Safety and Security Sciences Review

Biztonságtudományi Szemle

HEDY - Life in the AI age SPECIAL ISSUE

HEDY - Élet az MI korában KÜLÖNSZÁM

BEKE Éva | HENDLEIN Teréz | Dr. KOLLÁR Csaba | Dr. SZABÓ Gyula

editors by special issue   a különszám szerkesztői

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The **aim** of the journal is to publish studies, research reports, book reviews for professionals working in the field of security science or related scinces, or for those interested in the subject of the broadly disciplinary framework of military technical sciences, and for security awareness and developing a safety culture. We know that the cultivation of security sciences includes the study of the history of military and law enforcement security, as well as the knowledge of the historical aspects of our field of science, and its development. We are working towards to present the latest theoretical models and empirical research findings in our journal. We believe that our Journal and our authors can contribute to the creation of a world that enables a (more) secure life for all the inhabitants of the Earth by knowing the historical past and examining the events of the present with precision and accuracy.

Published quarterly, typically in Hungarian, occasionally in a foreign language. Special and/or thematic issues related to conferences and topics are occasionally published in Hungarian or in foreign languages.

Only those papers will be published which reviewed by two independent reviewers and recommended suitable for publication in the Safety and Security Sciences Review. The submitted manuscripts must meet the requirements both of the form and the content which can be found in the journal's website. Please note: we will not return unapproved manuscripts.

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A **folyóirat célja** a biztonságtudomány területén, vagy ahhoz kapcsolódó területeken dolgozó szakemberek, vagy a téma iránt érdeklődők számára a katonai műszaki tudományok, s így a biztonságtudomány tágan értelmezett diszciplináris keretébe tartozó tanulmányok, kutatási jelentések, beszámolók, könyvismertetők megjelentetése, s ennek révén a biztonságtudatosság és a biztonsági kultúra fejlesztése. Tudjuk, hogy a biztonságtudományok művelésébe beletartozik a had-, rendészet- és biztonságtörténet vizsgálata, tudományterületünk történeti és történelmi vetületeinek, s így fejlődésének megismerése. Azon dolgozunk, hogy Folyóiratunkban bemutassuk jelenkorunk legújabb teoretikus modelljeit és empirikus kutatási eredményeit. Hiszünk benne, hogy Folyóiratunk és szerzőink a történelmi múlt ismeretével, a jelenkor eseményeinek precíz és akkurátus vizsgálatával hozzá tudunk járulni egy olyan világ megteremtéséhez, amelyik lehetővé teszi a Föld minden lakója számára a biztonságos(abb) életet.

Megjelenés negyedévente, jellemzően magyar, eseti jelleggel idegen nyelven. Konferenciákhoz és témákhoz kapcsolódóan különszámok, tematikus számok alkalmi jelleggel magyar, vagy idegen nyelven jelennek meg.

A Biztonságtudományi Szemle folyóiratban csak két független lektor által lektorált és megjelentetésre alkalmasnak tartott tanulmányok jelenhetnek meg. A beküldött kéziratoknak formai és tartalmi szempontból egyaránt meg kell felelnie a Folyóirat weboldalán közölt elvárásoknak. El nem fogadott kéziratokat nem áll módunkban visszaküldeni.

A Biztonságtudományi Szemle folyóiratban megjelenő cikkek az Óbudai Egyetem Digitális Archívumában (ÓDA) archiválásra kerülnek. Az Óbudai Egyetem munkatársainak és hallgatóinak a Folyóiratban megjelent tanulmányait az Egyetemi Könyvtár munkatársai rögzítik a Magyar Tudományos Művek Tárában (MTMT).

ALVES MOREIRA, Ana I.

ana.moreira@aidlearn.pt

Ana I. ALVES MOREIRA has a Bachelor's degree in Psychology and a Master's degree in Psychology of Intercultural Relations from ISCTE-IUL for which she received an academic excellence award. She is a licensed psychologist by the Ordem dos Psicólogos Portugueses (Portuguese Order of Psychologists) and is an International Affiliate Member of the American Psychological Association. She has been working as a Junior Project Manager in European Projects at AidLearn. Additionally, she also works as a freelance research assistant, mostly related to data analysis/interpretation of both quantitative and qualitative data, as well as transcription of qualitative data and translation of research materials. In her professional path she has conducted various research activities, and, as part of her work at AidLearn, she has published a meta-study on arts-based interventions for the social inclusion of refugees and asylum-seekers. Her research interests mostly lie in social cognition, culture and diversity, and social inclusion.

ALVES MOREIRA, Ana I. bachelor fokozatot szerzett pszichológiából és mesterdiplomát az interkulturális kapcsolatok pszichológiájából az ISCTE-IUL-en, amiért akadémiai kiválósági díjat kapott. Az Ordem dos Psicólogos Portugueses (Portugál Pszichológusok Rendje) okleveles pszichológusa, és az Amerikai Pszichológiai Társaság nemzetközi társult tagja. Az AidLearn-nél junior projektmenedzserként dolgozott európai projektekben. Emellett szabadúszó kutatási asszisztensként is dolgozik, főként a kvantitatív és kvalitatív adatok adatelemzésével/értelmezésével, valamint kvalitatív adatok átírásával és kutatási anyagok fordításával foglalkozik. Szakmai pályája során különféle kutatási tevékenységet végzett, és az AidLearn-nél végzett munkája részeként metatanulmányt publikált a menekültek és menedékkérők társadalmi befogadását szolgáló művészeti alapú beavatkozásokról. Kutatási területe leginkább a társadalmi megismerés, a kultúra és sokszínűség, valamint a társadalmi befogadás területe.

ANGULO BAHÓN, Cecilio

cecilio.angulo@upc.edu

Cecilio ANGULO is Full Professor at the Universitat Politècnica de Catalunya and founder of the Intelligent Data Science and Artificial Intelligence Research Center. He is also a member of the Ethics Committee in this university. His research interests include social and cognitive robotics, reinforcement learning and human-robot interaction. He received his Doctorate in Applied Mathematics from the Universitat Politècnica de Catalunya in 2001. He has worked on theoretical aspects of machine learning and on applications in recommender systems, cognitive social robots and assistive technologies. He is the author of books on machine learning and robots, and has published nearly 300 articles in international and national journals and conferences. He has led and participated in 47 competitive R&D projects, 21 of them funded by the European Commission.

ANGULO, Cecilio az Universitat Politècnica de Catalunya rendes professzora és az Intelligens Adattudományi és Mesterséges Intelligencia Kutatóközpont alapítója. Ezen az egyetemen az Etikai Bizottságnak is tagja. Kutatási területe a szociális és kognitív robotika, a megerősítő tanulás és az ember-robot interakció. 2001-ben szerzett doktori fokozatot alkalmazott matematikából az Universitat Politècnica de Catalunya-n. Dolgozott a gépi tanulás elméleti vonatkozásaival, valamint az ajánlórendszerekben, kognitív szociális robotokban és kisegítő technológiákban történő alkalmazásaival. Gépi tanulásról és robotokról szóló könyvek szerzője, közel 300 cikke jelent meg nemzetközi és hazai folyóiratokban, konferenciákon. 47 K+F projektet vezetett és vett részt, ezek közül 21-et az Európai Bizottság finanszírozott.

CAREGLIO, Davide

davide.careglio@upc.edu

Davide CAREGLIO is an associate professor in the Department of Computer Architecture (DAC) at the

CAREGLIO, Davide a barcelonai Universitat Politècnica de Catalunya (UPC) Számítógép-

Universitat Politècnica de Catalunya (UPC), Barcelona, Spain and member of the Intelligent Data Science and Artificial Intelligence research center (IDEAI) located in UPC. He received the M.Sc. double degree in telecommunications engineering and electrical engineering from UPC (2000) and Politecnico di Torino (2001), respectively, and his PhD from UPC in 2005. His research interests are focused on algorithms and protocols for computer networks with special interests in interoperability, control and management, novel architectures, planning and routing. He has published more than 200 articles in international and national journals and conferences and has been involved in several EU and industrial research projects.

architektúra Tanszékének (DAC) docense, valamint a UPC-ben található Intelligens Adattudományi és Mesterséges Intelligencia Kutatóközpont (IDEAI) tagja. Megkapta a kettős mester diplomát szerzett távközlési és villamosmérnöki a UPC-től (2000), illetve a Politecnico di Torino-tól (2001), PhD fokozatát pedig a UPC-től 2005-ben. Kutatási területe a számítógépes hálózatok algoritmusai és protokolljai, érdeklődési területe az interoperabilitás, vezérlés és menedzsment, újszerű architektúrák, tervezés és útválasztás. Több mint 200 cikket publikált nemzetközi és hazai folyóiratokban és konferenciákon, és számos uniós és ipari kutatási projektben vett részt.

CASACCIO, Federica

casaccio@aceeu.org

Federica CASACCIO is a Junior International Project Officer at ACEEU, where she manages several Erasmus+ projects within the cross-cutting themes of digitalization, women entrepreneurship and innovation in HEI. She holds a Bachelor Degree in Political Science and International Relations (Milan, Italy and Zagreb, Croatia) and a Master's Degree in Peace, Conflict and Development Studies (Castellon de la Plana, Spain) where she specialised in the analysis of peace education as a society's transformative tool. Federica has extensive expertise in research, advocacy and project management. Her experiences include working in Spain, Czech Republic, Lebanon and the Netherlands in numerous organizations and projects focused on the valorisation of education for the development of individuals, communities and societies.

CASACCIO, Federica az ACEEU Junior International Project Officer, ahol több Erasmus+ projektet irányít a digitalizáció, a női vállalkozók és az innováció átfogó témáiban a felsőoktatási intézményekben. Bachelor fokozatot szerzett politikatudományból és nemzetközi kapcsolatokból (Milánó, Olaszország és Zágráb, Horvátország), valamint mesterdiplomát béke-, konfliktus- és fejlődéstanulmányokból (Castellon de la Plana, Spanyolország), ahol a béke elemzésének oktatására,mint a társadalom átalakító eszköze szakosodott. Federica kiterjedt szakértelemmel rendelkezik a kutatás, az érdekképviselet és a projektmenedzsment területén. Tapasztalatot szerzett, Spanyolországban, Csehországban, Libanonban és Hollandiában számos olyan szervezetben és projektben, amelyek az oktatás egyének, közösségek és társadalmak fejlődését célzó validálását célozzák.

DIMOVA, Rozalina S.

rdim@abv.bg

Professor Dr. Eng. Rozalinda DIMOVA received the Diploma Engineer degree in electrical engineering from the Technical University Varna, the PhD degree from the Telecommunications Department, Technical University of Sofia, Bulgaria and has experience as a lecturer for more than 20 years at "Communication engineering and technologies". She is the head of Applied Health Technologies Center and former Rector of the Technical University of Varna. Rozalina DIMOVA has current research interests in information and communication technologies (ICT), Artificial Intelligence (AI) and Next generation networks. She is co-authored over 120 scientific publications and has participated either as project

Professzor Dr. Eng. DIMOVA, Rozalinda a Várnai Műszaki Egyetemen szerzett elektromérnöki diplomát, a bolgár Szófiai Műszaki Egyetem Távközlési Tanszékén PhD fokozatot, és több mint 20 éves oktatói tapasztalattal rendelkezik a „Kommunikációs mérnöki technológiák" területen. Az Alkalmazott Egészségügyi Technológiai Központ vezetője és a Várnai Műszaki Egyetem korábbi rektora. DIMOVA, Rozalina jelenleg az információs és kommunikációs technológiák (IKT), a mesterséges intelligencia (AI) és a következő generációs hálózatok területével foglalkozik. Több mint 120 tudományos publikáció társszerzője, és projektvezetőként vagy tudományos csoport tagjaként vett részt 7 európai és több mint 50

leader or member of scientific teams in 7 European and more than 50 national funded research projects. She is a Member of European Society for Engineering Education (SEFI), IEEE, Member of Management Board of the Scientific and Technical Union, Varna, Bulgaria and Member of Management Board of Union of Scientists in Bulgaria.

nemzeti finanszírozású kutatási projektben. Tagja az Európai Mérnökképzési Társaságnak (SEFI), az IEEE-nek, a Várna (Bulgária) Tudományos és Műszaki Unió igazgatótanácsának, valamint a Bulgáriában a Tudományos Szövetség igazgatótanácsának tagja.

DOMÈNECH ARGEMÍ, Miquel

Miquel.Domenech@uab.cat

Miquel DOMÈNECH is Associate Professor of Social Psychology at the Universitat Autònoma de Barcelona. He is a member of the European Association for the Study of Science and Technology (EASST) and a founding member of the Barcelona Science and Technology Studies Group (STS-b) at the UAB. His research interests cohere broadly in the field of science and technology studies, with special emphasis on the relationship between care and technology, citizen participation in technoscientific issues, and ethics of technology. He has published many papers and leaded several research projects on these topics. Currently, he is the Director of the Department of Social Psychology.

DOMÈNECH, Miquel az Universitat Autònoma de Barcelona szociálpszichológiai docense. Tagja az Európai Tudományos és Technológiai Tanulmányi Szövetségnek (EASST) és alapító tagja a Barcelona Science and Technology Studies Group (STS-b) az UAB-nál is. Kutatásai és érdeklődési köre széles körben összefügg a tudomány-technológiai tanulmányok területével, különös tekintettel az ellátás és a technológia kapcsolatára, az állampolgári részvételre a technológiatudományi kérdésekben és a technológia etikájára. Számos közleménye jelent meg, és számos kutatási projektet vezetett ezekben a témákban. Jelenleg a Szociálpszichológiai Tanszék igazgatója.

DOVRAMADJIEV, Tihomir A.

dr.tihomir.dovramadjiev@gmail.com

Professor (Assoc.) Dr. Eng. Tihomir DOVRAMADJIEV has professional activity related to management, academic, educational, scientific and other to the Bulgarian Association of Ergonomics and Human Factors (BAEHF) and Technical University – Varna (TUV, Bulgaria). He received the Ph.D. in "Ergonomics and industrial design" (TUV/2012). He is a professor (assoc.) Dr. Eng. at TUV more than 10 years at Industrial Design Department. He is the author of the book "Advanced technologies in Design", TUV, pp. 228, ISBN: 978-954-20-0771-5, 2017. He has participated in over 60 scientific publications (Incl. Springer & Elsevier). Based of ResearchGate data (2022), he has about 300 K research reads. Actively participates in scientific conferences IHSED, IHSI, AHFE and IHIET as a scientist, reviewer and organizer. He is on the editorial board of the IETI Transactions on Ergonomics and Safety (TES), IETI Transactions on Engineering Research and Practice (TERP), American Journal of Management Science and Engineering (AJMSE), topical advisory member of MDPI Mathematics and other.

Dr. Eng. DOVRAMADJIEV, Tihomir a Bolgár Ergonómia és Emberi Tényezők Szövetsége (BAEHF) és a Várnai Műszaki Egyetem (TUV, Bulgária) vezetői, tudományos, oktatási, tudományos és egyéb szakmai tevékenységet folytat. Ph.D fokozatot kapott az „Ergonómia és ipari formatervezés" (TUV/2012) című munkájáért. Több mint 10 éve a TUV ipari formatervezési tanszékének docense. Ő az „Advanced technologies in Design" című könyv szerzője, TUV, 228. o., ISBN: 978-954-20-0771-5, 2017. Több mint 60 tudományos publikáció társszerzője (Incl. Springer & Elsevier). A ResearchGate adatai (2022) alapján mintegy 300 ezer olvasója van tudományos cikkeinek. Aktívan részt vesz az IHSED, IHSI, AHFE és IHIET tudományos konferenciákon tudósként, lektorként és szervezőként. Tagja az IETI Transactions on Ergonomics and Safety (TES), az IETI Transactions on Engineering Research and Practice (TERP), az American Journal of Management Science and Engineering (AJMSE) szerkesztőbizottságának, az MDPI Mathematics témakör tanácsadó tagja.

FILCHEV, Rusko V.

rusko.filchev@gmail.com

Financial expert Rusko FILCHEV is a long-term bank manager (Societe Generale Expressbank, DSK and others). Responsible for information and telecommunication security of the bank office. Activities cover innovations in cybersecurity and monitoring of hightech processes related to financial institutions. Organizes and is responsible for the implementation of the goals and tasks approved by the business plan and budget of the branch. Responsible for the good development of the business, makes contacts to attract new clients in the office, maintains relationships with current clients, researches opportunities to offer new products and services. He has a university master degree in economics. His competence covers as well as performs activities in the following areas: Public sector economics; Pension insurance funds; Public sector audit; Health insurance systems; European Union Finance; Research; Government debt management; Tax process; Fiscal policy and mechanisms and others.

FILCHEV, Rusko pénzügyi szakértő hosszú távú bankmenedzser (Societe Generale Expressbank, DSK és mások). Felelős a bankiroda információs és távközlési biztonságáért. A tevékenységek a kiberbiztonsági innovációkra és a pénzintézetekhez kapcsolódó hightech folyamatok felügyeletére terjednek ki. Szervezi és felelős a fióktelep üzleti tervében és költségvetésében jóváhagyott célok és feladatok megvalósításáért. Felelős az üzlet jó fejlődéséért, kapcsolatokat létesít új ügyfelek bevonása érdekében az irodában, kapcsolatot tart a jelenlegi ügyfelekkel, kutatja az új termékek és szolgáltatások kínálásának lehetőségeit. Egyetemi közgazdász diplomával rendelkezik. Illetékessége az alábbi területekre terjed ki: Közgazdaságtan; Nyugdíjbiztosítási alapok; Közszféra ellenőrzése; Egészségbiztosítási rendszerek; Európai Unió finanszírozása; Kutatás; Államadósság kezelése; Adózási folyamat; Fiskális politika és mechanizmusok és mások.

HEITLERNÉ LEHOCZKY Mária

lehoczky.maria@uni-obuda.hu

Maria HEITLERNÉ LEHOCZKY certified psychologist, certified marketing communication economist, certified Total Quality Management specialist, professional crisis therapy consultant (personal and group counselling), accredited interpersonal skills development trainer, organisation developer consultant. PhD student at the Doctoral School on Safety and Security Sciences of Óbuda University. Lecturer at Budapest Business School. One of the founding members of Artificial Intelligence Workshop at the Óbuda University. Member of the Hungarian Psychological Association. Her field of research is the study of the psychological mechanisms of economic processes from multidisciplinary perspective, including psychological aspects of artificial intelligence, cyberpsychology (psychology of cybersecurity), organizational psychology, career psychology, psychological capital, psychological wellbeing.

