecting data against attacks such as SQL injections, as well as hardening other applications against unauthorized use of malicious exploits. At the same time, data protection at the lowest level, regardless of where and how it is stored.

I also launched back in 2020 a challenge at the company level to find a solution to cover all white areas in the country with satellite communications, including the 5,000 schools that are not served by the telecommunications network… for all these developments human capabilities are at the core.

3. Managing human failures, Zero Trust and McCumber cube

As I already stated, regarding the implementation of the *zero-trust concept* the architecture of the implementation of the EU Cyber Center, must be solid, based on the Cybersecurity Cube (also called the McCumber cube), a tool for managing network protection, domains and the Internet, which systematizes the domain approach on three dimensions.

The first dimension of the Cybersecurity Cube includes the three principles of information security. This concern: information states, characteristics of critical information and security measures [5]. Information states include transmission, storage and processing. Characteristics of critical information include confidentiality, integrity, and availability. Security measures include technology, policies and practices, as well as people/user education, training and awareness.

The second dimension identifies the three states of the information or data.

The third dimension of the Cube identifies the expertise required to provide protection.

These are often called the three categories of cybersecurity safeguards.

3.1. Principles of Security – The CIA Triad

The first dimension of the cyber security cube identifies the objectives of protecting cyber space. The objectives identified in the first dimension are the fundamental principles.

These three principles are confidentiality, integrity, and availability, commonly referred to as the CIA triad (confidentiality, integrity, and availability).

Privacy prevents disclosure of information to unauthorized persons, resources, or processes. Integrity refers to the accuracy, consistency, and reliability of data. Availability ensures that information is accessible to authorized users when needed.

These principles are used to ensure focus and prioritization of actions when protecting networked systems.

3.2. Protect states: Transit, Rest, Storage, In Process

Cyberspace is an area that contains a considerable amount of important data (big data), which is why cybersecurity experts must focus on protecting data.

The second dimension of the Cybersecurity Cube focuses on the issue of protecting data in cyberspace in each of its possible states: Data in transit, Data at rest or stored, Data in process.

Protecting cyberspace requires cybersecurity professionals to consider data protection in all three states.

3.3. Safeguards through skills, discipline, policies, procedures, and education

The third dimension of the Cybersecurity Cube defines the skills and discipline that a cybersecurity professional can access to protect cyberspace.

Cybersecurity professionals use several different skills and disciplines when protecting data in cyberspace, taking care to always stay on the "right side" of the law.

The Cybersecurity Cube identifies the three types of skills and disciplines used to provide protection.

The first capability includes the technologies, devices, and products available to protect information systems and protect against cybercriminals. Cybersecurity professionals have a reputation for mastering the technology tools at their disposal.

However, McCumber reminds that technological tools are not enough to defeat cybercriminals. Cybersecurity professionals must also build a strong defense by establishing policies, procedures, and guidelines that allow cyberspace users to stay safe and adhere to best practices.

Finally, cyberspace users must strive to continuously update themselves on cyberspace threats and establish a culture of education and awareness.

The location of the EU Cyber Center in Romania places us in a position as a regional and European leader in the field of cyber security, but also as a pole of technological expertise in cyber security at the European and international level.

This will contribute to the promotion of Romania at the European and international level as a strong digital country, with a competitive economy, with exceptional prospects for increased investments, in the direct or related fields of cyber security.

4. Human Errors and Critical Infrastructure

Everyone can make errors no matter how well trained and motivated they are. However, in the workplace, the consequences of such human failure can be severe. Analysis of accidents and incidents shows that human failure contributes to almost all accidents and exposures to substances hazardous to health. Many major accidents eg Texas City, Piper Alpha, Chernobyl, were initiated by human failure. To avoid accidents and ill-health, companies need to manage human failure as robustly as the technical and engineering measures they use for that purpose.

The challenge is to develop error tolerant systems and to prevent errors from initiating; to manage human error proactively it should be addressed as part of the risk assessment process, where: significant potential human errors are identified, such as poor design, distraction, time pressure, workload, competence, morale, noise levels and communication systems – performance influencing factors (PIFs).

Control measures are devised and implemented, preferably by redesign of the task or equipment. I recently came up with and idea of using neuronal redesign games at the level of human resources management.

This Key Topic is also very relevant when trying to learn lessons following an incident or near miss. This also involves identifying the human errors that led to the accident and those factors that made such errors more likely.

4.1. Types of human failure

It is important to be aware that human failure is not random; understanding why errors occur and the different factors which make them worse will help you develop more effective controls. There are two main types of human failure: errors and violations.

A human error is an action or decision which was not intended. A violation is a deliberate deviation from a rule or procedure.

5. Study case – Critical Infrastructure and Industrial High Pressure Equipment

Knowing what needs to be done to achieve excellence in pressure equipment integrity (PEI) is one thing, but knowing how to organize everything to be successful in the field is quite another, namely how to organize all stages of PEI work to achieve overall success, to ensure that everything that needs to be done is done using Management Systems (MS) and Work Processes (WP).

Without an effective organizational strategy for EIP, many of the essential elements of EIP can become derisive as there may not be a management system in

place to ensure that each element is properly planned, scheduled and completed at precise intervals by an entity responsible.