HEITLERNÉ LEHOCZKY, Mária okleveles pszichológus, marketingkommunikáció szakközgazdász, Total Quality Management szakközgazdász, egyéni és csoportos krízislélektani tanácsadó és konzultáns, akkreditált interperszonális készségfejlesztő tréner, szervezetfejlesztő konzultáns Az Óbudai Egyetem Biztonságtudományi Doktori iskolájának hallgatója. A Budapesti Gazdasági Egyetem oktatója. Az Óbudai Egyetem Mesterséges Intelligencia Műhelyének egyik alapító tagja. A Magyar Pszichológia Társaság tagja. Kutatási területe a gazdasági folyamatok pszichológiai mechanizmusainak vizsgálata (gazdaságpszichológia) multidiszciplináris megközelítéssel, amely magában foglalja a mesterséges intelligencia pszichológiai vonatkozásait, kiberbiztonság pszichológia tényezőit (kiberpszichológia), a szervezetpszichológiát, a karrierpszichológiát, a pszichológiai tőkét, a pszichológia jóllétet.

HERNANDO PERICAS, Francisco Javier

javier.hernando@upc.edu

Javier HERNANDO received the M.S. and Ph.D. degrees in telecommunication engineering from the Technical University of Catalonia (UPC), Barcelona, Spain, in 1988 and 1993, respectively. Since 1988,

HERNANDO, Javier távközlési mérnöki mesterdiplomát és doktori címet szerzett a Katalóniai Műszaki Egyetemen (UPC), Barcelona, Spanyolországban, 1988-ban, illetve 1993-ban. 1988 óta az UPC

he has been in the Department of Signal Theory and Communications, UPC, where he is currently a Full Professor and the Director of the Research Center for Language and Speech. During the academic year 2002–2003, he was a Visiting Researcher in the Panasonic Speech Technology Laboratory, Santa Barbara, CA, USA. He has led the UPC team in several European, Spanish, and Catalan projects. His research interests include robust speech analysis, speech recognition, speaker verification and localization, oral dialogue, and multimodal interfaces. He is the author or coauthor of about 200 publications in book chapters, review articles, and conference papers on these topics. He received the 1993 Extraordinary Ph.D. Award of UPC.

Jelelméleti és Kommunikációs Tanszékén dolgozik, ahol jelenleg rendes professzor és a Nyelvi és Beszédkutató Központ igazgatója. A 2002–2003-as tanévben vendégkutató volt a Panasonic Speech Technology Laboratory-ban, Santa Barbarában, az USA-ban. Számos európai, spanyol és katalán projektben vezette az UPC csapatát. Kutatási területei közé tartozik a robusztus beszédelemzés, a beszédfelismerés, a beszélő ellenőrzése és lokalizálása, a szóbeli párbeszéd és a multimodális interfészek. Mintegy 200 publikáció szerzője vagy társszerzője könyvfejezetekben, cikkekben és konferenciaelőadásokban ezekben a témákban. 1993-ban az UPC rendkívüli doktori címét is megkapta.

JAKOBI, Antonia L. P.

antonia.jakobi@aidlearn.pt

Antonia L. P. JAKOBI concluded her Bachelor's degree in Psychology in Germany, after which she proceeded to finalize her Master of Science degree in Psychology of Intercultural Relations in Portugal. Since then, she has been working as a Junior Project Manager in European Projects at AidLearn, a Portuguese human resources consultancy. Her work focuses on Erasmus+ funded European projects that deal with societal challenges and issues from an educational approach. Therefore, she has been involved in various projects on topics like gender equality, global citizenship and social inclusion. Within these projects, Antonia has conducted various research activities. Among them belongs the publication of a meta-study on arts-based interventions for the social inclusion of refugees and asylum-seekers. Her scientific approach entails both qualitative and quantitative methods. Antonia's interests are psycho-societal issues, in particular social inclusion, diversity, and gender.

JAKOBI, Antonia L. P. Németországban fejezte be pszichológia szakos alapképzését, majd Portugáliában véglegesítette az interkulturális kapcsolatok pszichológiája szakon szerzett mester fokozatot. Azóta junior projektmenedzserként dolgozik az európai projekteken az AidLearn portugál humánerőforrás tanácsadó cégnél. Munkája az Erasmus+ által finanszírozott európai projektekre összpontosít, amelyek a társadalmi kihívásokkal és kérdésekkel foglalkoznak oktatási megközelítésből. Ezért számos projektben vett részt olyan témákban, mint a nemek közötti egyenlőség, a globális állampolgárság és a társadalmi befogadás. Ezeken projekteken belül Antonia különféle kutatási tevékenységeket végzett. Ezek közé tartozik egy metatanulmány publikálása a menekültek és menedékkérők társadalmi befogadását szolgáló művészeti alapú beavatkozásokról. Tudományos megközelítése kvalitatív és kvantitatív módszereket egyaránt magában foglal. Antonia érdeklődési köre a pszicho-társadalmi kérdések, különösen a társadalmi befogadás, a sokszínűség és a nemek közötti egyenlőség.

KOLLÁR Csaba

kollar.csaba@uni-obuda.hu

Csaba KOLLÁR communications engineer, certified communications specialist, head of electronic information security, doctor of economics (PhD), cybernetic, consultant, coach, mediator. His research interests include the social aspects and economic impacts of the digital age, in particular the human dimension of information security, the development of information security awareness, human-robot interaction, smart city, artificial intelligence, social credit

KOLLÁR, Csaba kommunikációtechnikai mérnök, okleveles kommunikációs szakember, elektronikus információbiztonsági vezető, a közgazdaságtudományok doktora (PhD), kibernetikus, tanácsadó, coach, mediátor. Kutatási területe a digitális kor társadalmi vetületei és gazdasági hatásai, kiemelten az információbiztonság humán aspektusa, az információbiztonság-tudatosság fejlesztése, az ember-robot interakció, az okosváros, a mesterséges intelligencia, a

system, and domotics. He is a senior research fellow at the Óbuda University, leader of Artificial Intelligence Workshop, lecturer and supervisor at the Doctoral School on Safety and Security Sciences, and at the National University of Public Service Doctoral School of Military Engineering. He is an examiner for professional qualification exams. He is a senior consultant, mediator and coach of PREMA Consulting, expert of the Hungarian Military Society and the National Association of Human Professionals. He has been a member of the Artificial Intelligence Consortium since Q4 2018.

társadalmi kredit rendszere, a domotika. Az Óbudai Egyetem tudományos főmunkatársa, a Mesterséges Intelligencia Műhely vezetője, az Egyetem Biztonságtudományi Doktori Iskolájának és a Nemzeti Közszolgálati Egyetem Katonai Műszaki Doktori Iskolájának az oktatója, témavezetője. Elnök a szakmai képesítő vizsgákon. A PREMA Consulting vezető tanácsadója, mediátora és coacha, a Magyar Hadtudományi Társaság és a Humán Szakemberek Országos Szövetsége szakértője. 2018. negyedik negyedévétől a Mesterséges Intelligencia Konzorcium tagja.

PAVLOVA, Diana Y.

diana.pavlova@dentaprime.com

Expert M.Sc. Diana PAVLOVA – dental technician at Dentaprime Dental Clinic. Develops competencies for working with various software for designing dental structures and manufacturing with 3D printers and CAD/CAM Currently works in a medical dental center, the position is "training and development of specialists and, develops innovative projects to improve dental production, receives the first graduated in 2012 at the Medical College - Varna with a professional bachelor's degree in Dental Technology. She graduated with a degree in "Health Care Management and Teaching Practice". She obtained a higher degree – a master's degree in this field and actual is PhD candidate at Technical University of Varna, Bulgaria. She is working on a dissertation related to the development of ICT communication in dentistry. She held a position in the structure of the Medical University – Varna, Bulgaria as the head of a laboratory for 3D technologies used in dentistry and actively participated in the curricula and the learning process of dental students. She is an author of science publications, teaching aids for digital technologies in dentistry.

Szakértő okl. PAVLOVA, Diana – fogtechnikus a Dentaprime Fogászati Klinikán. Kompetenciákat fejleszt különböző szoftverekkel való munkavégzéshez fogászati struktúrák tervezéséhez és 3D nyomtatókkal és CAD/CAM-mel történő gyártáshoz Jelenleg egy fogászati orvosi központban dolgozik, a pozíciója "szakemberek képzése és fejlesztése, valamint innovatív projektek fejlesztése a fogászati tudomány javítása érdekében, megkapja az első 2012-ben szerzett diplomát a Várnai Orvostudományi Főiskolán fogtechnikai szakos alapképzésben. „Egészségügyi menedzsment és oktatási gyakorlat" szakon szerzett diplomát. Jelenleg PhD-jelölt a Várnai Műszaki Egyetemen, Bulgáriában. Dolgozatán dolgozik, amely a fogászat IKT kommunikációjának fejlesztésével kapcsolatos. A bulgáriai Várnai Orvostudományi Egyetem struktúrájában a fogászatban használt 3D technológiákkal foglalkozó laboratórium vezetőjeként dolgozott, és aktívan részt vett a fogorvostanhallgatók tantervében és tanulási folyamatában. Tudományos publikációk, fogászati digitális technológiák oktatási segédanyagainak szerzője.

SOLÉ-PARETA, Josep

josep.sole@upc.edu

Prof. Josep SOLÉ-PARETA obtained his M.Sc. degree in Telecom Engineering in 1984, and his PhD in Computer Science in 1991, both from the UPC. In 1984 he joined the Computer Architecture Department of UPC. Currently he is Full Professor with this department. He was co-founder of the UPC-CCABA, and UPC-N3cat. His current research interests are in Nanonetworking Communications, Traffic Monitoring and Analysis, High Speed and Optical Networking, and Teaching Innovation Techniques. His publications include several book chapters and

Prof. SOLÉ-PARETA, Josep 1984-ben távközlési mérnöki okleveles diplomát szerzett, majd 1991-ben PhD-t számítástudományból, mindkettőt a UPC-től. 1984-ben csatlakozott a UPC Számítógép-architektúra Tanszékéhez. Jelenleg ennek a tanszéknek a rendes professzora. Társalapítója volt a UPC-CCABA-nak és a UPC-N3cat-nak. Jelenlegi kutatási területei a nanohálózati kommunikáció, a forgalomfigyelés és -elemzés, a nagysebességű és optikai hálózatok, valamint az innovációs technikák oktatása. Publikációi között több könyvfejezet és több mint 350

more than 350 papers in relevant research journals (>90), and refereed international conferences. He has participated in many European projects in the Computer Networking field. He was Local Chairman of the 25th Conference on Computer Communications (EEE INFOCOM 2006) held in Barcelona on April 23-29, 2006, and General Chairman of the 7th International Conference on Transparent Optical Networks (ICTON 2005, Barcelona, July 3-7, 2005). Currently, he is a member of the N3Cat and the IDEAI-UPC.

közlemény található releváns kutatási folyóiratokban (>90), valamint nemzetközi konferenciákon referált. Számos európai projektben vett részt a számítógépes hálózatok területén. A 2006. április 23-29-én Barcelonában megrendezett 25. Számítógépes Kommunikációs Konferencia (EEE INFOCOM 2006) helyi elnöke, valamint a Transparent Optical Networks 7. Nemzetközi Konferencia (ICTON 2005, Barcelona, július 3-7.) általános elnöke volt. 2005). Jelenleg az N3Cat és az IDEAI-UPC tagja.

SUKHOVII, Evgeniia

sukhovii@aceeu.org

Evgeniia SUKHOVII is a philologist and international business engineer. She received her undergraduate degree in the field of English Philology from Namik Kemal University in Turkey, and her postgraduate degree in the field of International Business Engineering from the University of Montpellier in France. She completed two Erasmus+ exchange studies and two traineeships in Portugal, Poland and Germany. She worked as a language teacher, business and marketing developer and European project assistant. Her research interests include (but not limited to) entrepreneurship, education, business and marketing.

SUKHOVII, Evgeniia filológus és nemzetközi üzleti mérnök. Egyetemi diplomáját angol filológia szakon a törökországi Namik Kemal Egyetemen, nemzetközi üzleti mérnöki posztgraduális diplomáját a franciaországi Montpellier Egyetemen szerezte. Két Erasmus+ csere-tanulmányt és két szakmai gyakorlatot végzett Portugáliában, Lengyelországban és Németországban. Nyelvtanárként, üzleti és marketingfejlesztőként, valamint európai projekt-asszisztensként dolgozott. Kutatási területei közé tartozik (de nem kizárólagosan) a vállalkozás, az oktatás, az üzlet és a marketing.

SZABÓ Gyula

szabo.gyula@bgk.uni-obuda.hu

Gyula SZABÓ PhD. is a registered European ergonomist and associate professor at Óbuda University. He obtained an electrical engineering and teaching degree, a university doctorate at the Budapest University of Technology, and a PhD in ergonomics at the National University of Public Service. His primary research interest is the assessment of human factors at work, and he leads projects for their development. He participates in the scientific committee of conferences and proofreading journals. In addition to teaching ergonomics and safety at work, he is responsible for the Occupational Safety Specialist, Occupational Safety Engineer, Specialist in the field of investigation of work accidents and occupational diseases, and Ergonomics and Human Factors specialist in postgraduate training courses. He is the president of the Hungarian Ergonomics Society, a board member of the Federation of European Ergonomics Societies, the Health and Safety Technical Committee of the International Ergonomics Association, and the steering committee of the partner network of the European Agency for Safety and Health at Work.

Dr. SZABÓ, Gyula regisztrált európai ergonómus, az Óbudai Egyetem docense. Villamos mérnöki és tanári diplomát és egyetemi doktori címet a Budapesti Műszaki Egyetemen, a PhD fokozatot a Nemzeti Közszolgálati Egyetemen szerzett ergonómiai területen. Elsősorban az emberi tényezők munkahelyi értékelését kutatja, és vezet projekteket ezek fejlesztésére. Részt vesz konferenciák tudományos bizottságában és folyóiratok lektorálásában. Ergonómia és munkavédelmi ismeretek oktatása mellett szakfelelős a Munkavédelmi szakember, Munkavédelmi szakmérnök, a Specialista munkabalesetek és foglalkozási megbetegedések kivizsgálása területén és az Ergonómia és emberi tényezők szakember szakirányú továbbképzési szakokon. A Magyar Ergonómiai Társaság elnöke, vezetőségi tagja az Ergonómiai Társaságok Európai Szövetségének, a Nemzetközi Ergonómiai Társaság Munkavédelmi Bizottságának, és az Európai Munkahelyi Biztonsági és Egészségvédelmi Ügynökség partnerhálózat irányító testületének.

VALLÈS-PERIS Núria

nuria.valles.peris@upc.edu

Núria VALLÈS-PERIS is sociologist, researcher at the Barcelona Science and Technology Studies Group (STS-b) of the Universitat Autònoma de Barcelona. She is currently a postdoctoral researcher at the Intelligent Data Science and Artificial Intelligence Research Center (IDEAI) of the Universitat Politècnica de Catalunya. Her research has focused on the study of the ethical, political and social controversies surrounding robotics and artificial intelligence, especially in the field of health and care. Her approach is based on the study of science and technology and the philosophy of technology. She is interested in the study of imaginaries, the design of technologies and the processes of democratisation of technology.

VALLÈS-PERIS, Núria szociológus, az Universitat Autònoma de Barcelona Barcelona Science and Technology Studies Group (STS-b) kutatója. Jelenleg posztdoktori kutató az Universitat Politècnica de Catalunya Intelligens Adattudományi és Mesterséges Intelligencia Kutatóközpontjában (IDEAI). Kutatásai a robotikával és a mesterséges intelligenciával kapcsolatos etikai, politikai és társadalmi viták vizsgálatára összpontosítottak, különösen az egészségügy és az ellátás területén. Megközelítése a tudomány és technológia tanulmányozásán, valamint a technológiafilozófián alapul. Érdekli az ábrázolás tanulmányozása, a technológiák tervezése és a technológia demokratizálódási folyamatai.

CONTENT │ TARTALOM

EDITORIAL PREFACE | SZERKESZTŐI ELŐSZÓ

SZABÓ, Gyula[1]

Artificial intelligence is undeniably present in our lives. We openly use artificial intelligence, e.g. in self-driving vehicles, for translation of foreign language texts, language correctness checks or pattern-based searches. Still, occasionally we use artificial intelligence covertly, e.g. chatbots, automated customer services, lie screening, generating fake news or customizing ads. The previously unimaginable increase in computing and data storage capabilities has enabled the development of artificial intelligence to such an extent that it fundamentally changes our socio-economic environment and turns our way of life upside down. The rise of artificial intelligence surpasses imagination, and the border between reality and science fiction is often blurred. From the application of artificial intelligence, we can hope for the creation of jobs and the automation of routine intellectual work, which will lead to the relief of people, the improvement of the content of the work performed by people, and the appreciation of human competencies. The direct benefits of using AI include improved efficiency and productivity and eliminating human error.

We launched the "HEDY – Life in the AI age" Erasmus+ Cooperation partnerships in higher education project (KA220-HED 0C8D3623) in November 2021. The Óbuda University leads the project with the participation of Aidlearn, Consultoria em Recursos Humanos Lda., Portugal, Lisboa; Bulgarian Association of Ergonomics and Human Factors, Bulgaria, Varna; Universitat

A mesterséges intelligencia tagadhatatlanul jelen van életünkben. Közismerten mesterséges intelligenciát használunk pl. az önvezető járművekben, idegen nyelvű szövegek lefordítására, nyelvhelyességi ellenőrzésre vagy mintázat alapú keresésekre; de alkalmanként sor kerül a mesterséges intelligencia fedett alkalmazására is, pl. csevegő robotok, automata ügyfélszolgálatok, hazugságszűrés, álhír generálás vagy hirdetések testre szabása. A számítási és adattárolási képességek korábban elképzelhetetlen növekedése a mesterséges intelligencia olyan mértékű fejlődését tette lehetővé, mely alapjaiban változtatja meg a társadalmi-gazdasági környezetünket és forgatja fel életmódunkat. A mesterséges intelligencia térnyerése felülmúlja a képzeletet, sokszor elmosódik a határ a valóság és a tudományos-fantasztikus irodalom között. A mesterséges intelligencia alkalmazásától munkahelyteremtést, a rutinszerű szellemi munkák automatizálását remélhetjük, ami emberek tehermentesítéséhez, az emberek által végzett munkák tartalmának javulásához és emberi kompetenciák felértékelődéséhez vezetnek. Az MI alkalmazásának közvetlen előnyeiként a javuló hatékonyságot és termelékenységet, az emberi hibázás kiküszöbölését.