However, with an effective MS PEI, each site should be able to maintain pressure equipment integrity (i.e. no containment breaches) and achieve pressure equipment reliability (i.e. have pressure equipment available to operate as planned default / as well as business), both defining excellence in PEI.

5.1. What is excellence in PEI?

It is simply doing what needs to be done, doing it right, doing it when it needs to be done, to create, implement and sustain the PEI program to avoid containment violations. Having effective management systems (MS) for all PEI issues that need to be managed is the foundation of a successful PEI program.

5.2. What is a management system (MS)?

It is simply a compendium of all the necessary information describing what needs to be done, why it needs to be done, how it needs to be done, and how often or when. Some operating sites then combine MS PEI with PEI work process (WP) maps and descriptions to show who is involved and how the work is being done.

Management systems are the inputs to WP maps and descriptions.

There are many ways to organize a successful PEI MS program. Some ways of organizing a PEI MS program can be just as effective as others, as long as all the necessary elements are included, programmed and carried out according to plan. Without effective PEI MS, even if we know what needs to be done, we may be wasting time and other critical resources rather than doing what needs to be done effectively to prevent containment breaches.

5.3. The ten PEI management systems

The literature generally reveals 10 essential MS required for an effective PEI program that can achieve excellence:

- Managerial leadership and support for PEI
- Integrity Operating Windows (IOW)
- Management of change (MOC)
- Damage Management and Control
- Risk assessment and inspection planning
- Life cycle management
- PEI codes and standards
- Site procedures and work processes for (WP) PEI
- PEI record keeping and data management
- Continuous improvement of the PEI

For each of these, we will have several sections where we will record all procedures, standards, guidelines, work processes, best practices, engineering

assessments, failure analyses, metrics, etc. that we need to design and operate a successful PEI program.

A robust PEI program means much more than inspection procedures and standards.

PEI is not just the result of a competent inspection program!

An effective multidisciplinary approach with management, operations, engineering, maintenance and inspection is needed to achieve what needs to be done to achieve excellence in PEI. All these MS of the PEI must be strongly integrated to achieve success in the PEI.

Those operating sites that still have each of their functions largely "working in silos" and are not effectively integrated with other MS will not be able to achieve the level of success in PEI that is vital in today's competitive environment, which requires excellence in cost optimization and reliability.

5.4. Managerial leadership and support for PEI

Like all 10 MS, if we do not have all the systems in place for managerial leadership and support for the PEI program, we are unlikely to achieve the level of success expected. So this is a critical component of the PEI's MS...as are the other 9. At its best, when this MS is fully functional, the PEI group aims for strong leadership and support for the PEI's mission and goals, and as such , all eyes are on the actions and decisions of the management that manages the PEI. At worst, where leadership and management support are lacking, the PEI group spends a lot of time managing critical situations, and we all know what usually happens when such situations arise.

This MS, Managerial Leadership and Support for the PEI Program, describes the systems and work processes that are required from operating site and company management to provide the direction and resources necessary to achieve excellence in PEI. These resources include budgeting, staffing, training, certification, upskilling, a shared asset management attitude, knowledge transfer from PEI to others who need and want to know, and pro-active management - doing what we say.

An overview of the 10 MS of the PEI that are necessary to achieve and maintain excellence in the PEI "Compliance" is not the absolute end of a successful business plan. The integrity of the pressure equipment and subsequent reliability of the pressure equipment is part of a good business plan. PEI of excellence is needed to achieve subsequent reliability.

These PEI MS are always improving and expanding to keep pace with changing business conditions and requirements.

But in the end, it all boils down to people and personnel and career management and our nursery and the value of our competitiveness lies in the academic space and the ongoing work with it.

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[3] See also in https://www.thediplomat.ro/2021/04/06/secretary-of-state-dragos-preda-the-construction-of-ngn-backhaul-infrastructure-requires-more-than-2-billion-euros/ as of 6th of April 2021

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The development of e-health in the health system of the Republic of Moldova – a tool for sustainability in the context of European practices

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Abstract

The digital transformation of the national economy, including public health, is one of the main research directions not only for technical specialists but also for sociologists, economists, political scientists, and researchers from other fields. It becomes clear that these processes have a significant impact on the quality of life of the population and its components. The prospects of R. Moldova's integration into the EU lead to the emergence of new requirements that must be implemented for all public products and services provided by the state, especially those dealing with public health. The article analyzes the impact of the digital economy as a promising direction for health services. The study aims to identify aspects that address certain issues regarding the impact of global and local developments in health computerization and the development of solutions to improve the effectiveness of the provision of health services, through the mass computerization of medical services. The following research methods were

used to achieve the aim and objectives: documentation, selection and bibliographic synthesis of statistical information from national and international medicine. Graphical, tabular and comparative analysis methods were used for visual and representative interpretation. Methods of grouping, synthesis, induction, and deduction of statistical data were also used. Ensuring the standardization of work tools, necessary to allow the cross-border circulation of electronic information on public health, is conceived in various European documents, which provide for their implementation in medical services in the countries that have joined the EU, including candidate countries such as the Republic of Moldova.

Keywords: *public health, medical services, digital medicine, modern medical technologies, managerial tools.*

1. Introduction: the role of digital transformation in public health

The continuous digital transformation of the economy, society and public health requires consideration of the theoretical foundations of the digitization of the population's life, requires consideration of the theoretical foundations of the digitization of the population's life, as well as an empirical analysis of changes in the quality of life in cross-border regions in modern conditions.

Thus, the digital society is a system of political, social, ethical-cultural relations and other nature, formed in connection with the development of a digital economy and digital information technologies based on the production, dissemination, and use of digital information technologies.

The use of digital technologies presents innovative new perspectives for the future of healthcare in the EU and Eastern Partnership regions and is beneficial for improving quality of life and health satisfaction. At the beginning of the 21st century, new technical e-health solutions are being developed that have the power to revolutionize traditional medicine through patient-centered healthcare and electronic databases. [1, 15, 16]

Many opportunities and solutions for the development of smart technology in EU and Eastern Partnership countries can transform healthcare into a digital approach. However, there are certain challenges to implementing the new solutions. International cooperation and coordination are very important factors in the context of the development of each country. To open up new opportunities in the field of "smart specialization", regions and countries should analyze their position in European and global value chains. [2, 3]. Based on this analysis, smart medical specialization strategies should be coordinated not only with national priorities and programs but also with those of other countries regions, since no region has complete and comprehensive information about all possibilities for cooperation at the regional, national and European in the field of smart technology. [4, 6, 21]

This thing requires a focused approach in the context of transregional cooperation, including related aspects such as administrative responsibility, risks and application domain by the public authorities. The EU4Digital eTrade network addresses the digital aspects of the entire implementation cycle with fairness, of

European policies not only in developed countries but also in developing ones. Thanks to the Association Agreement with the EU, the implementation of *e-health in the Republic of Moldova and in other developing countries will raise the level of coverage of performance medical assistance and medical logistics in urban and rural regions*.

At this stage of regional development, an important element in the activity of logistics innovation systems becomes innovation management and investment evaluation, as well as logistics coordination in the decision-making process of product or process innovations.

Logistics innovation is used in the organization and management of material and non-material production, which includes healthcare. At the same time, logistics innovations, faced with the need to periodically renew technical facilities, actively influence the development of scientific and technological progress.

In terms of processes, modern logistics «consists of 90% information technology. Only the remaining 10% is made up directly of the transport of goods. Without the application or constant renewal of information technology in logistics, modern medicine will undergo great changes for the worse, because information technology is used in all areas and at all stages of the logistics process [4, 5, 6, 25].

2. Research materials and methods

In this article, the authors used methods such as documentation, selection and bibliographic synthesis of sources related to theoretical and practical foundations in the field of medical care. For a clear and representative interpretation, a comparative method was used.

Starting from a new scientific paradigm of continuous development of the human factor, understood as human capital, the correlation with personified digitization is very high, implementing the elements of the quality of medical services for a health potential.

The authors of the article mention that among the basic objectives of the Ministry of Health of the Republic of Moldova are the creation of an e-Health Center under the Ministry, the implementation of the electronic patient file, e-prescription and other digital projects that would provide added value to the health field. The Vice-Minister of Digitalization from the Republic of Moldova, Iurie Țurcanu, mentioned in the media: "Digitalization and health are two high-level priorities, and in parallel with the fight against the effects of the pandemic, we must think about how to build a structure of good resistance in health. We are willing to take some international standards in the field, adapt them and have a close collaboration with development partners who are interested in this subject" [3].

For this purpose, on October 26, 2021, the first meeting of representatives of public institutions in the medical field was convened, including the Ministry of Health, the National Medical Insurance Company, the National Agency for Public Health, but also the Electronic Government Agency of the Republic of Moldova to consult the opinion of specialists and jointly discuss the measures required to build a unified government information system, generically called e-Health. This initiative

was carried out thanks to the representatives of the Employers' Association - Union of Private Medical and Health Institutions from the Republic of Moldova. Based on the opinions of these representatives and specialists, a series of challenges faced by the current public health system in terms of medical statistics, patient records, the collection and exchange of personal data, as well as the impediments to processes and activities in the field of health were marked. could be digitized.

The strategy regarding the formation of the Digital Single European Market aims to:

- Ensuring interoperability and standardization of the tools needed to enable cross-border circulation of electronic health information.
- Creating a common infrastructure for digital e-health services.

The services provided by the eHealth digital service infrastructure also contribute significantly to the achievement of objectives 1 and 2 of the communication on the digital transformation of health and care [1], which focus on citizens' secure access to their health data, also, a common European data infrastructure must be implemented in all countries in medicine [5, 26].

3. Implementation of the EU4Digital European Project in public health

The authors mention that the implementation of the EU4Digital European Project is maneuver-directed. It manifests itself as an opportunity to improve and increase the quality of healthcare services. Professor H. Martins, [2021], specialist in digital health, predicted that the future of health is interdependent with digitized health and provides insight into future opportunities and overcoming challenges and consequences in achieving the full potential of digital technologies in healthcare [27].