A „HEDY – Élet az MI-korában" ERASMUS+ partnerségi együttműködés a felsőoktatási szektorokban projekt (KA220-HED 0C8D3623) 2021 novemberben indult. A projektet az Óbudai Egyetem vezeti, közreműködik az Aidlearn, Consultoria em Recursos Humanos Lda., Portugália,

[1] szabo.gyula@bgk.uni-obuda.hu | ORCID: 0000-0002-3963-2916 | associate professor, Óbuda University | egyetemi docens, Óbudai Egyetem

Politecnica De Catalunya, Spain, Barcelona; and Accreditation Council for Entrepreneurial and Engaged Universities (ACEEU) Muenster, Germany. In the project, we comprehensively and separately interpret the role of artificial intelligence in the context of Industry 4.0 and its effects on the economy, legislation, education and lifestyle. The project manager is Dr. Gyula Szabó PhD associate professor, the professional leader is Dr. Csaba Kollár PhD senior research fellow, head of the Artificial Intelligence Workshop, Teréz Hendlein performs project coordinator duties.

The HEDY – Life in the AI Age project aims to prepare higher education participants to recognize and manage artificial intelligence applications and identify their potential uses. In the first phase of the project, we investigated the social impact of artificial intelligence in the five participating countries using the method of literature review and focus group interviews. Based on our results, it is clear that artificial intelligence is fundamentally changing the world of work and, through it, our everyday lives. In the studied areas and locations, without exception, there is great anticipation and interest in artificial intelligence, both among subject matter experts and university students. Similar to the rise of "new and unknown" things, there are conflicting opinions; even experts do not find the desired balance between the promise of productivity and comfort and the fear of defeat and vulnerability.

We are proud to publish the Safety and Security Science Review HEDY – Life in the AI age special issue. Studies in this volume present our snapshots on artificial intelligence in the spring of 2022 from the perspective of the literature, experts and uni-

Liszabon; Bolgár Ergonómiai Társaság, Bulgária, Várna; Universitat Politecnica De Catalunya, Spanyolország, Barcelona; és az Accreditation Council for Entrepreneurial and Engaged Universities (ACEEU) Muenster, Németország. A projektben átfogóan és külön-külön értelmezzük a mesterséges intelligencia szerepét az Ipar 4.0 kontextusában, valamint annak gazdaságra, jogalkotásra, oktatásra és életmódra gyakorolt hatásait. A projekt menedzsere Dr. Szabó Gyula PhD egyetemi docens, szakmai vezetője Dr. Kollár Csaba PhD tudományos főmunkatárs, a Mesterséges Intelligencia Műhely vezetője, Hendlein Teréz a projektkoordinátori feladatokat látja el.

A HEDY – Élet a MI-korban projekt elsődleges célja a felsőoktatásban résztvevőket felkészíteni a mesterséges intelligencia alkalmazások felismerésére, kezelésére, felhasználási lehetőségeik azonosítására. A projekt első szakaszában a mesterséges intelligencia társadalmi hatását a résztvevő öt országban irodalomfeldolgozás és fókuszcsoportos megkérdezéses módszerrel vizsgáltuk. Eredményeink alapján egyértelmű, hogy a mesterséges intelligencia alapjaiban változtatja meg a munka világát és ezen keresztül a mindennapi életünket. A vizsgált területeken és helyszíneken kivétel nélkül nagy a mesterséges intelligenciához köthető várakozás és érdeklődés, a téma szakértői szakértők és az egyetemi hallgatók körében egyaránt. Az „új és ismeretlen" dolgok térnyeréséhez hasonlóan ellentmondásosak vélekedések, és még a téma szakértői sem találják a kívánatos egyensúlyi helyzetet a termelékenység és kényelem ígérete és a legyőzetés és kiszolgáltatottság félelme között.

A kötetben szereplő tanulmányok a mesterséges intelligenciáról 2022 tavaszán készí-

versity students. In the course of the project, we are preparing a booklet, an AI film library and e-learning material, which will be available in the Óbuda University open learning system in English, Spanish, Catalan, Portuguese, German, Bulgarian and Hungarian.

We chose a picture of Hedy Lamarr (1914–2000) for the cover because she was a world-famous Hollywood actress. At the same time, she was the first woman to receive the Inventor Oscar for creating the frequency hopping transmission method that also laid the foundation for developing Bluetooth technology.

On behalf of my fellow editors and the authors, I wish you a pleasant professional-scientific time while reading our special issue!

tett felvételeinket mutatják be a szakirodalom, a szakértők és az egyetemisták szemszögéből. A projekt során szinopszis kiadványt, MI filmtárat és e-learning anyagot készítünk, amely angol, spanyol, katalán, portugál, német, bolgár és magyar nyelven lesz elérhető KMOOC rendszerben. Kutatásunk eredményeként jelenik meg a Biztonságtudományi Szemle HEDY – Élet az MI korában című különszáma is.

Borítónak a világhírű hollywoodi színésznő, Hedy Lamarr (1914–2000) képét választottuk. Ő volt az első nő, aki megkapta a Feltaláló Oscar-díjat a Bluetooth technológia fejlesztését is megalapozó frekvenciaugrásos átviteli módszer megalkotásáért.

Kellemes szakmai-tudományos időtöltést kívánok szerkesztőtársaim és a szerzők nevében különszámunk olvasása közben!

ON THE ROAD TO HUMAN-SCALE ARTIFICIAL INTELLIGENCE, AS SEEN BY OUR EXPERTS

AZ EMBERI LÉPTÉKŰ MESTERSÉGES INTELLIGENCIA FELÉ VEZETŐ ÚTON, AHOGY AZT SZAKÉRTŐINK LÁTJÁK[1,2]

HEITLERNÉ LEHOCZKY, Mária[3] – KOLLÁR, Csaba[4]

Abstract

In our study, we will first present some of the definitions of AI, noting that there is no single definition that is universally accepted, but it is the many definitions that highlight the many readings and uses of AI. In a separate section, we discuss AI on a human scale, which could also be a synonym for ethical AI, since we are convinced that only an ethical approach and its international acceptance by governments, industry and society can guarantee that the human focus will be maintained in the development of technology. In the empirical part of our study, we present the results of two expert studies conducted in the Artificial Intelligence Workshop at Óbuda University, and after presenting and comparatively analysing the opinions of the two groups of experts, we conclude with a short summary.

Absztrakt

Tanulmányunkban először a mesterséges intelligenciával kapcsolatos definíciók közül mutatunk be néhányat azzal a megjegyzéssel, hogy egységes, mindenki által elfogadott definíció nincs, de pont a sokféle definíció világít rá arra, hogy a mesterséges intelligenciának mennyi olvasata és mennyi felhasználási területe van. Külön részben foglalkozunk az emberi léptékű mesterséges intelligenciával, amelyik alapvetően az etikus mesterséges intelligencia szinonimája is lehet, hiszen meggyőződésünk, hogy csak az etikus megközelítés és annak nemzetközi kormányzati, gazdasági és társadalmi elfogadottsága a garancia arra, hogy a technika fejlődésében a humán fókusz megmaradjon. Tanulmányunk empirikus részében az Óbudai Egyetemen működő Mesterséges Intelligencia Műhelyben végzett két szakértői kutatásunk eredményét ismertetjük, majd a két szakértői csoport véleményének bemutatása és komparatív elemzése után egy rövid összefoglalással zárjuk írásművünket.

Keywords

artificial intelligence, ethical AI, foresight, expert interviewing

Kulcsszavak

mesterséges intelligencia, etikus MI, jövőkutatás, szakértői megkérdezés

DEFINITIONS OF ARTIFICIAL INTELLIGENCE

It is difficult to clearly define AI due to diversity of Artificial Intelligence (AI) problems, solutions, distinction of what AI contains and what not. The shortest and simplest definition is: "AI is not biological intelligence" [1]. AI is one of the most life-changing scientific and technological development of the century. There is no universally accepted definition of AI, it is an umbrella term. AI is a science and computational technology that is inspired by the way how people use their nervous system (acquire, store, manipulate, transmit information, learn, reason) and bodies to learn, reason, take actions.

Encyclopedia Britannica defines [2] as "the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of human beings, such as the ability to reason, discover meaning, generalize, or learn from past experience". The Cambridge Academic Content Dictionary [3] compresses in a shorter version: "the use of computer programs that have some of the qualities of the human mind, such as the ability to understand language, recognize pictures, and learn from experience".

Artificial Intelligence (AI), a term coined by John McCarthy in 1955, was defined [4] in 2007 as "the science and engineering of making intelligent machines especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable".

After 1955, several definitions of AI have emerged. In their popular book Russel and Norvig [5] developed a new taxonomy. They examined the definitions of AI according to two dimensions. On one hand, they separate the human-focused conception of the empirical sciences from the rational-focused conception of mathematics and engineering. On the other hand, thought processes, inference, are separated from behavior. Based on the combination of the two aspects, four groups can be formed.

Human approach

(1) systems that think like humans (e.g., cognitive architectures and neural networks);
Thinking Humanly: there is no comprehensive theory of mind yet, but the ultimate goal for the system is to function in a manner similar to human thinking. The interdisciplinary field of cognitive science brings together computer models from AI and experimental techniques from psychology to construct precise and testable theories of the human mind. If the program's input–output behavior matches corresponding human behavior, that is evidence that some of the program's mechanisms could also be operating in humans.

(2) systems that act like humans (e.g., pass the Turing)
Acting Humanly: Turing [6] proposed a test called "The Imitation Game": (Turing-test), which is an operational definition of intelligence. A computer passes the test if a human interrogator, after posing some written questions, cannot tell whether the written responses

come from a person or from a computer. The computer would require to possess following capabilities:

- natural language processing to communicate successfully in a human language;
- knowledge representation to store what it knows or hears;
- automated reasoning to answer questions and to draw new conclusions;
- machine learning to adapt to new circumstances and to detect and extrapolate patterns
- computer vision and speech recognition to perceive the world;
- robotics to manipulate objects and move about.

Ideal approach

(3) systems that think rationally (e.g., logic solvers, inference, and optimization);
Thinking Rationally: a system is rational if it does the "right thing", given what it knows, based on irrefutable reasoning process. The logicist tradition within artificial intelligence hopes to build on such programs to create intelligent systems.

(4) systems that act rationally (e.g., intelligent software agents and embodied robots that achieve goals via perception, planning, reasoning, learning, communicating, decision-making, and acting).
Acting Rationally: computer agents are expected to operate autonomously, perceive their environment, persist over a prolonged time period, adapt to change, create and pursue goals. A rational agent is one that acts so as to achieve the best outcome or, when there is uncertainty, the best expected outcome. All the skills needed for the Turing Test also allow an agent to act rationally. important fact: perfect rationality – always taking the exactly optimal action – is not feasible in complex environments, because the computing needs are too high. The history of AI is dominated by study and construction of the rational agent approach and Russel and Norvig [5] define as the study of agents that receive percepts from the environment and perform actions.

The definition, given by Nilson [7], includes a broad interpretation of the concept of intelligence, not only humans, but animals and some machines are intelligent to variant degrees: „AI is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment."

The definition of AI also differs in documents issued by international organizations.
- European Comission [8]: "AI is a collection of technologies that combine data, algorithms and computing power".
- OECD [9] : "An AI system is a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations, or decisions influencing real or virtual environments." "AI systems are designed to operate with varying levels of autonomy."
- UNESCO [10]: AI is an ensemble of advanced ICTs that enable "machines capable of imitating certain functionalities of human intelligence, including such features

as perception, learning, reasoning, problem solving, language interaction, and even producing creative work"
- Council of Europe [11]: "Artificial intelligence (AI) systems are software (and possibly also hardware) systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behavior by analysing how the environment is affected by their previous actions."

In general terms, AI refers to a broad field of science encompassing not only computer science, if we construe AI as studying how information is acquired, processed, stored, used, etc. in intelligent animals and machines then it obviously overlaps with several older disciplines [12]:
- Philosophy
- Mathematics and statistics
- Economics
- Neuroscience
- Psychology
- Biology and medical science
- Linguistics
- Computer sciences
- Technical sciences
- Safety and security sciences

Nowadays AI trained and focused to perform specific tasks (playing strategic games, language translation, self-driving vehicles, and image recognition, trip planning etc.). This development level of AI called [13] Artificial Narrow Intelligence (ANI) or Weak AI [14]. The next level is General AI (Artificial General Intelligence, or AGI) [13] or strong AI [14] refers to a future, theoretical form of AI system that exhibits apparently intelligent behavior at least as advanced as a person across the full range of cognitive tasks. Artificial Super Intelligence (ASI) [13] – also known as superintelligence – would surpass the intelligence and ability of the human brain.

STEPS TOWARDS THE REALIZATION OF HUMAN-CENTERED MI

AI will radically transform the world, we can already encounter such worrying phenomena, e.g. ethical concerns that may project a dystopian vision. Humanity is facing an existential challenge whose awareness and active struggle can bring about positive change, where cooperation between machines and people results in an utopian world. Tilesch and Hatamleh [15] are urging the development of a new paradigm in which humanity will define its vision, the institutional systems of AI. It is important to keep in mind that it does not serve the interests of a narrow stratum (the profit-oriented, amoral, manipulative use of MI) but places the public good above individual interests. Individual awareness of AI-related

changes is considered necessary. This includes making digital citizenship an integral part of everyday life, encouraging social dialogue about AI. It is considered essential to maintain authentic and quality media and to restore social trust. Three steps [15] are identified for the future implementation of human-faced AI:

1. planning: developing a globally accepted humanistic and actionable vision, harmonizing divergent interests into a normative and regulatory framework. (ethics, credibility, reliability) Regulation based on continuous feedback through impartial, fact-based supervisory institutions.
2. development, dissemination: creation of institutions dealing with research and educational activities in order to solve systemic problems with a multidisciplinary approach, in the form of open research, in accordance with ethical standards. They ensure the global dissemination of AI knowledge through their educational activities.
3. the transformation of humanity's image of itself, the core of a new ideology is conscience and awareness.

We are currently in the planning stage. The OECD Recommendation [16] makes it clear that the role of artificial intelligence can be the key to shaping the future positively, promoting people's welfare as well as subjective well-being, contributing to economic development and the achievement of sustainable goals. All this is accompanied by profound social changes. Five principles have been laid down for the present and the near future can promote an AI-powered crisis management that is trustworthy and respects human-centered and democratic values:

1. Inclusive growth, sustainable development and well-being: AI should help the population global prosper by promoting inclusive growth, sustainable development and prosperity
2. Human-centered values and fairness: AI systems must be designed to comply with legal requirements, human rights and democratic values. They should consider adequate safeguards (such as the possibility of human intervention) for a fair and just society.
3. Transparency and explainability: AI systems need to be transparent, with information disclosed responsibly so that people can understand and challenge MI-based decisions
4. Robustness, security and safety: AI systems must operate in a robust, safe and secure manner throughout their lifetime, and potential hazards must be continuously assessed and managed.
5. Accountability: Organizations or individuals developing, installing and operating AI systems must remain accountable for the proper operation of the systems, in accordance with the above guidelines.

The document also makes recommendations to governments:

1. Investing in AI research and development: Promote public and private investment in R&D by encouraging innovation in reliable AI systems. AI systems must respect privacy as well as data protection and should be free of inappropriate biases.

2. Fostering a digital ecosystem for AI: In order to have a trustworthy AI, governments need to support digital technologies, infrastructures, mechanism of knowledge sharing about AI, i.e. the AI ecosystem.

3. Shaping an enabling policy environment for AI: A regulatory environment needs to be created that paves the way for the deployment and operation of reliable MI systems.

4. Building human capacity and preparing for labor market transformation: People need to be equipped with artificial intelligence skills and all support should be given to workers to ensure a fair transition.

5. International co-operation for trustworthy AI: Cross-border and market-sector co-operation is needed to promote responsible care for reliable MI technologies by governments.

DESCRIPTION OF THE RESEARCH METHOD

Focus group interviewing is a qualitative research method and can be found in sociology, and more broadly in the social sciences, as well as in marketing, advertising, market research, public opinion research and psychology. In the development of the methodology used in this research, and in the processing and evaluation of the results as textual content, the social science foundations were laid by the writings of Cseh-Szombathy and Ferge [17], Earl [18], Krippendorff [19], Horváth and Mitev [20], Gordon and Langmaid [21], Langer [22]. Although our research was not marketing-oriented, we drew on the works of Malhotra [23], Scipione [24], Kollár [25] Vicsek [26] in organizing the focus group and conducting the focus group discussions. In the selection of the members of the two groups (senior and junior), as will be described in detail later, we were considerably more rigorous than the hascholarly selection methods and procedures in order to ensure that the members of the senior group met the requirements of expert selection [27] in all respects, while the junior experts were selected less rigorously, but with the aim of ensuring that the members of the group were found to have a verifiably and factually deeper more thorough knowledge of AI and robotics than the average person of interest, due to their technical and IT knowledge.

The general characteristics of the two groups of experts and the methodological criteria we use are described below. The members of the groups have a variety of self-constructed perceptions of reality, which they share with each other and which they shape and form in themselves through the questions they ask and their interactions with each other. Measurement, quantification of data, is not important except for the very simple demographic group description. Our sampling aims to get a deeper understanding of the experts' views and opinions, and to this end we created an atmosphere both online and in the physical world where our experts could talk informally with each other and with us. The questions we asked in the opening and tuning-in sections also served to create a relaxed, friendly atmosphere. Our analysis was based on "contextualized descriptions and understandings of phenomena" [20: 35 p.].

Following Malhotra [23: 206 p.], we carried out our research according to the following design and implementation steps:

1. Setting objectives and defining the research problem: Artificial Intelligence has been at the center of discourse in almost all fields of science over the last 10-15 years. The results of numerous questionnaire surveys and experiments on artificial intelligence and robotics can be found in scientific journals, and books by theoretical authors, either individually or co-authored, provide a wealth of knowledge for those interested in the subject. However, we felt that there was a lack of recent qualitative research conducted in Hungary, in which experts with a much richer and more profound knowledge than the average share their views on artificial intelligence with each other and, through our study, with the readers, their views on the future of AI, their own role and that of society, what challenges it will face in ten years' time, and whether they see AI as a risk or an opportunity.

2. To define the objectives and methodology of the qualitative research: to explore the current and future opportunities and risks of AI, using a rigorous focus group survey of senior and junior experts, and to identify similarities and differences between the views and positions of the two groups. The comparison of senior and junior opinions also gave us the opportunity to examine the perception of AI between generations (see Part 2 of our paper).

3. Identifying the questions to be answered by the focus groups: for details, see the subsection "Questions and areas covered by each expert group".

4. The screening questionnaire: the screening questionnaire in this study was used to screen the experts [27], i.e. to determine the expectations of the group members who were selected for the senior and junior groups.

5. Construction of the interview guide for the moderators: the interview guide for each group was constructed based on (1) the opening, (2) the tuning, (3) the main questions, and (4) the questions of the interview guide. The opening round and the tuning-in, as described above, contributed to creating a relaxed atmosphere, while the main questions addressed the participants' perceptions of the emerging fields of AI, its current and future potentials and limitations, and its impact on them as experts and on the fields they represent/are familiar with.