In addressing these issues, the authors mention that *the ultimate goal* of the e-health process is to shift the focus of providing healthcare services *from a doctor and hospital-centered algorithm to a patient-centered focus and the use of digital technologies in public health*.

This is reflected by the use of the managerial tool - Digital Systems, which are intended to group patient data into a single Electronic Health Record, which can be made available to different doctors, and public health professionals to issue prescriptions and also to give patients the mobility to more easily access prescribed medicines in any territory, etc.

E-health also means using modern technologies such as artificial intelligence (AI) or Big-data software to support disease prevention policies by flagging potential anomalies or risks in the data and, as a result, the correctness of the diagnosis of the disease [14, 15,16].

In terms of future solutions in the EU, the use of Electronic Health Records and Electronic Prescriptions is on the agenda. They rely on the availability of Interoperable Digital Systems to enable the exchange of health information.

A future priority is to enable these solutions to be cross-border available. This would mean, for example, allowing a Luxembourg citizen traveling to Croatia on

holiday to be able to pick up his prescription medicine in Luxembourg at a pharmacy in Croatia. Within the EU, cross-border pilot projects based on electronic Prescription are being carried out, which, in the future, could also be tested in the Eastern Partnership region or even between the EU countries and the Eastern Partnership regions.

The challenge in the field of cross-border e-health lies in the interoperability of digital health systems. Professor H. Martins, uses the banking sector as an example. Financial banking is a cross-border service where citizens of one country can withdraw money from an ATM in another country. This is based on your home bank and the foreign bank having similar operating systems that can talk to each other and exchange banking information such as account numbers and the patient's available cash amount [11, 25].

In e-Health, it is also possible to exchange data across borders, except that health data is not always just numbers, but can also be text and images, which adds a level of complexity to correct diagnosis [8, 9, 10, 12].

Common standards to ensure similar operating systems and digital tools are a key element to enable information exchange. The other challenge in cross-border e-health is the interoperability of medical competence, which is necessary for e-prescribing when one country needs to recognize the prescription of a healthcare professional from another country [13, 15].

"Seamless flows of health information and data between relevant organizations, regions and even countries are the next threshold for e-health. This is based on the development of harmonized and interoperable e-health services at the national and regional level," said Martynas Daugirdas, the e-health leader in the EU4Digital project [3, 16, 17].

Smart infrastructure serves as the basis for all major aspects of living in a smart city/smart village, including rational population behavior, rational mobility, rational economy, rational lifestyle, rational management, and rational use of the environment. The main feature underlying most of these components is their interconnection and the generation of data that can be rationally used to ensure optimal resource consumption and increase efficiency [14, 15, 22].

Cooperation is extremely important within the European Reference Networks (ERNs), which bring together designated healthcare providers and Centers of Expertise in the member states, especially in the field of rare, unusual, and complex diseases and conditions. This action will help ensure affordable, high-quality, cost-effective healthcare and improve these patients' access to the best experience and care available in the EU for their disease.

Cross-border databases have been created to coordinate networks and collaborate with patients with clinical problems by supporting the virtual collaboration of health professionals within the ERN.

The first ERNs were launched in March 2017, involving more than 900 highly specialized medical units in more than 300 hospitals in 26 EU countries. Today, more than 26 ERNs work on a range of thematic issues, including bone disease, childhood cancer and immunodeficiency.

ERNs will also serve as focal points for medical education, research, information dissemination, and health assessment. The exchange of medical data, especially electronic prescriptions, has already begun. Three member countries (Finland, Estonia and Croatia) have started the international exchange of electronic prescriptions.

As of January 2019, more than 5,500 electronic prescriptions have been issued. In addition, doctors in Luxembourg and Croatia can receive summaries of patients traveling from the Czech Republic. Malta and Portugal are expected to join these exchanges in Q4 2019/Q1 2020. By 2023, these services will be gradually introduced in the 22 European countries participating in the initiative.

The EU's potential for e-Health action is highlighted by:

a) Patient registries that may be implemented in the future.
b) The main person responsible for the European Commission for e-Health issues is DG SANTE.
c) Member States' support in the development of cross-border e-health services.

The authors emphasize that, in the current circumstances, when society has faced a deep pandemic crisis, the need for transparency and efficiency of the information circuit in the medical system is fully realized, and the existing information systems do not communicate sufficiently with each other, and from here appear a series of deficiencies on the part of the informational circuit and access to data. The rational healthcare management system makes it possible to transform population health data into clinical and economic information, which includes electronic patient registration, home health care, and remote patient diagnosis, treatment, and observation mechanisms. In addition, the system promotes the delivery of medical services using smart network technologies that help monitor the health of citizens. This system allows for a shift in focus from treatment to prevention, along with the spread of broader views on general healthcare, healthy lifestyles, and wellness management.

The improvement of the mechanisms and instruments for the coordination and implementation of the national regional development policy is reflected by the achievement of Specific Objective 3, which is a mandatory premise for ensuring the efficient and effective implementation of Specific Objectives 1 and 2 within this Strategy. This specific Objective aims to improve the management of the implementation process, which is still at a transitional stage of development and consolidation. In this sense, the necessary interventions to improve the mechanisms and tools for coordination, implementation, and evaluation of the national regional development policy are to be carried out on several levels. At the same time, the given objective is not only aimed at strengthening the already existing mechanisms and instruments but also foresees the creation of new ones, aimed at ensuring the practical application of the intersectoral approach of the regional development policy, including the deepening of cooperation between all the actors involved in the implementation process. "The main challenge so far in the implementation of the

regional development policy has been the failure to impose an integrated and unique approach to planning, coordination, and evaluation of sectoral public investments aimed at the development of regions. On this dimension, the coordination structures, both at the central and regional level, need to be re-conceptualized, and their attributions reviewed, based on new institutional regulations" [12].

The authors emphasize that in the context of the National Development Strategy, in general, "without the promotion of an effective regional development policy, 4 of 10 objectives of the SND "Moldova 2030" will not be able to be achieved according to the assumed targets and fixed terms, there are strong gaps and discrepancies territorial issues that must be addressed in a specific and systemic manner (1 – increasing income from sustainable sources and mitigating inequalities; 2 – increasing people's access to physical infrastructure and public utilities, 3 – improving working conditions and reducing informal employment, 10 – ensuring the right fundamental to a healthy and safe environment)" [12, 25, 26].

In the same context, under the conditions in which the SND "Moldova 2030" aims by 2026 to achieve significant objectives of increasing the quality of life (for example, at least 85% - coverage with running water services and at least 75% - coverage with sewage services), currently "in the Republic of Moldova there continue to be hundreds of localities where the construction of the basic infrastructure in terms of centralized water supply and sanitation systems has not even been initiated. That's why the authors believe that without an effective regionalization approach of the actions of the existing public utility operators, achieving the assumed goals is not possible or will involve excessively high costs» [20].

The health care management system has strong potential, taking into account the aging population of developed countries, and is able to reduce the inequality in health care between high-income and low-income groups. It is impossible to select a specific concept of smart settlements and transfer it from one geographical region to another: smart infrastructure concepts must be adapted to local conditions and meet local development requirements [20].

The authors mention that the *Territorial Agenda 2030* model is an effective part of the innovative implementation for sustainable European development. «Territorial Agenda 2030 (European) is a Strategic Framework Document that underlines the importance of strategic planning and ensures its orientation, as well as calls for strengthening the territorial aspect of sectoral policy at all levels of government. Its purpose is to ensure an inclusive and sustainable future for all territories and to promote the achievement of the objectives of Sustainable Development in Europe» [7, 17, 24].

The territorial agenda contributes to the achievement of key European objectives: a "fair Europe" that offers future prospects for all places and people and a "green Europe" that protects shared livelihoods and shapes social transformation. Pilot events consisting of several countries and partners were carried out to support the Territorial Agenda [14, 15, 16].

Pilot actions develop, demonstrate and unite stakeholders across Europe to implement the priorities of the territorial agenda. They demonstrate how the territorial aspect of regional, national and European politics can be resolved. Everyone is invited to follow these actions, be inspired, and offer suggestions for new actions, in the context of well-being and quality of life [17, 20]. The authors point out that the European Commission has nominated the DG SANTE International Company as responsible for this implementation.

4. Cross-border cooperation: a pillar of e-health sustainability

Open issues of cross-border spatial planning are reflected in Table 1. Robotics and the use of artificial intelligence (AI) is another future opportunity that could transform healthcare. The image of fully autonomous humanoid robots treating patients is more science fiction than reality, but the use of robotic parts to support healthcare professionals and patients is already a growing area, according to Professor Martins. For example, a robotic arm could be used by orthopedic health professionals to help them treat patients by providing additional support or strength to move and manipulate limbs. The use of exoskeletons, a digitally enhanced mechanical support framework, is already being prototyped in the EU to help rehabilitate stroke patients, helping them regain their ability to walk in less time than traditional physiotherapy practices. I propose to consider the concept of the EIT Regional Innovation Scheme (EIT RIS) in the article.

Table 1. Degree of achievement of cross-border spatial issues in the context of e-health implementation in the EU

Open issues of cross-border spatial planning	Country Profile Synthesis Algorithm of e-Health	E-health in the context of the R. Moldova
1. Non-harmonised cross-border spatial data (roads, rivers, railways) and administrative data (land cadastre, spatial units, planned territories)	1. Synthesis of information on the state of health in the respective country	70% done
2. Unauthorized spatial database management system, separate maintenance procedures	2. Synthesis of determinants of health, with emphasis on behavioral risk factors	30% done
3. Non-harmonised standards for data content of non-harmonised databases	3. Synthesis of accessibility and determining the possibilities of implementing European standards in the national health system	35% done
4. The need for data harmonization for effective spatial management and sustainable development planning in a cross-border area	4. Synthesis of the organization of the health system	25% done
5. The need to strengthen cooperation between Institutions - Data Providers - Data Users - and Interested Parties	5. Synthesis of the effectiveness, accessibility and resilience of the national health system	35% done

Source: Performed by authors in the context of SNDR 2022, https://ec.europa.eu/regional_policy/en/information/publications/brochures/2020/territorial-agenda-2030-a-future-for-all-places

The EIT Regional Innovation Scheme (EIT RIS) was created by the European Institute of Innovation and Technology to reduce the gap between regions that are leaders in innovation and those that are still developing. The description of the action is reflected by the coherence of digital services in public health and the effectiveness of medical services.