6. Conduct of the focus group discussions: see Table 1.

7. Data analysis: the data were analysed separately for the two expert groups and are presented in the subsections "Results of the research" for each expert group in our study.

8. Summary of results: our research results are reported separately for each expert group.

9. Comparative comparison and summary of results: we concluded our study by comparing the results obtained for the two groups.

The general characteristics of the focus group expert discussions are listed in Table 1, based on Gordon and Langmaid [21: pp. 57-58].

Description	Senior Expert Group	Junior Expert Group
Date of the expert discussion	Monday, 21 February 2022, 18:00-20:05	23 February 2022, Wednesday, 10:00-12:15
Location of the expert discussion	Online (Zoom)	Óbuda University, Bánki Donát Faculty of Mechanical and Safety Engineering, Room 306
Duration of the expert interview	125 min	135 min
Demographic characteristics of the participants	1 woman, 7 men min. age: 28 years max. age: 61 years average age: 43 years professionals with tertiary education	3 women, 2 men min. age: 20 years max. age: 28 years average age: 24 years University students (safety engineer)
Number of participants	8 persons	5 persons
Seating arrangements in the room	Participants were able to see each other and the moderators on a monitor, thanks to the interface provided by the Zoom application	On either side of the table, facing each other
Location of respondents and moderators		The two moderators sat on the shorter side of the table
Identity of moderators	Experts in qualitative and quantitative research in online and offline environments are Mária HEITLERNÉ LEHOCZKY (psychologist-economist) and Csaba KOLLÁR (engineer, humanities, PhD in economics).	
Observers, other participants	In order to keep all selected and invited participants active throughout the discussion, we decided to exclude passive participants and observers from the discussion.	
Technical equipment, IT background	Zoom application, not recorded at the request of the participants	Dictaphone, participants contributed to the audio recording

1. Table: General characteristics of focus group interviews with experts [5], own ed.

Introduction of the Senior Expert Group

In selecting senior experts, we followed Kollár's [27] recommendations as follows. The following statements apply to the experts we invited to participate in the online focus group discussion:

- have a higher education qualification
- is a member of at least one professional and scientific organization:
  - Óbuda University Artificial Intelligence Workshop
  - Artificial Intelligence Coalition
  - Communication and Information Science Association Artificial Intelligence Section

- o National Association of Human Resources Professionals
- o Hungarian Military Science Society Electronics, Informatics and Robotics Section
- o Hungarian Academy of Sciences Public Board
- in areas related to artificial intelligence, digital society, human-robot interaction, industry 4.0
    - o have at least 3 papers published in peer-reviewed scientific journals
    - o at least 3 presentations at scientific and professional conferences

In classic focus group interviews, experts are named in the research reports and the resulting studies. The experts we asked did not contribute to this, as many of them work in a public or governmental sector where they would have had to seek permission from the institution before making a statement, and because internal workplace rules require them to express an opinion that reflects the institution's position. Due to time constraints, our experts did not have the opportunity to ask for permission to express their views by name and job title, and it was considered more important to analyse the individual views expressed by the experts than to analyse the position of the organization. 8 experts participated in the online expert focus group discussion, 1 woman and 7 men. The youngest of our senior experts is 28 years old and the oldest is 61 years old, with an average age of 43. The participants in the online focus group interviews have the following higher education qualifications: computer engineer-economist, engineer-economist, computer engineer (2), economist-psychologist, sociologist, engineer, computer scientist. The average number of diplomas per person is 1.75. 3 people have a doctorate (economics, military engineering, security science) and one participant is an expert of the National Association of Human Sciences and one is an expert of the Hungarian Military Science Association.

Introduction of the junior expert group

The core group was made up of students from the Óbuda University, Bánki Donát Faculty of Mechanical and Safety Engineering (students of mechanical engineering, mechatronic engineering and safety engineering). Within the core group, a smaller group was formed, which includes those who took the course "Artificial Intelligence in Engineering", announced by Csaba Kollár, in the spring semester of 2022. Students who have taken the course were invited by email to participate in a focus group discussion on the challenges, opportunities, risks and future of artificial intelligence. We invited 5 full-time students to participate: Dávid BÁRCZI, Rita Bianka BARNA, BAYARAA, Burtejin, Noémi BENKŐ, Zsolt FÁBIÁN. The junior expert focus group consisted of 3 women and 2 men, the youngest participant was 20 years old, the oldest 28 years old, with an average age of 24 years. All five of our junior experts are all students of security engineering with a bachelor's degree in information security specialization. Their previous training included: logistics administrator, fire safety lecturer, medical college, high school, network administrator, mechanical engineer, mechanical engineering technologist, CNC programmer, systems operator.

CONCLUSIONS AND RECOMMENDATIONS BASED ON THE OPINIONS OF SENIOR EXPERTS

The first experience of the majority of the expert group were based on theoretical, cybernetic models, which they are currently using in the field of AI development and education, and thus have a historical overview of the development of AI and are therefore authoritative in estimating future trends. Just as career choices are often based on childhood experience, their experience of films and reading about AI and robots have also played a key role. They also use fiction as a constant source of inspiration in their work, a relatively rare phenomenon among professions. In the future, there will be a growing demand for highly qualified experts and developers, and building on this interest, films and games could be used to orient children towards different areas of storytelling intelligence as a potential career path.

There is no consensus among experts on the definition of artificial intelligence, nor is there a consistent literature, but it is a generic term. The distinction between robots and artificial intelligence has led to two possible scenarios: humanoid/animoid robots competing with humans in a dystopian future, taking over and subjugating humans, but the risk of increased tensions as social inequalities increase was not mentioned. The optimistic view is that robots and artificial intelligence will bring about positive changes in the quality of human life, because human society will be able to use its coping potential constructively.

The difficulty of defining AI is also due to the wide range of its current applications, which experts have listed, while implicitly touching on the issue of social trust: people may become suspicious of technical backgrounds they do not know, fearing misuse and therefore rejecting their use because of the bi-sensitivity deficit. Experts have also raised the impact of the attention economy, the contradiction that "user-friendly" ("attention-grabbing", convenient, fun, requiring little cognitive effort) applications are not necessarily safe, reliable, serving the interests of making a sure profit. In contrast, the return on investment of professional systems is not always guaranteed, and investors are often sceptical about the economics of AI [28].

The complexity of AI makes it challenging for professionals to carry out risk analysis on a horizontal basis, to assess potential threats (mis-programming, external attacks, etc.) and to estimate the extent of the damage. This raises the issue of addressing secondary damage in AI risk assessment, i.e. systematizing errors resulting from human actions and exploring ways to address them, such as algorithm biases, limitations of human cognitive capacity [28].

The techno-pessimistic view of the experts is that the dominance of competitive motives will increase in the foreseeable development, i.e. the acquisition of economic, power and security superiority, which may eclipse ethical aspects, human values and democratic rights, and that people may find their happiness in the meta-world rather than in the physical world. Although a number of international regulations have been put in place to implement AI in a human-centered way (e.g. 193 countries have signed the Ethical AI Agreement in 2021) [29], experts argue that these will not prevent socially dangerous developments, but are not sufficient on their own and that more broad-based action is needed. In addition to civilian applications, they do not consider the unrestricted use of artificial intelligence in defense and national security areas to be permissible, nor do they consider it permissible to override the relevant existing internationally valid rules and agreements on

ethical standards and the destruction of the enemy. Experts consider a broad 'socialisation' of artificial intelligence, education, awareness-raising and education to be key to countering these threats, and to maintaining the social control that will provide the basis for an optimistic vision of the future.

All participants agreed that the transmission of universal human values is essential in the development and education of artificial intelligence and that this is a priority in their work. Although Hungary's Artificial Intelligence Strategy 2020-2030 [30] comprehensively describes the guidelines for preparing society and the expected changes in the labor market, experts believe that we are already lagging behind in anticipating these changes, not only in terms of dissemination, but also in terms of concrete plans and their implementation, especially in measures to deal with the mass unemployment that will arise as a result of robotization and automation, the failure of which could escalate into a social crisis.

FORMULATED ON THE BASIS OF THE OPINIONS OF JUNIOR EXPERTS CONCLUSIONS, RECOMMENDATIONS

The junior experts were university students with a background in artificial intelligence, who, due to their age, had a different experience and time perspective from the senior experts. The emotional impact of the recent childhood film and other experiences with AI was vivid in their minds. The junior experts agreed that the unpredictability of the pace and direction of AI development means that the potential futures range widely. It was felt that if social awareness and pro-activity were to be replaced by a lack of interest and fears shaping people's attitudes, this passivity could make the techno-pessimistic scenario a self-fulfilling prophecy. A distopical vision of the future was a recurring element in their manifestations, which could be a real threat to the shape of their lives. In the social perception of AI, there was unanimous agreement that fear predominates in the middle-aged and elderly, both as a result of media representation and as a natural human reaction to the lack of certainty. Young adults, i.e. their own generation, are not aware of AI, they are uninformed, they are not interested in it, they do not appreciate the dangers, they are vulnerable and have a resigned attitude towards AI. Among children at large, the presence of AI is already a natural part of their socialization and they are not threatened by the use of their data, for example, which is less accepted by older people. Differences in attitudes between generations were also a recurring organizing force in our thinking.

The definition of AI and robots did not result in a unified view among junior experts, as theorists use different definitions, rather as an umbrella term. The need for control over AI was stressed as an essential component, e.g. in the form of an emergency stop button providing security, which could be interpreted as a means of actively coping with the threat and leading to the desired optimistic scenario. The dangers of AI included mass unemployment and the 'awakening of self-awareness' that would result from increasing autonomy as technology developed, and the associated aggression against the human race. In both cases, the fabulous intelligence is transformed from being a subordinate to a rival, rather than a servant of humanity, which today reinforces the trust deficit that goes hand in hand with fear.

The junior experts also use a wide range of artificial intelligence applications [31], some of which they themselves use mostly with their smartphones. Their drawbacks include language and geographic accessibility limitations, but reliability issues have become more

important, for example an application that performs computational tasks and generates erroneous results.

The expected qualitative change in interpersonal relationships based on multidimensional experiences as the boundaries between virtual worlds and physical reality blurred was also highlighted, with mixed views, both positive and negative, expressed by participants. The hope of comfort, security and a happy life defined their hopes, but they also saw the danger of the world becoming boring and "too comfortable". In the world they envision for 2032, they expect, among other things, smart cities, homes and vehicles to operate safely, predictably and with humane choices. In the case of major decisions, responsible human decision-makers and bodies using decision-support systems are still considered acceptable.

In the content of the opinions expressed in the junior group, the psychological needs described by Ryan and Deci in their [32] self-determination theories can be identified from above. According to this theory, three basic needs can be distinguished in humans:

(1) autonomy, i.e. the possibility of free choices and actions, which is threatened by "non-human decision-makers" or "self-aware" master-intelligence competing with the human species;

(2) the need for competence, i.e. a sense of self-efficacy, threatened by the loss of control over artificial intelligence and by "coddling";

(3) the need to connect, i.e. to form relationships based on love and respect, threatened by the multiverse of virtual worlds.

The experts also highlighted the need for human traits in certain applications of AI, such as the need for social and emotional intelligence, or aggression to protect the person in one's care. The latter is particularly important in the case of military AI or the use of robots, e.g. the validity of the rules of military warfare in the case of human-robot or robot-robot combat.

COMPARATIVE ANALYSIS OF THE OPINIONS OF SENIOR AND JUNIOR EXPERTS

Despite their differences in experience and perception, senior and junior experts were similar in many areas.

In both groups, the influence of childhood film and other experiences on career choices can be identified as a background to AI-related careers. Among seniors with a stable career identity, it was complemented by a commitment to their professional work by providing continuous development opportunities and a livelihood. Due to the generational difference between the two groups, juniors approached the issues from a future time perspective, while seniors have a broader view of the past, present and future of AI. Both groups are familiar with a number of AI-based applications, most notably smart homes (domotics), in smart cities, autonomous vehicles, healthcare and pharmaceutical applications, applications in the fields of banking, military, agriculture, environment, education.

Despite the fact that the focus groups were composed of competent experts, there was no consensus on the definition of AI in any of the groups, which is in line with the fact that there are many different definitions in the literature and therefore it can be considered as a generic term. In both groups, the associations were structured around security and convenience, which the juniors defined in emotional terms (good-bad, scary) and the seniors in

rational terms (technical, economic). In the distinction between robots and artificial intelligence, robots were associated with physical embodiment, with both groups having cyber-physical systems at one pole and humanoid/animoid robots at the other, the latter endowed with social, emotional skills. Both groups agreed that media representations of robots and AI are significantly more dystopian, where the existence of the human race is threatened, and therefore the social perception of AI is dominated by negative emotional content, mainly fear.

The experts in the focus groups elaborated on the risks and challenges associated with AI, which covered the following main areas:

- Social distrust: AI is often presented in contexts that pose a threat, can be abused and thus lead to suspicion and rejection.
- Lack of transparency: due to its complexity, it is a challenge for highly skilled and experienced professionals to analyse the risks of practical applications of AI, e.g. to identify potential threats (mis-programming, mis-education, cyber-attacks), to estimate the resulting damage to financial or other resources.
- Bias, discrimination, which reflects systemic errors in human decision-making, e.g. may result from machine learning based on biased data (religion, gender identity).
- The security of information and data becomes less and less guaranteed due to lack of regulation and transparency, the use of data becomes opaque, privacy and human rights may be violated, e.g. social credit systems.
- Artificial intelligence is used for unfair political and economic power purposes, democratic values and human rights are violated.
- Restructuring of the labor market: on the one hand, the replacement of human labor by AI-based technology may lead to mass unemployment due to lack of appropriate retraining. On the other hand, the growing demand for a workforce with the skills needed to develop artificial intelligence could lead to labor shortages, with the emergence of new professions that are not yet known. Labor market restructuring could lead to increased social inequalities and social fragmentation.

According to junior experts, generations have different approaches to AI. The younger a person is, the more accepting and natural it is for them, while older people are distrustful and find it threatening. The experts say that steps and measures to prevent threats cannot be delayed, that adverse phenomena can be controlled today, that the future can be shaped and that professionals must play an active role in this.

Experts are confident that in 10 years' time, AI will be serving the well-being and comfort of mankind, contributing to an improved quality of life, and operating in a humane and ethical way. To this end, the widest possible range of society must be prepared for the expected impact and use of AI. Both groups believe that the boundary between virtual worlds, meta-experiences and physical reality will blur, that the search for happiness will be shifted to the virtual world, that flesh-and-blood human relationships will be replaced by worlds constructed by avatars, and that sensory experiences will be replaced by sensor technology.

A specific area of human-centeredness in AI is warfare, where aggression and the application of traditional rules of warfare raise a number of questions. The seniors approached the issue from the side of regulation: in this field, the introduction of artificial

humanity is necessary, i.e. the possibility of human intervention should always be a given, the counter-attack should not be significantly greater than the strike. Nor can the goal be the total destruction of the opponent, and compliance with the rules and regulations of international law applicable to war must remain a requirement. Rules of war must also be developed for AI-powered devices. The juniors examined the issue from a technical point of view: the use of robotic soldiers was seen as a risk factor in terms of uncontrollability and the technical sophistication that could determine the outcome of war. On the aggressive behavior of robots and AI, the juniors agreed that it could be acceptable to protect human physical integrity, imagining as an example a family robot protecting a child from a burglar, which would switch into defensive mode by the child's physiological reactions.

Both groups expressed the importance of creating ethical artificial intelligence, without which their concerns about a dystopian future are perceived as a real threat. Artificial intelligence is a man-made "creature" that can become a partner or rival in coevolution, living in peace with the human race. The junior experts were more likely to express emotional opinions, while the seniors shared concrete experience and knowledge, thus expressing their views in a more factual and rational way.

A further content analysis aspect for future research, beyond the scope of this paper, could be the investigation of the psychological needs of humans in attitudes towards mastery intelligence. The widely known Maslow's hierarchy of 5 levels of needs can serve as a starting point. Providing for the analysis of physiological needs in the field of production and services, by further developing the processes already in use, can make life more and more comfortable, but a persistent sense of comfort can lead to boredom. Safety needs are focused on the ability of artificial intelligence to be detectable, reliable and to minimize risks and hazards, e.g. the "protective robot". Social robots ("lovable robots") already exist to satisfy the need for belonging and love, and artificial intelligence with human empathy, emotional and social intelligence is filling this role. The need to be valued is satisfied if people retain their autonomy and creativity, thereby gaining the recognition of others, e.g. by taking an active role in the development of AI, or in the work of regulatory bodies, and by lifelong learning to meet the challenges of the labor market. Finally, there is ample scope for self-fulfilment, not only in the metaverse, but also through the creative use of more leisure time in a comfortable life.

Both groups found the focus groups useful to share experiences and opinions, to reflect together, to learn new perspectives and to become aware of the wide range of threats.

SUMMARY THOUGHTS, CONCLUSIONS

Humanity is at a critical stage in the development of artificial intelligence, which has the potential to dramatically improve the quality of human life, but also to realize a dystopian future, as experts have explicitly stated. Sinderman [34] and his colleagues have distinguished five attitudes towards AI, reflecting these two directions: trust in AI, AI will be beneficial for the human race, on the contrary, AI is scary, threatening, will lead to the destruction of the human race, will cause unemployment in many fields. In order to reduce the potential threats, regulatory measures by international organizations (e.g. UNESCO [35], OECD [36], [37]) are not sufficient, action at societal level is needed to protect democratic values and human rights, to increase public welfare and well-being, to enhance personal data and information security. To improve social trust, the ethical development of

intelligent systems must ensure efficiency, transparency, professionalism, define responsibilities and minimize the potential for abuse, as declared by a community of 700 experts [38]. Experts, as stated by Tilesch and Hatamleh [39], call for a globally accepted, feasible vision of human-centred AI, based on universal human values, harmonizing divergent interests, and a unified regulatory framework, but the paradigm shift will only be complete if humanity creates a new worldview based on conscience and trust, thus ensuring the survival of the species.

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EXPERT AND NON-EXPERT PERSPECTIVES ON AI'S IMPACT ON BUSINESS

SZAKÉRTŐI ÉS NEM SZAKÉRTŐI PERSPEKTÍVÁK AZ MI ÜZLETI ÉLETRE GYAKOROLT HATÁSÁRÓL

CASACCIO, Federica[1] – SUKHOVII, Evgeniia[2]

Abstract

With the consolidation of Artificial Intelligence (AI) and its incorporation in the fourth industrial revolution (Industry 4.0), businesses and industries worldwide are now competing to become AI-focused entities. Economic development and growth are intertwined with the strategic development and implementation of AI-driven systems and tools in several sectors including marketing, production and management for an increasing number of entrepreneurial entities. On top of this, it is now undeniable that the actual impact of AI on business is growing at a fast pace, resulting in a series of challenges in terms of technology business regulations, employee's security and companies management. As a result, the current research, which has been conducted within the framework of the Erasmus+ HEDY-Life in the AI Era project, aims to analyse the relation and most importantly the impact of AI on business. In doing so, it dwells on a detailed desk research supported by the remarks made by AI-experts and non-experts during two different focus groups sessions.