The objectives of the infrastructure of digital e-health services are as follows:

- Cross-border sharing of patient data from electronic prescriptions and summaries of patients by supporting Member States in establishing national contact points for e-Health. This action will improve continuity of care, patient safety, patient access to highly specialized care, and the sustainability of health care systems. E-prescribing and e-dispensing allow EU citizens to obtain their medicines from a pharmacy located in another EU member state by electronically transferring their prescription from their country of residence to their country of travel. Patient records provide basic information about important aspects of health, such as allergies, current medications, previous illnesses, surgeries, etc., making them available digitally in the event of an (emergency) medical visit in another country. This is a summary of the patient's complete health data in electronic format (electronic health records). The Commission recently adopted a recommendation on a European format for the exchange of electronic medical records, with the aim of establishing common standards for the electronic exchange of different types of medical data. Electronic patient records and electronic prescriptions should be available to patients and healthcare professionals across the EU, wherever and whenever they are needed [4].
- Exchange of medical data, especially electronic prescriptions, has already started. Three member countries (Finland, Estonia and Croatia) have started the international exchange of electronic prescriptions. As of January 2019, more than 7,750 electronic prescriptions have been issued.
- In addition, doctors in Luxembourg and Croatia can receive summaries of patients traveling from the Czech Republic.
- Malta and Portugal are expected to join these exchanges in Q4 2020/Q1 2021. By 2023, these services should be phased in across the 22 European countries participating in the initiative.
- Cooperation within the European Reference Networks (ERNs), which bring together designated healthcare providers and centers of expertise in the Member States, especially in the field of rare, unusual, and complex diseases and conditions. This action will help ensure affordable, high-quality, and cost-effective healthcare and improve these patients' access to the best experience and care available in the EU for their disease. Trusted cross-border IT solutions have been created to coordinate networks and collaborate with patients with clinical problems by supporting the virtual collaboration of healthcare professionals within the ERN. The first ERNs

were launched in March 2017, involving more than 900 highly specialized medical units in more than 300 hospitals in 26 EU countries. Today, 24 ERNs work on a range of thematic issues, including bone disease, childhood cancer, and immunodeficiency. ERNs will also serve as focal points for medical education, research, information dissemination, and health assessment.

- Implementation of Patient Registries globally.
- The main responsibility of the European Commission: DG SANTE.
- Support member states in the development of cross-border e-health services.
- Freedom of action potential.

Digital health technology is a critical component of the Digital Single Market. Deputy Prime Minister for Digitalization, Iurie Țurcanu, convened, on October 26, 2021, the first meeting of representatives of public institutions in the medical field, including the Ministry of Health, the National Medical Insurance Company, the National Agency for Public Health, but also the Electronic Government Agency for to consult the opinion of the specialists and jointly discuss the measures required to build a unified government information system, generically called e-Health. « The official added that among his priorities this year is the deepening of cooperation with Romania and the exchange of digital tools and applications. Romania is much better in terms of cyber security, the area in which the Chisinau Government needs to strengthen» [21]. Member States in the e-Health network have adopted additional clauses to the general guidelines for the electronic exchange of health data under the cross-border Directive 2011/24/EU to support the exchange of patient summary data for cross-border care.

5. Research results

The authors note that digital health technology is critical to the Digital Single Market. With the increasing mobility of citizens in the European Union, national health policies and health systems need to use the full potential of digital health technologies, including e-health and telemedicine, to become more interconnected and maintain the continuity of healthcare across borders. However, patient health information is far from being portable within and between Member States and many challenges remain such as technical, semantic, and legal ones.

Among the subsequent activities to be carried out in the context of the continuity of this collaboration on the digital dimension are: the wider dialogue with all the actors involved, including donors, the joint agreement of a new concept with a clear vision of the new e-health information system, an assessment-expertise of the current situation, a feasibility study, a road map with concrete objectives to which all institutions related to the field should align.

The rational healthcare management system makes it possible to transform population health data into clinical and economic information, which includes

electronic patient registration, home health care, and remote patient diagnosis, treatment, and observation mechanisms. In addition, it promotes the delivery of medical services using smart network technologies that help monitor the health of citizens.

The dimension of health is described by subjective and objective indicators. In the field of health, objective indicators illustrate two dimensions: health status and health care services. In the view of university professor Gorobievschi Svetlana, the dimension of health is measured by means of objective indicators: life expectancy, general mortality rate, mortality rate by cause of death, morbidity rate, population disease incidence, health expenditure but also by other indicators such as the number of medical personnel, the institution's endowment with adequate medical equipment, the number of health institutions in the country, the planned expenses for the treatment of patients through the prism of the GDP share, indicators that characterize the medical system trained in the treatment of patients.

In relation to the COVID-19 pandemic phenomenon caused in the Republic of Moldova, which had much larger dimensions compared to European countries, including neighboring states such as Romania, Ukraine, and Bulgaria, in 2020, a team of researchers from the Republic of Moldova initiated the idea of scientific research with the title "*Evaluation of the state of health and assessment of the quality of life of patients included in the electronic registry COVID-19*", aimed at researching the impact of this disease and determining its consequences on health and quality of life (QOL) in post-Covid-19 patients. This idea gained the status of the Expression of Interest with the title "*Evaluation of the State of Health and Assessment of the Quality of Life of Patients Included in the Electronic COVID-19 Registry*", the activities being carried out in 2020-2021 within the State University of Medicine and Pharmacy "Nicolae Testemiţanu " (USMF) from the Republic of Moldova.

Thus, the researchers S.Gorobievschi, T.Costru, R.Puia, and A.Ungureanu (2021-2022) in their research carried out during the Covid-19 pandemic, developed and implemented the electronic records of patients with Covid-19. As a result, it was confirmed that the elaborated Electronic Register played an important role in the assessment of health status and, indirectly, allowed the possibility of rapid access to information, proving to be a relatively simple, cheap, and effective tool for taking of medical decisions, establishing the form of the disease and the appropriate treatment of patients. Monitoring tools as health assessment components allow for establishing the effectiveness and safety of applied treatments, dynamically tracking the realization of e-health [18], [19].

It is important to mention that the results of the implementation of the electronic Covid-19 Registry in the activities of medical institutions in Chisinau were presented and appreciated by national and international authorities in the field of research and innovation. Thus, the State Agency for Intellectual Property of the Republic of Moldova (AGEPI) in November 2021, at the Specialized International Exhibition, within the XVII th Edition, appreciated the results of the implementation of the project for the economy of the Republic of Moldova with the Bronze Medal [20].

On May 26-28, 2022, the Government of Romania and the Association EUROPEAN EXHIBITION OF CREATIVITY AND INNOVATION also mentioned the contribution of the project results to the economy of the Republic of Moldova with the Bronze Medal [21].

For the invention, "Assessment of the state of health and assessment of the quality of life of patients." included in the electronic Covid-19 Registry" at the Traian VUIA International Exhibition of Inventions, Braşov, Romania, October 10, 2022, the group of researchers were awarded the Gold Medal [22]. E-health enables a shift in focus from treatment to prevention, along with the spread of wider views on general healthcare, healthy lifestyles, and well-being management.

The system of rational management of medical assistance has a strong potential, taking into account the aging of the population of developed countries; is able to reduce the inequality in health care between high-income and low-income groups. It is impossible to choose a specific concept of smart settlements and simply transfer it from one geographical region to another: smart infrastructure concepts must be relevant to local conditions and respond to local development needs. The context, culture and economy influence this process in direct proportion to public health, and even more so, digital technologies.

In other words, *Telemedicine is an opportunity to consult a doctor online without visiting a polyclinic or a hospital* (online visit). By phone or video, the patient contacts the doctor, tells about his symptoms and also receives advice with instructions on how to proceed. It is worth noting that Telemedicine is suitable for those patients who have already had a face-to-face consultation and now want to follow the recommendations, as well as monitor their health, which was confirmed during the Covid-19 pandemic.

With the development of telemedicine, a person can save time and effort, because communication with a specialist will be online. This is very important for residents of large cities and megacities, mothers with many children, people with disabilities, etc., who often do not have enough time to get to the doctor, as well as to wait in the waiting room [2].

It should be noted that digital Telemedicine technologies can be used in almost any medical field, be it psychotherapy, dermatology (due to the high quality of images dermatologists can examine patients suffering from psoriasis, etc.), pediatrics (a sick child does not still need to be transported to a doctor) or neurology (for example, blood pressure indicators are redirected to a specialist using remote monitoring). Radu C, Pana B, Furtunescu F., mention that:, Telecare has also been developed to replace some visits to the doctor's office and this, in the future, could support the improvement of care services for underserved communities [17].

Next, we will highlight the main objectives of Telemedicine, fig. 1.