Absztrakt

A mesterséges intelligencia (MI) megszilárdulásával és a negyedik ipari forradalomba (Ipar 4.0) való bevonásával a vállalkozások és iparágak világszerte versenyeznek azért, hogy MI-központú entitásokká váljanak. A gazdasági fejlődés és növekedés összefonódik az MI által vezérelt rendszerek és eszközök stratégiai fejlesztésével és bevezetésével számos ágazatban, beleértve a marketinget, a termelést és az egyre több vállalkozói entitás menedzsmentjét. Ráadásul ma már tagadhatatlan, hogy az MI üzleti tevékenységre gyakorolt tényleges hatása gyors ütemben növekszik, ami számos kihívást jelent a technológiai üzleti szabályozás, az alkalmazottak biztonsága és a vállalatirányítás terén. Ennek eredményeként a jelenlegi kutatás, amely az Erasmus+ „HEDY – Élet az MI korában" projekt keretein belül zajlott, az MI üzleti tevékenységre gyakorolt kapcsolatát és legfőképpen hatását kívánja elemezni. Ennek során egy részletes dokumentumelemzésen alapuló kutatásra támaszkodik, amelyet MI szakértők és nem szakértők két különböző fókuszcsoport során tett észrevételei is alátámasztanak.

Keywords

Artificial Intelligence, business, economic development, market, industry

Kulcsszavak

Mesterséges intelligencia, üzleti élet, gazdaságfejlesztés, piac, ipar

[1] casaccio@aceeu.org | ORCID: 0000-0001-5953-1031 | Junior International Project Officer at ACEEU | Junior nemzetközi projektfelelős, ACEEU (Vállalkozói és Elkötelezett Egyetemek Akkreditációs Tanácsa)
[2] sukhovii@aceeu.org | ORCID: 0000-0002-2224-6920 | International Project Assistant at ACEEU (Accreditation Council for Entrepreneurial and Engaged Universities) | Nemzetközi projekt asszisztens, ACEEU (Vállalkozói és Elkötelezett Egyetemek Akkreditációs Tanácsa).

INTRODUCTION

By the 1970s, the finance community and business management information systems acknowledged the value of intelligent hardware and software, which significantly transformed many business operations [10].

Various business sectors have been attempting to determine how different forms of AI can be implemented. For instance, computer-based systems, hybrid systems, intelligent-agent systems have been equally implemented in management processes, planning, and strategy development [7]. This technological advancement, ascribed to AI, has been revolutionizing the living standards of the human, enhancing human-machine interactions, and above all, innovating and modifying the logic of business models.

Business model innovation is a process of altering the core logic of a company's value creation in order to improve customer value and competitiveness. It may encompass changes in the elements of various business models, as well as changes in the interactions among elements or dynamic mechanisms [10].

LITERATURE REVIEW

Current impacts of AI on Business

Considered a key driver of future economic development and growth, AI has become a primary value proposition for an increasing number of new start-ups, particularly around Europe [9]. AI is conquering every industry worldwide and motivating businesses to compete to become AI-focused entities. The competitive business environment has been forcing corporate leaders, entrepreneurs, strategists, and investigators to employ AI to develop new strategies and generate new revenue streams [2].
European Commission [3] indicates that in 2017, 25% of large EU businesses and 10% of small and medium-sized enterprises utilized big data analytics. Only one out of every five small and medium-sized businesses was significantly digitized, and one-third of the workforce still lacks fundamental digital skills.

Meanwhile, the advantages of AI applications are widely acknowledged. According to the 2018 Digital Transformation Scoreboard [3], businesses in the commerce, agri-food and construction sectors that have implemented AI report excellent outcomes in developing products or services, attracting new customers and entering new markets. In the meantime, AI has revolutionized online shopping by anticipating shopping trends based on the products that customers buy and when they buy them. Most major e-commerce companies, such as Amazon, Alibaba, eBay, and others, have implemented AI to offer product recommendations that customers may be interested in, resulting in significant revenue growth [16]. Other sectors dominantly utilizing AI are as follows:

- **Marketing:** Marketing is one of the most advanced fields when it comes to AI. Discussions about AI in marketing include how AI methods can help forecast whether a new customer's future spending will reduce or grow after the initial purchase.
- **Management:** AI is widely used in Human Resources to improve decision making processes integrating technical, human, and organizational systems to achieve an enterprise's strategic success.

- **Production:** AI helps improve the quality of production systems and, as a result, the quality of products. AI also enables the creation of highly personalized goods.
- **Digital (Social) Media:** AI is a crucial component of the popular social media platforms that have become to be used primarily for business purposes. LinkedIn uses artificial intelligence to provide job suggestions, suggest new network opportunities and diverse content [9]

While there is a growing interest among businesses in investing in and incorporating AI into their operations, significant barriers exist at the organizational level that prevent businesses from achieving AI's full potential. These barriers have a direct impact on an organization's capacity to gain access to and use enablers that allow AI. Some of the main barriers worldwide preventing AI applications are lack of clear AI strategy, cultural resistance, lack of talent needed for AI solutions, enterprise size, and budget constraints [2].

Findings show that in Europe, a lack of government financing and venture capital are frequently reported as financial obstacles to AI development, particularly in SMEs and non-tech companies [5]; thus governments have been working to determine and eliminate all the constraints that prevent companies from AI adoption. Yet, the development of AI technologies in Europe means reduced dependency on foreign technologies, which is vital for Europe's strategic autonomy. It also assists in the alignment of AI technologies with European values. Such insights into business technology adoption decisions are essential to guide legislation and guarantee that AI technologies benefit both employers and employees by making the technology trustworthy, simple to use, and useful in day-to-day work [6]

In a nutshell, AI technologies have started to be implemented all around the world and are expected to be integrated at the corporate level in order to realize macroeconomic benefits [14]. In 2019 report revealed by Intellectual Property Organization on AI indicates that the number of research papers in the AI field has increased significantly since 2000, with notable growth in patent applications between 2013 and 2016. Until now, several European countries have been massively funding AI technologies and developing long-term plans to adopt AI applications to a larger extent. Germany, for instance, has recognized its backwardness in the field, thus is preparing to take significant action to become more attractive for German entrepreneurs and researchers who tend to leave the country for better opportunities in the field of AI. Moreover, Germany has spent 500 million euros on AI research over the last 30 years. Currently, the German Research Center for Artificial Intelligence (DFKI) is receiving 77 million euros for machine learning research (2017-2021) and 30 million euros for institutional support (2018 to 2022). AI has been and will continue to be financed — albeit on a much lower scale – through new technology initiatives.

Expected impacts of AI on Business

Many businesses, technology, and industry experts consider artificial intelligence (AI) as a game-changing technology that will alter how we work, live, and communicate. For business and industry leaders, it will be necessary to comprehend and be convinced of the idea that proactive management of technology transitions is not only in the best interests of society as a whole but also in the more narrowly focused financial interests of businesses themselves.

The availability of funding and the amount of AI companies are good indicators of the feasibility of an AI ecosystem [2]. The EU, China, and the United States have all placed a strategic emphasis on fostering the development of AI enterprises through a supportive legislative environment. The current EU start-up environment is broad and dynamic, however, only 10% of digital unicorns are located in Europe. Due to the lack of an adequate venture capital ecosystem, these companies are considered unable to attract significant investment. In this regard, Europe has raised its investment and the commitment to AI research to increase Europe's technological growth potential and catch up with the countries leading the AI race. According to European Commission (2020), implementing an AI ecosystem can bring significant benefits of the technology to the EU and the economy in general. As for business development, innovative products and services can be boosted by AI in areas where Europe excels (machinery, cybersecurity, transportation, farming, the green and circular economy, healthcare, and high-value-added sectors such as fashion and tourism).

While this is the case, in the transformation process, organizations face major and particular obstacles and questions about the future of the business world [8]. The business world is rather skeptical about the rapid pace of technological change and its impacts. Concerns about privacy, ethics, and trust are also present and are expected to rise in the near future. The most common cause of privacy issues is the exposure of personal information; thus, companies strive to set out particular objectives to gain trust. For instance, Google stated that it would not pursue the AI applications that have caused, or are expected to cause, widespread harm and will proceed only if the benefits outweigh the risks, and will include appropriate safety limits if there is a material danger of harm [15].

Privacy and data protection is a major and frequently discussed ethical issue. Although privacy and data protection are not synonymous, for the purposes of AI ethics, informational privacy is the most important privacy concern, and data protection can be thought of as a means to protect informational privacy. AI based on machine learning generates several risks to data protection. On the one hand, it takes immense datasets for training, and access to those datasets can generate data security concerns. The fact that AI and its ability to recognize patterns may raise privacy risks, even when no direct access to personal data is allowed, is more noteworthy and more specific to AI. According to some studies, AI can detect sexual orientation from Facebook friendships, which is a good example. It is easy to understand how AI can be utilized to generate data that raises privacy concerns. AI also has the ability to re-identify anonymized personal data in ways that were not anticipated when machine learning's capabilities were discovered. While most nations have well-established data protection laws, AI has the potential to generate new data protection issues that are not addressed by legislation, raising additional ethical problems. AI could also use or generate sorts of personal data that are now neglected, such as emotional personal data, contributing to the problem [17].

Relatively, some of the current ethical concerns include AI making choices in favour of AI systems, drastic job losses as well as the change in the workforce. Studies predict that AI may transform the concept of the workforce by extinguishing some jobs. The problem of trust is also considered from the perspective of both consumers and employees. Customers may prefer human interaction over AI and building trust in AI technologies may take a while [8].

Conversely, the majority of studies emphasize that when strategically implemented and developed, AI technologies are likely to bring various advantages and impact every business sector for good. Some of the impacts derived from the use of AI algorithms in business are:

- Increase in productivity and cost efficiency,
- Human error reduction,
- Faster business decisions,
- Customer satisfaction,
- Sales maximisation (Soni et al., 2018).

AI-enabled logistics management is expected to forecast product demand by analysing previous sales, geography, buying patterns, and other factors. Every year, retailers all across the world lose money owing to improper inventory planning. The inventory issues will be significantly eliminated through the newly created AI-powered warehouse drones.

Besides, AI's integration into the workplace and daily life will have a substantial impact on digital literacy skills. By analysing speech and search trends and recommending online sources to improve understanding, AI will help more people expand their digital literacy skills (Herdiana, 2013). A research conducted by McKinsey [12] on AI's potential impact on global economic activity underlines the highly potential development of as many new jobs as the number of ones that are being or will be replaced. It is estimated that there will be more available vacancies for engineers, software developers, and ICT professionals in Europe in the near future. According to Deloitte Human Capital Trends [1] report, newly created jobs will be more service-oriented, interpretive, and social, requiring creativity, empathy, communication, and complicated problem-solving skills. As for Accenture research, the AI-driven jobs that will be created are "trainers," explainers" and "sustainers." These new jobs will include training AI systems, guaranteeing that they continue to perform as designed and do not learn the "wrong" thing, and closing the gap between business and technology (Herdiana, 2013).

Finally, AI will be a market trend and a business opportunity during the next decade. It is predicted that it contributes $ 15.7 trillion to global GDP and that this index will be 14 percent higher by 2030 attributable to AI. Analysts predict a 6.6 trillion-dollar gain in production, with a 9.1 trillion dollar increase in consumption. If Europe develops and disseminates AI in accordance with its current assets and digital position in relation to the rest of the world, it may contribute €2.7 trillion, or 20%, to its combined economy output by 2030, resulting in 1.4 percent compound annual growth. This impact would be nearly double that of previous general-purpose technologies which developed countries have adopted in the past [12].

RESEARCH METHODOLOGY

To provide insights about the relation between Artificial Intelligence and business, we have conducted two focus groups with AI experts and non-experts. More specifically, within the framework of the project HEDY, the term "expert" is define as a person who is

partially/very familiar with artificial intelligence, and in particular with its impacts on business.

The focus groups were held in two different sessions and they involved professionals in the AI sectors as AI experts and students enrolled in different universities as non-experts in AI. The two focus groups were recorded on video.

Planning and implementation of the Focus group with AI-experts

The discussion with the AI-experts focus group took place online. The participants had to comply with the following requirements:
- Have a university degree
- Being members of at least one professional scientific organization
- Have been working in areas related to artificial intelligence, digital society, human robot interaction, Industry 4.0 for at least 5 years
- Have given/participated in at least 3 presentations at scientific and professional conferences

Overall, 7 experts participated in the online focus group discussion. The demographic description of the participants can be seen in Table 1.

Gender	Age	Profession	Qualification
7 males	Min. age: 26 years old Max. age: 50 years old Average age: 35 years old	1 analyst/economist, 2 physics engineers 1 engineer-entrepreneur, 1physicist/researcher	PhDs: 2 in Physics 1 in Biomedicine

Table 1.: Demographic description of focus group 1

In Table 2. are collected the questions asked to the participants during the focus group:

Introduction	1. What is your experience with Artificial Intelligence?
Transition	2. Do you have direct experience with AI management?
	3. Based on your expertise, what is the most important benefit and disadvantage that AI can bring to the business environment?
Key questions	4. How do you define AI in your business or business world in general?
	5. According to your expertise, is there currently an impact of AI in your company or other business companies?

Key questions	6. In your expert opinion, how do you expect AI to affect people's way of working and their work environment?
	7. How should AI be developed in the university learning process?
Ending	8. Of all the needs we discussed, which one is most important to you and your business (workplace)?

Table 2.: Questions to focus group 1

AI-Experts: Results analysis

In the introduction part, the experts talked about their first experience with artificial intelligence (AI). Half of them had already a long history with AI and its implementation in their workplaces, businesses and professions. The ones who were not directly working with AI stated that they interact with it every day both intentionally and unintentionally. Most of the experts agreed that everybody who is having smart phones and smart technology directly interact with AI. An example is when people use banking systems, they also use AI unintentionally, or their data is being used in an AI-supported system to enhance the banking network. Experts mentioned banking systems that are implementing AI to analyse data and create opportunities/offers for customers accordingly. They called AI "a revolution" several times and agreed that it can be considered a tool that is changing our daily lives by solving issues and by becoming more common day by day.

When asked about benefits and disadvantages that AI can bring to the business environment, experts mostly agreed on the fact that AI speeds up the tasks, particularly the ones that do not require complex processes and that therefore it reduces simple mistakes while saving time. Some comments given by experts on the benefits and disadvantages of AI included: "We use AI to have sentiment analysis and these all are advantageous. The cost related to these activities can be disadvantageous, as well as finding people who can manage these processes is problematic" and "There are algorithms which are not properly regulated, which can be an issue. I'm also skeptical that AI would not do human errors. But what if the algorithm was trained falsely or with some bias(racism)? In this case AI can do mistakes. So, who is to make the last decision - AI or the human? we don't know how AI comes to a decision. Why whatever decision was made, we don't know. Thus, there needs to be made with effort to make AI systems more explicable to understand why it decides for or against things."

Generally, experts agreed that AI is as fundamental contribution to their business as it reduces the complexity within different situations, it personalizes their products and it saves time. One expert stated that AI are tools that help with specific tasks.

When asked about the current impact of AI on business and their work environment in particular, experts highlighted the changes that AI brought to their work experience. According to them, AI creates differentiation and increases the efficacy in specific field such as the medical one. On the other hand, one expert indicated that AI can also have negative impact as it can make people/employees feel useless and uncomfortable within such an innovative and automated environment.

On a general note, experts expect AI to reduce the complexity even more in the near future, but they also expect it to add new and complex tasks as well as opportunities, which would need to be learned and practiced by humans. The general opinion is that everything depends on the field of work: "AI can open doors for new tasks but in some fields, it can just replace the human labor and reduce the complexity. So, it really depends."

When asked about the AI development in the university learning process, experts agreed that AI has already changed the higher education environment as now everybody can learn new skills individually: "AI is expected to create flexible and personalized education by analysing and detecting students' weak or different points".

Experts underlined that the higher education in general has a crucial role in teaching the technology-based mindset and in providing best practices and real examples from business cases. In their opinion it can bring different and rather innovative teaching methods, which can become one of the advantages.

When concluding, some experts indicated that the most important needs that AI can provide include saving time, shortening tasks, automatization, having the ability to analyse big data more efficiently and reducing the complexity of some field, especially finance and medicine. More specifically, one of the experts highlighted the importance of the ability of AI to enhance the capabilities and perspectives in business, however it was also stated that AI should not replace human capability and decision-making: "Humans are the ones who can distinguish the things in fields like biomedicine. But we can still AI for simple detections. And in larger medical fields it is important to use AI but we should be sure that it is safe and will not cause big errors. Expert knowledge shouldn't be replaced by AI but rather enhanced. It should give recommendations but should not decide. I would prefer AI to enhance what humans can do. We are very far from that point where AI can replace the human knowledge anyway. Plus, it can be dangerous. Also, the responsibility (trolley problem) is another issue to consider when it comes to AI making decisions."

Planning and implementation of the Focus group with AI non-experts

The discussion with the AI non-experts focus group took place online. The participants were university students enrolled in master's degree at the time when the focus group took place. None of the participants had taken part into a focus group survey before.

Table 3 collects the demographic description about the focus group participants:

Gender	Age	Profession	Qualification
3 males 4 females	Min. age: 22 years old Max. age: 30 years old Average age: 24 Years old	7 students	Master's Degree in: Marketing and Sales Mathematics Business Business Engineering Politics/Linguistics

Table 3.: Demographic description of focus group 2

Table 4 collects the questions asked to the participants of the focus group with AI non-experts:

Introduction	1. Have you ever participated in a focus group?
Transition	2. What is your first association with the term artificial intelligence (AI)?
	3. Can you give us an example of an interaction (preferable in the work environment) you think you had with AI?
	4. When you think of AI, what is the most important benefit and advantage that AI can bring to business life?
Key Questions	5. When you heard the term AI management in business what did you think it was?
	6. Do you need AI in your current or future job?
	7. Is there currently an impact of AI in (your) business environment?
	8. In your opinion, how do you expect AI to affect people's business lives?
	9. What is your experience with artificial intelligence?
Ending	10. Of all the needs we discussed, which one is the most important to you?

Table 4.: Questions to focus group 2

AI non-experts: Results analysis

In the beginning, all participants stated that they have never taken part into a focus group before this survey. Most of the participants stated that their first association with the term artificial intelligence was with machines able to perform independently without the need of a human presence and agreed that the general view on AI had been influenced by science fiction.

When asked about which interaction they think they have had with AI, most of the participants mentioned virtual assistants such as general chatbots and Amazon's robots "Earnie and Bert" which are part of Amazon IU development and are generally used to help warehouse workers with packages and deliveries. By the answers provided, it resulted that all participants agreed to have had some sort of interactions with AI, especially when navigating websites and using different platforms (e.g. LinkedIn). In this regard, one of the participants mentioned that they are aware that tools such as Google SEO and more generally marketers have indeed integrated some sort of AI in their systems.

In reference to the benefits and disadvantages that AI bring to business life, most non-AI experts agreed that AI brings benefits such as forming reference models to solve future problems using past data as in the case of finance and providing process optimization in business. Another AI benefit identified during the survey is the support that AI provide to companies and brands in terms of image innovation, individualisation and personalization in order to attract customers. Nonetheless, almost all participants raised concerns about AI. In this context some of the disadvantages that have emerged from the survey include the cost optimization that follows the implementation of certain AI and that results in higher levels of unemployment for humans. The participants reported also concerns concerning AI reliability and their ability to predict human moves (e.g. automatic email composition): "Companies can benefit from AI to innovate their image and it leaves a good impression. Also cost optimization in human resources. It is good for business perspective. But as for CSR and human labour it can be problematic as AI replaces some jobs."

When asked about the meaning of "AI management in business" most participants agreed that it had to do with data collection. On the one hand, some participants highlighted the connection between data collection and decision-making, especially in marketing environments and social media, as AI has the ability to influence users' choices. On the other hand, other participants stated that AI management in business concerns the "infrastructure and different operations of the companies "and the way how they collect and store data, from which AI can learn and improve. Following, non-AI experts were asked to tell whether they need AI in their current/future job. According to most of them, knowing about AI technologies and their use is necessary to be more competitive in today's working context and it will become even more a need in the future. In addition, two among the participants have stated that AI is already visible everywhere such as in public services, higher education, and even governments: "When it comes to needing AI, it is necessary, but we don't need it necessarily. To stay competitive, it is a need for companies but for individuals it is tricky. Too much reliance on it might arise new problems. Like getting a job after having been interviewed with a robot is likely realistic."

Concerning the AI impact on (their) business environment, most participants agreed that AI is creating new types of jobs, but that there is also a shift in the work force where several jobs are being replaced by machines. Non-AI experts working in the educational field highlighted that people are currently studying and that they are getting ready to tech things that are still unknown. However, a participant stated that AI improved the quality of their work in the fashion industry.

When asked about how they expect AI to affect people's business lives, most participants reported that AI will bring several benefits and opportunities (e.g. In the medical sector and in costume care) as it will be integrated more and more into everyone's working life. Despite this, the answers collected show that the participants agreed that human interaction will be still needed and that thinking about the ethical issues related to AI is necessary: "AI cannot be fully implemented as we need interaction and we need to speak with real people. I was also thinking of ethical issues. People need to think about this particular subject. And it is prone to impact society as well as business life."

Towards the end of the survey it was asked to the participants which direct experiences did they have with AI and almost all of them reported that they had some kind of

problems with automated virtual assistants and that only by connecting "with a real person" it was then possible to solve their issues.

In conclusion, non-AI experts were asked to identify which need, among those discussed, was the most important. Most of them reported that AI development should be tested, as it is supposed to make humans life easier by taking care of their tasks, by saving lives and by improving the productivity "instead of making them feel paranoid". Finally, they recommended that education institutes should provide classes for the younger students to learn about AI and technology: "It could be useful to give some AI classes for younger students so they know how to deal with it and know the risks/challenges. We already use it but it is still tricky and we don't reflect on it a lot. Maybe it can be useful to have these courses at school to learn about it more."

CONCLUSIONS

The findings emerged from the two focus groups have provided insightful results about AI and its role in the business environment. From the analysis of the answers provided by the AI experts of Focus Group 1, it is clear that AI technology is already a big part of everyone's daily-life and work. AI has great potential especially when it comes to saving time, facilitating tasks and bringing innovative solutions, especially in field such as medicine, biomedicine and finance. Nonetheless AI experts agreed that AI should not replace human capability and decision-making.

The same consideration was raised by the non-AI experts of the Focus Group 2, who mentioned on several occasions that AI should be approached from an ethical perspective and that human freedom to make decisions should be prevented from being influenced by AI-driven tools. Also, non-AI experts agreed that AI is a type of technology that is spreading in several working environments (e.g. higher institutions, public and governmental offices) and that such trend will increase in the future.

In conclusion, the main recommendation coming from both Focus Groups is the necessity to provide teachings, courses and trainings in schools and higher education institutes to facilitate the use and adoption of AI for young people and future generations.

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APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN PEOPLE & LIFESTYLE BASED ON EDUCATION EXPERIENCE	A MESTERSÉGES INTELLIGENCIA ALKALMAZÁSAI EMBERI KÖRNYEZETBEN ÉS ÉLETMÓDBAN OKTATÁSI TAPASZTALAT ALAPJÁN

DOVRAMADJIEV, Tihomir A.[1] – DIMOVA, Rozalina S.[2] –
PAVLOVA, Diana Y.[3] – FILCHEV, Rusko V.[4]

Abstract

The application of artificial intelligence (AI) in people's daily lives (lifestyle) is becoming more and more tangible. Directly or indirectly, it is present in the life of most modern people who massively use smart devices, computers, and others. They, in turn, use the services of the Internet, where a significant part of the applications in one way or another is connected to certain systems. Some of them have a direct connection with computerized systems, where AI intelligence participates directly or indirectly, but in one way or another collects, selects, and recommends information, activities, services, and others. In the field of education, AI is often already present in school and university curricula. The present study aims to cover the main important points related to the presence of AI in the everyday life of people in general, and concentratedly aimed on experts and non-experts working and developing activities in the fields of education, science, and development academic activity.

Absztrakt

A mesterséges intelligencia (MI) alkalmazása az emberek mindennapi életében (életmódjában) egyre kézzelfoghatóbbá válik. Közvetlenül vagy közvetve jelen van a legtöbb modern ember életében, akik tömegesen használnak intelligens eszközöket, számítógépeket és egyéb eszközöket. Ők pedig az Internet szolgáltatásait veszik igénybe, ahol az alkalmazások jelentős része így vagy úgy kapcsolódik bizonyos rendszerekhez. Némelyikük közvetlen kapcsolatban áll a számítógépes rendszerekkel, ahol az MI közvetlenül vagy közvetve részt vesz, és így vagy úgy információkat, tevékenységeket, szolgáltatásokat és egyebeket gyűjt, válogat és ajánl. Az oktatás területén az MI gyakran már jelen van az iskolai és egyetemi tantervekben. Jelen tanulmány az MI jelenlétével kapcsolatos legfontosabb szempontokat kívánja áttekinteni általánosságban az emberek mindennapi életében, és koncentráltan az oktatás, a tudomány és a fejlesztési tudományos tevékenység területén dolgozó és fejlesztő szakembereket és a nem szakértőket célozza meg.

Keywords

Artificial Intelligence, people, academia, lifestyle, education, science

Kulcsszavak

Mesterséges intelligencia, emberek, akadémia, életmód, oktatás, tudomány

[1] dr.tihomir.dovramadjiev@gmail.com | ORCID: 0000-0003-0734-1345 | BAEHF and TUV Professor (Assoc.) PhD Eng. | egyetemi docens, BAEHF és TUV

[2] rdim@abv.bg | ORCID: 0000-0001-8158-3647 | BAEHF and TUV Professor PhD Eng. | egyetemi tanár, BAEHF és TUV

[3] diana.pavlova@dentaprime.com | ORCID: 0000-0002-0188-1888 | Training and Development Specialist at Dentaprime Dental Clinic | Képzési és fejlesztési szakértő, Dentaprime Fogászati Klinika

[4] rusko.filchev@gmail.com | ORCID: 0000-0001-8795-7048 | DSK Bank Manager | Igazgató, DSK Bank

INTRODUCTION

The areas of application of artificial intelligence (AI) are very diverse [1]. In today's high-tech world, people are confronted with AI in one way or another [2]. Whether they have a deep understanding of the direct link to AI or not, a significant proportion of people already have access to such technologies, or at least handle digital information that accompanies, includes or applies to AI applications related to relevant databases [3, 4]. The fact that the majority of the population has an individual smartphone and/or computer can now be considered a prerequisite for the consumption of certain apps, software and more AI applications [5, 6]. In their normal life, people and in particular consumers (ordinary people's lifestyle or professionals) can interact with the current main types of AI and AI applications, depending on their focus and application [7].

- **AI crucial tasks.** AI is related to the predominance of intellectual analysis.
- **AI based on specific tools.** The difference between this direction and the above is that here AI is designed to be able to solve a larger class of problems.
- **AI according to the developed model of thinking.** AI is characterized according to the developed model of thinking.

Table 1 shows the three main groups of AI with their directions, characteristic of modern society and present in one way or another directly or indirectly in the lives of people and society.

AI crucial tasks	AI based on specific tools	AI according to the developed model of thinking
Machine translation	Artificial neural networks	Search in online space for solution(s)
Automatic forwarding and retrieval of information	Evolutionary calculation	Presentation of knowledge
Speech communication	Pattern recognition	Machine learning
Intelligence of games, proof of theorems and automation of research	Expert systems	
Computer vision	Heuristic programming	
Data mining	Multi-agent approach and etc.	
Writing lyrics and music, etc.		

Table 1: Main groups of AI, typical for the modern technological society)[7]

Aimed at the daily activities of the majority of people, namely consumers (and partially also professional developers) using artificial intelligence is associated with certain priority

applications of AI [7]. Some of the popular implementations of AI (popular in people & lifestyle) are related to activities such as:

- **Computer vision.** This technology processes visual information to extract useful knowledge. It includes many tasks [8]: site discovery; tracking of objects; pattern recognition; segmentation; estimation of the depth of the distance.
- **Biometric identification.** It is widely used. Particularly popular application related to activating access to a particular person's smartphone through biometric fingerprint [9]. Biometric identification systems are many and are varied, such as: face recognition system, iris identification, analysis of the chemical composition of sweat, analysis of the chemical composition of body odor, analysis of microvibration of the fingers and micromovements of the hands, analysis of heart rate and heart size, fingerprints, voice biometrics, gait recognition, user action analysis - stride length, balance and speed, stylometry - keyboard handwriting - recognition of the author's individual handwriting when writing on smartphone or tablet, posture analysis, lip identification, palm vein pattern analysis, DNA test, auricle identification [10]. Biometric identification systems consist of two parts:
    1. Hardware.
    2. Specialized security software.
- **Natural language processing, searching and extracting information from texts.** They are used to generate texts that are almost indistinguishable from human ones in style [11].
- **Voice recognition.** It is widely used in call centers. It is also used in education and in the process of learning foreign languages. There are three types of speech recognition errors that affect speech quality:
    1. Replacement - another word is recognized instead of one;
    2. Insert - there is an additional word as a result of the recognition;
    3. Delete - when the word has not been recognized at all.
- **Speech synthesis.** Includes the following options: Changing the style of speech, generating several voices from one model, generating previously unknown voices, transmitting the intonation by model, adapting to the speaker's voice, and others.
- **Machine vision.** Machine vision is the application of computer vision in industry and manufacturing. They are used for counting objects on a conveyor belt, reading serial numbers, or searching for surface defects. Machine vision technology helps equipment see the production process of something, analyze data and make an informed decision. Modern machines already recognize over 90% of objects, which does not only fix the presence but also determine exactly what they see [12]. Such an example is IBM's PowerAI Vision [13].
- **Machine translation.** Depending on the language pair, the subject area, and, in fact, how similar the data used to train machine translation models is, the quality of the results of the different systems can vary considerably [14].
- **Generating text.** Allows the measure of the quality of language models, for example, by the probability of guessing the next word from the previous context (Perplexity Per Word). For example, Google Brain allows many remote correlations to be effectively taken into account due to the original word position coding scheme

using Fourier transform. This is the general seq2seq architecture used in machine translation [14].

- **Dialog systems (chatbots).** They are related to the interaction between man and vehicle (eg cars, buses, trucks, ships, etc.). By purpose, these systems are divided into three groups of chatbots: general purpose, targeted, and those capable of dialogue. Modern intelligent dialogue systems are complex and differ according to their purpose, being divided into three groups: natural language comprehension module (NLU); dialog manager (DM); Natural Language Generating Module (NLG) [15]. There are three indicators for determining the quality of chatbots:
  1. Consumer indicators. They include: the total number of users, active users, included users, and new users.
  2. Message indicators. They include: call start messages, bot messages, general messages, lost messages, and new calls.
  3. Bot indicators. They include retention level, target completion rate, goal/message completion time, number of failures, and customer satisfaction [14].
- **Tonality analysis.** Through this activity, users can determine the speaker's attitude or emotional reaction. They are divided into three types:
  1. Polarity of tonality. This is the main influencing factor.
  2. Custom models. Defines a specific language or jargon. Popular applications are IBM Watson, Meaning Cloud, and Salesforce Einstein.
  3. Aspect assessment of the tonality. It is determined on the basis of the situation.

PERSPECTIVES ON THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE AND IMPACT ON PEOPLE & LIFESTYLE

Prospects for the development of AI are directly related to the development of computer technology, ICT, electronics, automation, and others [16, 17]. Their application will become more tangible and will be a permanent part of online shopping and commerce (especially during epidemics), healthcare, transport, cybersecurity, and others [18]. AI will turn from a service into a permanent part of people's lives. The change in actual and future people's lifestyles become more and more true, globally the presence of AI is associated with [7].

- Exemption of people from routine activities, replacement or reduction of the intensity of intellectual work in certain professions until complete replacement of specialists from certain professions with intelligent devices;
- Building a digital interactive information technology space where people and thinking machines will collaborate;
- Fully integration of thinking machines such as robots into complex and dangerous places for work, rescue operations and others.
- Making responsible decisions in complex situations and processes;
- Increasing the efficiency of information processing with large volumes of data;
- Improving the quality of assistance in a routine area of everyday life;
- Improving the quality of professional assistance;
- Others.

When talking about AI related to people & lifestyle, we should also take into account the attitude of individuals and different societies on this issue. This refers not only to the purely technical and practical but also to psychological and social aspects, as well as the comfort zone of the individual and others. Generally speaking, it is necessary to take AI into account in people's lives and the necessary ethics [19].

It is clear that Artificial Intelligence is a technology that is evolving along with digitization [20]. People use AI in their daily lives, but they realize that this process of intellectual digitization must be carefully monitored [21]. This requires a responsible attitude from each individual and society.

Many see the impact of AI on humans and lifestyle in increasing human capabilities, but some predict that the growing dependence of people on automated systems will undermine their ability to think independently, take action and communicate effectively with others.

Artificial intelligence has great potential to change a person's life and make it more productive, efficient, and easier. Life will continue to change rapidly and one must be able to adapt to new conditions. Advances in AI will affect what it really means to be human in the 21st century. The changes that AI will bring to life will have positive and negative effects on people's daily lives, as artificial intelligence transforms the world in which we live. Comparing the risks and benefits of what lies ahead is complicated. Here are some of the consequences we need to think about how to deal with, as well as some of the positive effects of artificial intelligence.

Consequences of the implementation of artificial intelligence [22-28].

The positive impact of artificial intelligence on lifestyle:
- Artificial intelligence can improve the efficiency of human work and increase people's free time. If people do work that is more enjoyable for them, it can increase a person's happiness and satisfaction with life.
- AI will present new opportunities and abilities to improve lifestyle, providing technologies and opportunities for people to develop their natural interests and talents.
- With better monitoring and diagnostic capabilities, artificial intelligence can affect healthcare. The potential for personalized treatment plans, for awareness of the person, will change the quality and lifestyle.
- One will gain time and productivity with the introduction of autonomous transport and AI. Without travel to work, people will be able to spend their time in various other ways.
- One will feel more secure. The detection of crimes will increase with artificial intelligence.
- AI virtual assistants who use natural language processing to understand and perform tasks given by people will change lives.
- Automated systems powered by artificial intelligence are changing games and home life.
- AI can keep the family connected and informed with the right data and reduce the mental strain of household management.

- AI will allow for greater individualization, such as training based on human needs and intellectual abilities.
- AI will lead to infrastructure improvements (traffic relief, supply chain improvements, etc.). "

Negative impact of artificial intelligence on lifestyle:
- AI will make the workforce reorient and many people will lose their jobs because of the machines. According to PricewaterhouseCoopers, 7 million existing jobs will be replaced by AI in the UK from 2017-2037, but 7.2 million jobs can be created. Uncertainty and how a person will earn a living are under discussion.
- AI will have economic, legal, political, and regulatory implications that will affect lifestyle. Will people be able to control machines with intelligence in all situations?
- The purpose of AI is to benefit humanity, but whether it will be restricted from crossing ethical or legal boundaries in the work it is designed to do. This is important for the person and his lifestyle.
- Artificial intelligence algorithms are powered by data. This data is collected for each person and the confidentiality of personal information is violated.
- Limiting personal space. The widespread use of AI by large technology companies leads to the destruction of digital privacy.
- Socio-economic inequality. With the disappearance of millions of low-skilled to medium-skilled jobs, the income gap between medium-skilled and high-skilled labour will be huge. According to the UN, "71% of the world's population lives in countries where inequality has risen" and "the share of income that goes to the top 1% of the world's population has increased in 46 of the 57 data countries."

AI raises the question of man's understanding of himself and his freedom. Some people tend to be very conservative because they are not comfortable with technology that takes decisions out of their hands.

The hope is that artificial intelligence will have a more positive than negative impact on humans. He is a model of human activity. Human beings with their will and consciousness remain the source of intentions and the judge of all results. Machines are created to provide ease and efficiency in the journey from intention to an outcome. AI will work to improve human activities and experiences, save time and increase people's life satisfaction.

RESEARCH METHOD AND RESULTS

According to the project HEDY, the task is: "AI People & LifeStyle" two groups were interviewed, (1) experts with professional experience and professors from the Technical University of Varna, (2) non-experts, students at the Technical University of Varna.

FOCUS GROUP WITH EXPERTS

The following statements apply to the experts we invited to the online focus group discussion:
● have a university degree

●their professional status is in areas related to ICT, human-robot interaction, 3D design, and telecommunication networks:
○ working for at least 7 years
○ at least 10 papers published in peer-reviewed scientific journals
○ at least 10 presentations at scientific and professional conferences.
The experts we asked work as professors in the private and public sectors and as professors at the Technical University of Varna.

Demographic description of the expert focus group
women: 2 persons; men: 4 persons; min. age: 29 years; max. age: 59 years; average age: 44 years
Qualifications: computer engineer, telecommunication engineer (3 persons), computer scientist, a mechanical engineer. PhDs: 6

The questions asked to the expert focus group are shown in Table 2.