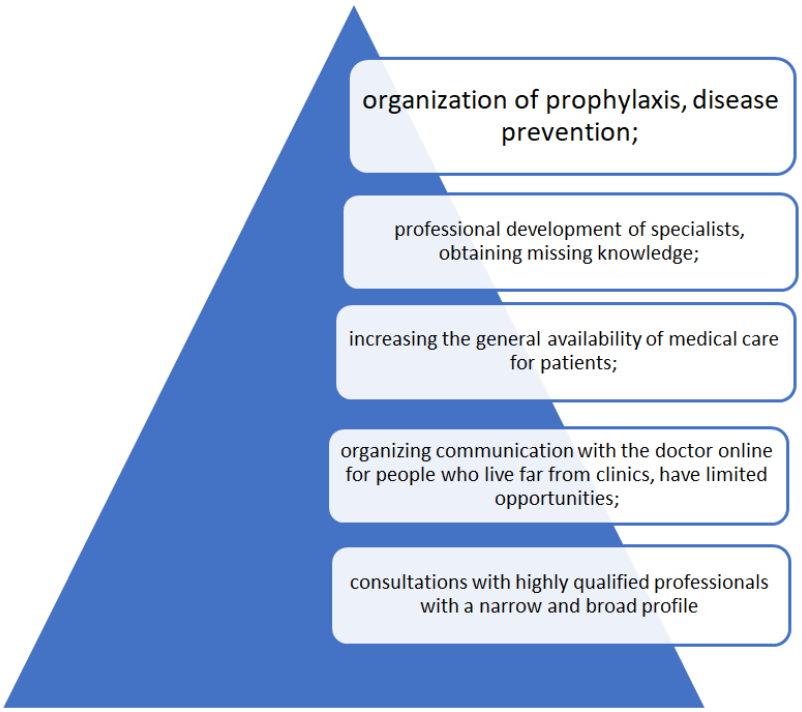

Fig. 1. The algorithm for implementing the Telemedicine objectives
Source: Developed by the authors in the context of SNDR 2022, https://ec.europa.eu/regional_policy/en/information/publications/brochures/2020/territorial-agenda-2030-a-future-for-all-places

To better analyze the advantages and disadvantages of Telemedicine, we present them in Table 2.

Table 2. Advantages and disadvantages of Telemedicine implementation

Advantages	Disadvantages
1. The ability to keep in touch with a specialist during treatment	1. There is no direct connection with the doctor if the patient only perceives face-to-face communication
2. Slowing down the spread of infections (visits to medical institutions may be associated with the risk of contracting various infections)	2. Patients, as well as medical institutions, may not have the necessary equipment
3. Improving access to care (so Telemedicine is more convenient for patients who find it difficult to get to a doctor in person)	3. Many people do not know how to use modern means of video communication
4. Electronic patient records play an important role in health assessment and indirectly determine its improvement through quick access to information	4. For some patients, the transfer of private data to third parties and the dissemination of personal information is considered a risk
5. Global network of over 1 million hospital and clinical staff; providing world-class services 24/7;	5. For patients, risk situations arise, to face scammers, who tend to win undeservedly
6. Services without hidden limits or exclusions.	6. Financial investments than traditional medicine

Source: performed by the authors based on database https://eufordigital.eu/bright-future-of-possibilities-for-ehealth-technology-while-some-challenges-remain

From Table 2, we can see that telemedicine can be distinguished as having many advantages and disadvantages. Many patients cannot personally visit narrow and broad-profile professionals for various reasons. Therefore, telemedicine is gaining a lot of popularity every year, by diversifying it in the context of better healthcare.

We can suggest, that telemedicine is a significant tool that allows us to obtain the following results:

a) creation of additional jobs;
b) provision of timely medical care to adults and children;
c) reducing the number of medical errors;
d) improving the quality of medical care for the elderly, as well as for patients with disabilities;
e) extension of important preventive measures;
f) organization of distance training of specialists, training and retraining of personnel in the Health System.

Telemedicine as a component of e-health is a fairly new direction, especially for the Republic of Moldova. It has been developed in many countries of the world, has proven its high efficiency in practice, and also has a comprehensive positive impact on the health system, improves the quality of medical care, and expands the capabilities of doctors.

The information deficit experienced during the 2019-2022 pandemic has spurred the creation and implementation of several electronic information systems to better manage overstretched healthcare resources. For example, a Diagnostic Testing system was established to improve communication between laboratories, local public health authorities, family doctors, and patients.

Vlădescu C (2016) notes the advantages of a centralized electronic system – an operational coordination center that reports daily the degree of occupancy of beds, facilitating the management of resources [17].

Telecare has also been developed to replace some office visits, and this could support improved care services for isolated communities [17].

The health system in the Republic of Moldova is at a premature level to implement diversified e-Health.

6. Conclusions

1. Digital health technology is a determining component of the digital single market, the implementation of which depends directly and proportionally on the economic growth of each individual country.
2. With the increase in population mobility in the European Union and the diversification of public health policies, health systems are all the more forced to implement the full potential of new health information technologies, including e-health and Telemedicine.
3. Telemedicine is a fairly new direction, especially for the Republic of Moldova. It has been developed in many countries, has proven its high

efficiency in practice, has a comprehensive positive impact on the health system, improves the quality of medical care, and expands the capabilities of doctors.

4. Patient registries can be implemented, in the future, in a Single European System
5. Due to the complexity and uncertainty of e-health implementation processes have both positive and negative consequences, which require a deep study of the effects and risks in the sphere of social life for each country.
6. The strategic vision of public health in the Republic of Moldova is reflected in correspondence with the new regional development paradigm. The strategic vision of SNDR 2022-2028 consists in "supporting the increase in competitiveness and sustainable development of each region, adjusting disparities, and increasing the quality of life of citizens in the context of European practices.
7. Based on the approach of improving the quality of medical services in the context of the development of the information society, the digitization of economic processes becomes a very important managerial tool in that it allows the development of the digital economy, contributes to the increase of labor productivity in all fields, ultimately ensures economic growth, the development of civilization human resources and creating opportunities in the development of human capital, increasing its intelligence and culture worldwide.

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