CATEGORY	N:	QUESTIONS
Introduction	1	What is your experience with artificial intelligence?
Transition	2	Do you have direct experience with AI management?
Key	3	When you think of AI, what is the most important benefit that AI can bring to humanity? And the disadvantage?
	4	How do you define AI in your lifestyle? (people & lifestyle)
	5	Is there currently an impact of AI in your lifestyle?
	6	In your opinion, how do you expect AI to affect people's daily lives?
	7	How should AI be developed in the university learning process?
End	8	Of all the needs we discussed, which one is most important to you?

Table 2: Questions asked to the expert focus group

Content analysis of the expert focus group interview
        All of the experts interviewed are professors or external lecturers at higher education institutions and also participate as trainers in the private sector. The experience of the participants in artificial intelligence is professional. In their professional activity, they use it in teaching, 3D design, information, and communication networks as engineers.
Regarding their opinion on the most important benefit that AI can bring to humanity, they believe that there are many benefits from it. Priority is given to the storage of huge databases, which through appropriate algorithms can be used in AI applications. AI also auto-

mates complex processes that keep users active, as well as save time, and increase productivity in conditions of limited resources. AI can replace people working in hazardous areas. It helps a person with information and replaces the person physically in dangerous activities. The disadvantages are different. The main is the possible loss of control over AI by humans. There is a lack of information and research on how much AI can be controlled. Dangerous is human stupidity, which limits the functions of the brain, as well as inaction. Limited human thinking and lack of self-development can lead to human dependence on the presence of artificial intelligence, which leads to a decline in the development of human beings.

Asked how they define AI in their lifestyle, experts define it as good at this stage. They see its development as a means of transparency of certain processes and speed of decision-making. There is also a negative effect – the majority of society has focused entirely on AI, and other major trends and fundamentals in people's lives are ignored. People lose their sense of true values in life. AI attracts and directs the attention of people in areas where someone blames them, rather than pointing their attention to personal self-development. Makes people more dependent on advertising and external influences. This separates them from the tranquility of life with nature.

Currently, the influence of AI on their lifestyle is partial (professionally and as a consumer). AI is not so well implemented at the moment. When surfing the Internet, they use it through the ads it generates. In the future, they expect AI to affect people's daily lives, depending on the control of the people who run these systems, as well as their permissible application in society. Some professions will disappear.

AI will make people addicted. This will make them lazier and will rely on their intellect rather than their natural intellect. This will make their lives easier, but also deprive them of social communications and closeness between people. The lie will disappear because of the transparency of public information. In some cases, this will have a positive effect (for people who understand or have an idea of AI), and in cases where people are not aware of AI (have superficial information about AI from the Internet, television, etc.), it is likely to have a negative impact.

The discussion was about how AI should be developed in the process of studying at the university. The comment was that the education system and universities, in particular, need to adapt to current global trends, where AI will expand its presence. Students must have personal knowledge as well as some professional skills related to AI.

It is important to learn from people so that they do not accept artificial messages as reality. AI should be presented in the learning process, but only with the presumption that students will continue research (engineering) work in this field.

Of all the needs that were discussed, the most important for the experts was to have control over AI and ethical standards. Important are the technical aspects of AI – high-speed decision-making and transparency for society, the role as a human supporter. It's important to replace the person in dangerous activities and as a source of information is an important application of AI, as well as the control and automation of processes that a person neglects during his dynamic daily life.

FOCUS GROUP WITH NON-EXPERTS

The focus group consists of students of Industrial Design and Safety Engineering at the Technical University of Varna. We have formed a group of students who have taken

course "3D design". Students who have taken the course have been invited to participate in a focus group discussion on the challenges, opportunities, risks, and future of artificial intelligence. 15 full-time students responded to our invitation.

Demographic description of the focus group
women: 11; men: 4; min. age: 20; max. age: 24; average age: 22

Questions asked to the student focus group are shown in Table 3.

CATEGORY	N:	QUESTIONS
Opening	1	Tell us your name and place of employment or employment status if any.
Introduction	2	Have you ever participated in a Focus Group?
Transition	3	What is your first association with the term Artificial Intelligence?
	4	Can you give us an example of an interaction you have had with AI?
Key	5	When you think about AI, what is the most important advantage AI can bring to humanity?
	6	Do you see any risk related to the adoption of AI on a large scale in the future?
	7	There are some concerns about the possibility that AI may "robot-ize" humanity, do you have an opinion on that?
	8	When you heard the term AI governance… what do you think it is?
	9	Do you think it should be a legal framework to regulate AI or it needs to be as open as possible?
End	10	What do you think is the missing information about AI? I mean, if you want to get insight into AI, what do you like to learn?

Table 3: Questions asked to the student focus group

Analysis of the content of the discussion in the focus group

The members of the focus group said that they have no experience with artificial intelligence and their first association with the term is the use of sound commands in the smartphone - Siri Voice Assistant on iPhone and this helps them in everyday life. They associate it with an algorithm, the inclusion of many technologies, hard work, and art. For some, it is a maintenance tool/program designed to maintain already established knowledge, a group of instructions that change in real-time according to input parameters. AI is a program that evolves over time and recognizes objects in the video cameras of smart devices, as well as optimizes the operation of the devices through the data collected by them, which

are subsequently analyzed and optimized by AI. Artificial intelligence is the intelligence demonstrated by computers, it is also the science of concepts in computer science that makes computers capable of performing tasks that can be considered intelligent. AI is convenience, automation, a robot, or a robotic object.

We asked them to give us an example of the interaction they think they had with AI. The answers were Siri or another voice assistant. 30% say they do not have such an interaction. They include Google and nVidia forecasting machines, Google Assistant and site cookies, hacking attacks, sculpting programs, various online communication systems such as chatbots, and a robotic vacuum cleaner.

About what is the most important benefit that AI can bring to humanity and what are the disadvantages, they believe that there are many advantages, but so far more disadvantages. Helps a person in everyday life, but facilitation would lead to habituation. If people use AI in more difficult situations and if one does not have AI, a person can panic. There are possibilities for mistakes - if there are sound commands and the person does not have good diction (or AI is not tuned to the speech of that particular person), errors can occur.

The benefit is for industrial automation, to develop the economy, huge calculated power in real-time. The advantage is that some unpleasant and dangerous tasks that people perform at work will be automated, bringing convenience, and saving time in which a person can develop in another direction. In this hectic daily life, he can do housework for us, such as cleaning. The disadvantage is that the emotion is exhausted, a person can get used to AI and this can affect his health - desocialization. Global job losses are also possible - with the collapse of the economy we are seeing, people will lose their jobs. Artificial intelligence aims to completely replace human actions that are not considered completely normal, leading to the devaluation of human labor in the middle statistical sector. certain goals, ie the performance of some machines will be optimized. There may be less and less need for human precision at the expense of machines, but it is possible that there will be a bug in the system.

Answering whether they have heard of AI control and what they mean by that, they say they have heard the term and believe that it is controlled using artificial intelligence, complex process automation, or a stand-alone automotive robot in production. Some believe that AI management is the work done by artificial intelligence, real-time management scripts, or a mobile network, such as AI network management. They associate this with car manufacturing robots and a camera that needs to take clearer pictures at night. For them, the management of AI is primarily a substitute for human resources, a program that manages mostly alone, studying the process. It is a computerized control and automatic service system, using a huge database of possible situations, which takes us through a service based on constant criteria and requirements, based on our specific desires for certain parameters. The work of individual researchers and the solution of specific tasks leads to differences in the approach to building artificial intelligence, as well as the use of completely different, sometimes incompatible technical means. They don't remember where they first heard of the term.

When asked if they need artificial intelligence in their lifestyle, it became clear that about 40% answered yes, 25% said they do not see the need, and others - to some extent, can do without AI, but do not see any problem with it and to use it. The answer is that it

would be useful to automate some commonly used services, for example, much of the bureaucracy.

When commenting on the current impact of AI on their lifestyle, students felt it was relative. It is primarily through the phone or computer. The presence of such automation gives them more convenience, especially when physical actions are slow and/or incompetent. They emphasize the use of AI in sites that select and offer products in the ads that interest us. They have a negative impact on filtering spam information created by AI. One-third believe that AI has not yet affected them.

According to them, they expect AI to affect people's daily lives in different ways, but above all successfully. The impact will be bipolar - younger people will adapt more easily and quickly to automated systems, and older people will find it increasingly difficult to keep their skills and knowledge of working with them up to date. The impact of AI will be more intense in the future. AI will give people more time for themselves. It can make life easier to some extent, for example, it will be useful for people with disabilities or people with diseases, and it can make life easier for them and their loved ones (if they are not alone). Some students expect it to have a negative impact on humanity. So far, technology is weak, but it will intensify in the near future, especially in marketing techniques. The social impact will be positive, but the economic one will be negative.

For better or worse, AI definitely has and will have an increasing share in our daily lives in the future, based on the path of development we have generally chosen directly or indirectly. So it is good to have professionally trained staff in this line of thinking. However, it is desirable that people are familiar with the mechanical implementation of processes that are automated. It would be good to have an elective discipline to teach.

Finally, there was a discussion about what was important to them. The answers were: the disadvantages of AI; to study AI in the learning process so that more people know what it is and what it is used for; possible dangers; automation for people who need extra care. The opinion was expressed that it is important to emphasize that it is good for factories or similar, but that we need to pay more attention to people who need help in their daily life. The interaction and help of artificial intelligence for man are important. It saves time from the same recurring obligations to use some services, for example. As well as AI gives a lower probability of errors, assuming that automation can offer it. However, these processes should definitely be monitored by informed and trained staff. AI is also important for improving the learning process. The study of the possibilities for creating such programs or devices, called intelligent agents, is the subject of a separate section of computer science. Optimizing AI performance and practical application were also of interest.

CONCLUSION

The present study presents in a compact form significant applications of artificial intelligence in people's daily lives. In a systematized form, priority areas of the presence of artificial intelligence are presented, where it directly or indirectly affects the way of life. Concentrating directly on the academy, education, and science, a study is carried out on the significance, presence, and necessity of artificial intelligence, referring to university experts and regular students.

ACKNOWLEDGMENTS

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ARTIFICIAL INTELLIGENCE IN GOVERNANCE: EXPERTS AND NON-EXPERTS PERSPECTIVES | MESTERSÉGES INTELLIGENCIA A KORMÁNYZÁSBAN: SZAKÉRTŐK ÉS NEM SZAKÉRTŐK NÉZŐPONTJAI

ANGULO BAHÓN, Cecilio[1] – CAREGLIO, Davide[2] –
DOMÈNECH ARGEMÍ, Miquel[3] – HERNANDO PERICAS, Francisco Javier[4] –
SOLÉ PARETA, Josep[5] – VALLÈS-PERIS, Núria[6]

Abstract

Artificial Intelligence (AI) is today part of our lives as a powerful tool for life easiness. However, AI is not always an easy question and concern, especially when applied in governance issues regulating our lives, jobs, or social relationships. In the context of the Erasmus+ project HEDY - Life in the AI era, two focus groups have been conducted to discuss with experts and non-experts in AI the challenges, opportunities, risks, and expected impacts of AI in governance in our society. The main objective is to collect opinions and questions, concerns and debated ideas from different social actors, thus broadening the current debates in the academic literature.

Absztrakt

A mesterséges intelligencia (MI) életünk része, mint annak megkönnyítésének hatékony eszköze. Az MI azonban nem mindig egyszerű kérdés és fogalom, ha az életünket, munkánkat vagy társadalmi kapcsolatainkat szabályozó kormányzási kérdésekben alkalmazzák. Az Erasmus+ projekt HEDY – Élet a mesterséges intelligencia korszakában keretében két fókuszcsoportot szerveztünk, hogy megvitassuk a mesterséges intelligencia szakértőivel és nem-szakértőivel a mesterséges intelligencia kihívásait, lehetőségeit, kockázatait és várható hatásait a társadalmunk kormányzásában. A fő cél az, hogy összegyűjtsük a különböző társadalmi szereplők véleményét és kérdéseit, aggályait és vitatott gondolatait, kiszélesítve ezzel a szakirodalom aktuális vitáit.

Keywords

Artificial intelligence, governance, focus group, qualitative research

Kulcsszavak

Mesterséges intelligencia, kormányzás, fókuszcsoport, kvalitatív kutatás.

[1] cecilio.angulo@upc.edu | ORCID: 0000-0001-9589-8199 | full professor, IDEAI, Universitat Politècnica de Catalunya (UPC) | egyetemi tanár, IDEAI, Katalóniai Politechnikai Egyetem
[2] davide.careglio@upc.edu | ORCID: 0000-0002-7931-8147 | associate professor, IDEAI, UPC | egyetemi docens, IDEAI, Katalóniai Politechnikai Egyetem
[3] Miquel.Domenech@uab.cat | ORCID: 0000-0003-2854-3659 | full professor, Barcelona Science and Technology Studies Group (STS-b), Universitat Autònoma de Barcelona | egyetemi tanár, Barcelonai Tudományos és Technológiai Tanulmányok Csoportja, Barcelonai Autonóm Egyetem
[4] javier.hernando@upc.edu | ORCID: 0000-0002-1730-8154 | full professor, IDEAI, UPC | egyetemi tanár, IDEAI, Katalóniai Politechnikai Egyetem
[5] josep.sole@upc.edu | ORCID: 0000-0002-9411-6308 | full professor, IDEAI, UPC | egyetemi tanár, IDEAI, Katalóniai Politechnikai Egyetem
[6] nuria.valles.peris@upc.edu | ORCID: 0000-0003-4150-761X | postdoctoral researcher, IDEAI, UPC | posztdoktori kutató, IDEAI, Katalóniai Politechnikai Egyetem

INTRODUCTION

Artificial Intelligence (AI) is today part of our lives. We can be aware of its presence and interact with it for instance when we ask Siri to find a restaurant for us. But, in many other aspects, we are not fully conscious that AI is also there: for example, financial institutes leverage AI to identify potentially fraudulent activities in our accounts; AIs are used to track and predict environmental impacts in farm fields using data from satellite scanning and monitoring of crop and soil health; AI has become the main way that companies keep us safe from cyber-attacks. Those are only few examples and, according to several studies, the Covid-19 epidemic has expedited the adoption of AI throughout all sectors of the economy [1].

Nonetheless, AI is not all puppy dogs and rainbows. Many academics point out that the way AI tools are produced must change due to limitations in collaboration and inaccurate data assumptions, such as the unreasonable expectations that drive the usage of AI systems not robust enough. For example, inaction on AI prejudice has resulted in many injustices against entire groups of people, racial profiling, and other disturbing incidents. Deepfakes and the ability to create realistic videos, pictures, text, speech and other form of (social) communication have raised many ethical and legal concerns lately about the use of AI and its capability of manipulating human perceptions. In cybersecurity, bad actors have also access to AI tools, so the cat-and-mouse game continues. Video surveillance based on AI to recognise persons through their face, speech, walk or movement have also raised some concerns regarding privacy. The Amazon Alexa has recently suggested to a 10-year-olf girl to touch live plug with penny after the girl asked for a challenge to do [2].

In this scenario of pros and cons when dealing with AI, the implementation of a *governance* becomes fundamental. Governance refers to all governmental procedures: the formation, maintenance, and regulation of rules or activities, as well as the assignment of accountability. It is usually a collective problem done by the government of a state, by a market, or by a network [3]. In a nutshell, AI governance should close the gap that exists between accountability and ethics in technological advancement [4] and make sure that reliable boundaries within technology are set, so it does no harm and further aggravate inequalities incidentally while it operates.

In the context of the Erasmus+ project HEDY - Life in the AI era [5], two focus groups have been conducted to discuss with experts and non-experts in AI the challenges, opportunities, risks, and expected impacts of AI governance in our society. The objective is to collect opinions and questions, concerns and debated ideas from different social actors, thus broadening the current debates in the literature. This work summarises the outcomes of these focus groups.

The rest of the paper is organised as follows. Section 2 introduces the AI governance and its principles. Section 3 describes the adopted methodology adopted for the conduction of the focus groups. Section 4 presents the main findings and highlights the key ideas of the focus groups. Section 5 concludes the paper.

AI IN GOVERNANCE VS AI GOVERNANCE

When AI is included in the term governance, two different interpretations can be found: i) The use of systems based on AI in the governance, meaning the adoption of AI in

service provision, policy-making, and enforcement in government practices and public-sector ecosystems [6]; ii) The governance of the AI, meaning the promotion of a proper institutional and legal framework for the development and use of AI [7].

Despite both are considering different topics, it is not possible to maintain a discussion about AI in governance without considering AI governance, because they work as communicating vessels. Thus, governance is understood here in reference to what is known as "AI governance", an idea composed of three components related to: a) the infrastructure - obtaining, storing and processing data; b) the application - the management of data; c) the utilisation – the decision-making and evaluation processes based on data.

Many other definitions can be found in the literature. For instance, AI governance is referred as "*a variety of tools, solutions, and levers that influence AI development and applications*" in [8], as "*the structure of rules, practices, and processes used to ensure that the organisation's AI technology sustains and extends the organisation's strategies and objectives*" in [9], as "*a set of processes, procedures, cultures and values designed to ensure the highest standards of behaviour*" in [10]. Probably, the most complete definition is available in [11], standing that "*AI governance is a system of rules, practices, processes, and technological tools that are employed to ensure an organization's use of AI technologies aligns with the organization's strategies, objectives, and values; fulfils legal requirements; and meets principles of ethical AI followed by the organization*".

Nonetheless, to be effective and provide the correct trade-off between company's strategies and objectives, legal requirements and ethics, many actors work on identify the main principles. For instance, Harvard University [12] created a visualisation map of 32 sets of AI principles. KPMG [13] provides four guideposts to help organizations ensure the proper governance of algorithms. Google [7] highlights five specific areas where precise, context-specific guidance from governments and civil society would help to advance the legal and ethical development of AI. In our work, a set of six AI principles are considered for AI in governance which are functionally algorithm-agnostic, technology-agnostic and sector-agnostic:

- **Accountability** requires a clear identification of who hold responsibility for decisions and actions when designing, developing, operating, and/or deploying AI system. It must be people or organizations that are ultimately accountable for the acts of AI systems, no matter how complex the AI system is.
- **Transparency** regards the ability to explain why an AI system behaves in a certain way in order to boost people's confidence and trust in the accuracy and appropriateness of its predictions.
- **Fairness** must ensure that AI systems are ethical, free from bias, free from prejudice and that protected attributes are not being used.
- **Safety** regards taking measures against both inadvertent and intentional abuse of AI that poses a threat to humans.
- **Human control** means that people need to be in one or more points in the decision-making process of an otherwise automated system.
- **Universality** principle recommends the definition and application of technical, clinical, ethical and regulatory standards during algorithm development, evaluation and deployment in order to have interoperability, cooperation and given level of quality, safety and trust.

Proactive governance measures are becoming more widely recognized as a differentiating feature for firms seeking to establish a reputation for trustworthiness. There are a number of worldwide frameworks on AI governance and ethics concepts. European Union issued the General Data Protection Regulation (GDPR) which includes a special set of rules that relate to a consumer's right to explanation when corporations employ algorithms to make automated choices. Nonetheless, it attracted also some controversial as does not afford a right to explanation of automated decision-making [14]. In this regard, the EU is likely to be the first to enact AI regulatory legislation [15]. The Algorithmic Accountability Act [16] in the US requires major companies with access to large amounts of data to audit AI-powered systems for fairness, privacy, accuracy, and security risks. A notable initiative is the Singapore AI Governance Framework. It is the first model developed in Asia and its strength is that it translates principles into a practical, operational framework for immediate action, decreasing the entry barriers to AI adoption. This framework is based on two factors: i) AI solutions should be human-centric, and ii) decisions made or assisted by AI should be transparent, explainable and fair.

METHODOLOGY

A focus group is a type of qualitative technique of data collection, in which a group of people, guided by a moderator, have a conversation and discuss around a common topic. It normally consists of a group of 7-9 persons who do not know one another. These individuals are chosen because they have particular traits that are relevant to the focus group's subject. By fostering a tolerant and caring environment that fosters many perspectives and points of view, without pressing members to attain consensus, the moderator uses the group and its interaction to learn more about a particular subject [17].

In our case, the subject under study is AI in general and AI governance in particular. In order to gather different opinions and contrasted ideas, during February 2022, we prepared and conducted two different focus groups: one focus group with only experts in AI and one focus group with only non-experts in AI.

For the case of experts in AI, 9 persons (7 males, 2 females) aged 35-70 years attended the focus group. We define the term expert as a person with a university degree, working for at least 5 years in the area of AI, digital society, human-robotic interaction or Industry 4.0, and at least 3 published scientific or professional articles.

For the case of non-experts in AI, 10 persons (7 males, 3 females), aged 22-70 years attended. These persons had no previous knowledge on AI and came from different sectors of the civil society, but with personal interest in technology advancements.

It is clear that this methodology has some limitations. Firstly, it is an analysis whose conclusions make it possible to identify the different interpretations and arguments socially available on an issue, but unlike quantitative analysis, its conclusions are not representative, but significant. Moreover, there exists the limitation of the heterogeneity of the focus groups since most of the experts were academics and the non-experts had a university degree; hence the outcomes may not represent the general population's views on the topic. However, it is worth mentioning that we contrasted people's opinions with the available literature and vice versa, so our findings are valuable and other similar works are likely to reach the same conclusions.

RESULTS OF THE FOCUS GROUPS

Structuring and mapping the topics

The structure of this article follows the structure of identified topics during the analysis of focus groups on the use of AI systems in governance. The content of the term discussion during the sessions has been analysed using the qualitative methodology of the Thematic Analysis (TA). TA is a qualitative method to identify, analyse and explain patterns (or fears) in data. It organizes and describes them in detail and also aims to interpret some aspect of the research topic. It is flexible in the theoretical approach, it is not associated with data processing technology and it is useful for analysing data generated through various techniques: interviews, focus groups, case studies, documentary texts.

As explained in [18], the TA depends on a series of decisions about the method. In the current phase of the research, due to the analysis of the topics for both focus groups, decisions taken about the method have been made based on the relevance in relation to the research question, not based on the prevalence or space in the discussion. In this way, the selected topics for articulating the identification of priority questions for citizens in the use of AI systems in governance have been organized into systems and a series of sub-topics, such as those shown in the scheme in Fig. 1.
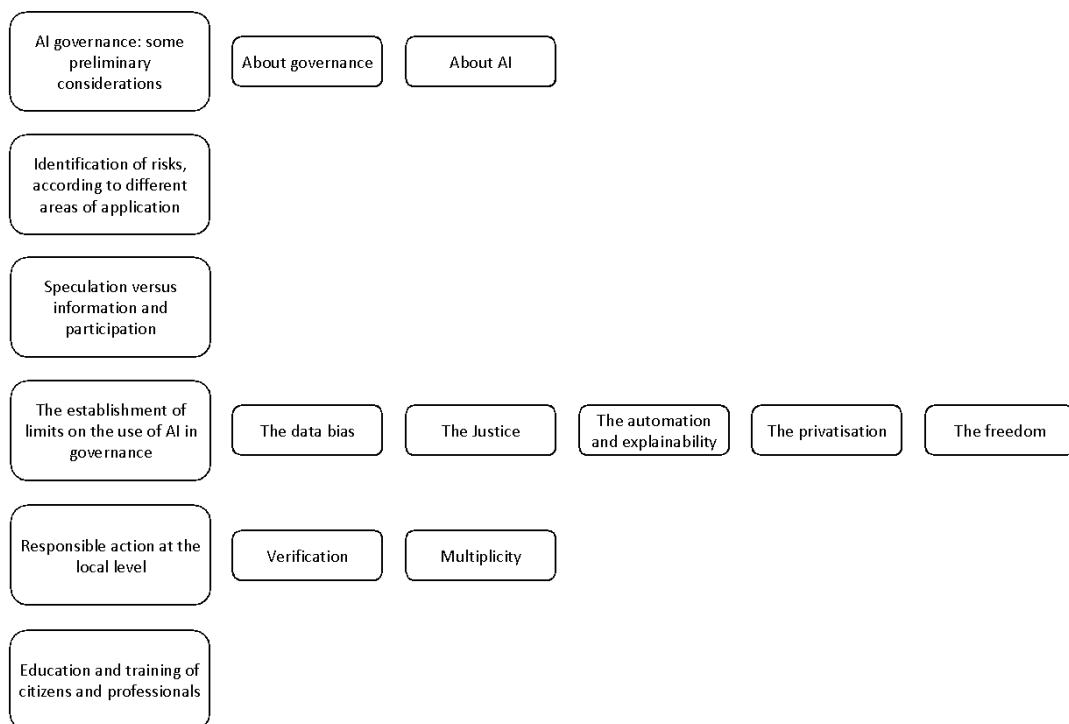

Figure 1.: Mapping of topics that have articulated the debate of the use of AI in governance

Some preliminary considerations

Prior to the analysis of the criteria that would guide the use of AI systems in governance, some general considerations should be introduced in order to contextualize the debate. These considerations refer to the very notions of "governance" and "artificial intelligence" that are going to mobilize the majority of focus groups.

- **About governance**: throughout the focus group, a definition of what is meant by the use of AI in governance has not been articulated. Therefore, a broad definition has been assumed that refers to the use of AI-based systems in decision-making processes, whether governmental, global or private.
- **About AI**: AI is conceived in two different ways in both focus groups:
  a) **Restrictive vision**: AI is another technology and, therefore, it can be treated as any other technology.

"AI is technology and a technology is not for everything, it is for what it is".
Participant in the expert focus group

  b) **Disruptive vision**: AI is a different technology, which marks a turning point in human society and the relationship between technologies.

"It has come to change society and we will not be able to go back".
Participant in the expert focus group

These two ways of conceiving AI appeared alternately at the end of the debate, allowing the focus of attention to be placed on different problems and proposals. Therefore, it is considered that, even though the apparently restrictive and disruptive vision is understood as contradictory, in fact they are complementary visions that make it possible to cope with the complexities of opinions, concerns and proposals regarding the use of AI systems in the governance.

Identification of risks, according to different areas of application

From a restrictive point of view of AI, the dilemmas posed by this issue are limited and solved by establishing a very clear line as to why AI can be used or not. In this sense, it is considered that AI can be very useful for data management and analysis, or for information support for decision making and evaluation, but instead should not be used to make automated decisions. In this sense, it is considered that those decisions that directly affect people must be made by people.

In contrast, from a disruptive view of AI, in contemporary societies any form of governance integrates or will integrate AI. This ability of AI to be used in decision-making processes is applicable to several areas. It is in these specific areas that the risks of using AI systems need to be assessed. At the end of the focus groups, there has been a discussion especially about the risks in the business, communication or medical field.

- In the **business** field: The risk is related to finding a balance between the economic interests of companies and the non-violation of the rights of citizens in matters related to privacy and individual freedom.

- In the **communication** field: It refers to the proliferation of fake news or the aggravation of certain harmful behaviours for young people. In this sense, special attention is paid to the "loop" mechanism of social networks, which provide content and information related to the history of searches and interests expressed by users in their use of social networks. A group that is considered particularly vulnerable in this regard are young people and children, who are highly influenced by this "loop" effect of communication made possible by AI-based systems.
- In the **health** field: This is an area in which AI is considered as a technology that enables an intense improvement in diagnostic processes, an area in which benefits are preferred to risks.

Speculation versus information and participation

A shared concern, which is mostly associated with a restrictive view of AI, and which appears both explicitly and implicitly throughout the focus groups, is related with the relationship of AI systems to science fiction imaginaries and with the idea that AI can solve all problems of any kind. Many applications have been developed in the field of AI, and they can be applied to many fields, but there is a significant gap between the current technical capabilities and functionalities and the narrative about what AI could do in the future.

This type of narrative around AI, which does not correspond to current developments, is considered to have two types of negative effects:

a) On the one hand, the difficulty in articulating a contrasted public debate on responsibility when forms of AI are used in the decision-making process and;

b) On the other hand, the emergence of a series of catastrophic imaginaries that generate reluctance towards AI among public opinion and citizens.

In order to avoid this type of narrative and its effects, actions related to information and citizen participation are proposed:

- **Information**: Ensure that the mass media report in an ethical and honest manner when talking about AI systems, which allows a clear differentiation between speculative futuristic visions and current developments and possibilities. Develop an educational task that allows citizens to learn how AI works and what applications are being developed.
- **Participation**: Involve citizens in the establishment of AI development priorities, at the service of needs. It is considered that the participative dimension can be the added value of the European strategy for the development of AI, with respect to other strategies that may be more advanced in terms of technology or implementation, such as the case of China or the USA. It is considered that the European strategy can incorporate as an added value to its AI the integration of citizens in the establishment of priority areas in which to develop or apply it.

"With artificial intelligence, citizenship is needed. And I think that AI technicians are still not clear about this... either they don't realize that citizens are very important in various aspects of AI research and implementation, or it's not valued."
Participant in the expert focus group

The establishment of limits on the use of AI in governance

There is a widespread consensus on the need to discuss the limits in the development of AI systems, because their use can have very important negative consequences for people's lives, or reproduce social models that are considered morally reprehensible.

"A research [project] to recognize a person based on the iris was financed through tax haven funds, to identify women with burqa and to know whether or not they were with their husband. I was very surprised [...]. How should it be done? Get here, yes? Get this far, right? What limits?"

Participant in the non-expert focus group

The limits, however, are not clear, and it is difficult to establish or agree on an ethical, political or regulatory framework that can regulate the development of forms of AI that can then have a high impact on social decisions. One of the difficulties that emerges in this regard, especially from a disruptive view of AI that understands more problematically everything to do with limitations to the development of AI, is the tension between a series of guarantees for the citizens and, at the same time, competitiveness in research and innovation.

In order to organize the definition of limits, especially in the focus group of experts, throughout the discussion the ability to intervene in decisions is considered in three different stages or stages:

1. In the management of the data that allow the decision to be taken.
2. In the evaluation of the decisions taken.
3. In the decision itself – a stage that, at the outset, is considered to be exclusive to humans.

"At the end they are algorithms and we shouldn't let them decide for us".

Participant in the expert focus group

In order to limit the use of AI systems in decision-making processes and/or to establish how this use should be carried out, in both focus groups issues related to: data bias, justice, automation of decisions and privatization.

The data bias

As specified at the beginning of the paper, the analysis of the social and ethical considerations of AI governance is inherent in the analysis of the use of AI in governance, an idea that captures the concept of data governance.

For this reason, in any decision-making process in which AI systems are used, participants from both groups emphasized the need to ensure that the data collected is not biased by gender, socio-economic level, ethnicity, etc. Guarantee of data diversity and its composition refers to the use of AI in all stages of the process, data collection, the decision itself or the evaluation.

"Humans make many decisions based on an ideology (...) A machine will also make a biased decision. Biased by whom? Because of the data, because of the engineer

who designed it or the company behind it, or the ideology of the state that financed it"

<div align="right">

Participant in the expert focus group

</div>

As illustrated in this quote, concern about how databases are built responds to the idea that any decision-making process, more or less automated, is biased, so there is ideology. Despite the apparent supposed neutrality of AI and other artifacts, the use of machines for decision-making is not exempt from this ideology underlying any decision. These ideologies can represent interests of various actors, being them of a political, technical or economic nature. This is an important issue to be solved in order to guarantee that collected data and their use respond to the objectives for which they are designed.

The justice

AI systems mainly work based on data compilation and statistics relationships. Beyond the data used, automated decision-making, regardless of whether or not the data is biased, poses a problem of justice, because the criterion of justice prevails over efficiency.

"[The AI] decides based on statistics. I am a fan of Rafa Nadal. If we were to pay attention to the statistics, he would not have won and he won. It is not fair that, in a case of conditional freedom, statistics are applied. It should be banned. We are forgetting the human factor, which AI does not take into account. AI is only the rational part, everything else, emotional intelligence, where is it? This is very important".

<div align="right">

Participant in the non-expert focus group

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Using the ability to handle large volumes of data and make statistical predictions is seen as an important value of AI. This is information to be taken into account when making contrasting decisions. However, this information cannot be used to make automated decisions that affect aspects directly related to people's lives.

From a more disruptive view of AI, it is assumed that even if we do not want AI to participate in numerous aspects of our daily lives, it is necessary to make an assessment of the costs and benefits, based on valuing what if the decisions made by AI systems were wrong. If the decisions affect non-substantive issues for people's lives, this error in the AI's decisions can be considered a minor issue and therefore, the AI could be used to make decisions on that particular issue. On the other hand, whether decisions affect substantive issues of people's lives, a wrong decision could have terribly unfair effects that would condition the person's life and, therefore, in that matter the decisions should not be made by systems day.

"Over the years we have built an important judicial system, which we want to maintain. There are areas in which the impact [of decisions made by AI] on the person is very important. AI should not enter this area."

<div align="right">

Participant in the non-expert focus group

</div>

The automation and explainability

Decisions are currently being automatically taken in several areas, even though AI systems are not used. There exist numerous processes in public administration that are already highly standardized involving a significant volume and time of work. Continuing with the example of the legal field:

> *"In justice, a large part of a judge's time is spent issuing very standard sentences. Less complicated decisions, for example on commercial issues, can be delegated to algorithms. 90% of the sentences are very simple."*
>
> *Participant in the non-expert focus group*

During the discussion, the participants point to a process of automating processes that goes beyond the development and use of AI systems. In other words, in relation to automation, a restrictive view of AI is assumed, because what is considered truly disruptive is the introduction of automated systems in more and more areas of our lives. This process, which has to do with the definition of standardized indicators and the difficulty of negotiating some processes, is prior to the popularization of AI systems. Therefore, the debate about limiting the automation of decision-making processes cannot be limited to AI, in the same way that AI cannot be considered solely responsible for the automation of decisions.

The problem with AI is when those who design an algorithm are not able to explain its decisions, as well as when users do not know criteria that AI designer has implemented into the algorithm. Regardless of the final decision or prediction, guaranteeing the transparency and explainability of the entire process is essential in order to be able to use AI systems in governance.

The privatization of governance

One of the main concerns in the use of AI systems in general and especially in the field of governance, which has appeared especially in the panel of experts, is the important control of data and the accumulation of knowledge that some large companies or corporations currently have. Given the high economic and technical capacity increasingly necessary to make intensive use of data, this phenomenon poses a threat to democratic decision-making.

Certain companies or corporations are accumulating a lot of algorithmic knowledge and about the behaviour of the population, which implies a lack of guarantees that these data or this knowledge is carried out respecting principles or agreed ethical values. In this sense, the accumulation of data and knowledge in AI by entities outside the scope of government supervision means the privatization of governance, an issue that should be corrected.

> *"We have to think carefully about the part of the relationship with humans and how we organize ourselves in a different way to favour AI for the benefit of people, not for the benefit of companies."*
>
> *Participant in the expert focus group*

Faced with this situation, and in order to guarantee an AI that makes fair decisions and that respects democratic values, it is necessary to align the three legs that are considered

to make up the governance of AI (citizenship, technology and administration). With this intention, apart from developing legal regulations, it is proposed to carry out data and algorithm audits on private companies.

"I believe that regulatory institutions should be created, in the same way that there are institutions that regulate banks and audit them to see what they do with the money. You should audit these companies like Google, Netflix and such, to see what their algorithms are really doing."

Participant in the expert focus group

The freedom

Freedom is one of the topics of most concern in both focus groups, as AI is considered to be a very powerful instrument for social control.

"It is a very powerful tool for control"

Participant in the expert focus group

The threat to freedom posed by the use of AI systems in decision-making processes can be understood from two different levels. The first dimension refers to the strategies that use AI to achieve greater advertising or visualization, based on algorithms that make users enter loop-type processes, which are used by Meta or Twitter-type companies. This type of process can mean a significant manipulation of some groups of people who are more influenceable or less educated, such as the youth. In this dimension, it is considered necessary to legislate the operation of these loops to avoid harm to people.

"I have teenage children, who believe what they see: the fake news, the bleach they drank to cure themselves of covid. I have a 12 years old daughter. I see that the information they see is a brutal danger. People are impressionable and this is very complicated. When you start to see a content, when we are young, we look for news that is what you expect, we are more influenceable. If you see a video that comes out... Well, you say 'I want to go to Malibu', 'I want a Prada bag'. The algorithm moves you."

Participant in the non-expert focus group

The second dimension, related to the first but taken to the extreme, has to do with a very disruptive vision of AI. In this sense, it is alerted to the ability of AI to control emotions and regulate feelings. Taking into account the digital trail that all citizens leave in all their daily movements, obtaining and using these data for commercial or authoritarian purposes can be very dangerous. According to this view, the problem is not the predictive capacity of AI systems in governance processes, but the use that can be made of these predictions. Faced with this situation, the solution proposed by the participants starts from questioning the supposed objectivity of the predictions and, therefore, proposes a use of the predictions based on subjective and contextual criteria, which can be known, negotiated and discussed.

Responsible action at the local level

AI changes the scale of decisions, has global effects, and therefore global control measures are also needed. This nature of AI transforms the way we understand governance

and the ability we can have to govern its effects. Global control and regulation mechanisms are needed, but at the same time, there is a need to develop local mechanisms that favour responsibility.

Verification

In the focus group of experts, the idea is raised that decisions about whether we should use AI in governance in one area or another and in what way they cannot be definitive ones, because we do not have sufficient knowledge about its effects and their consequences. One of the great difficulties in order to introduce ethical and responsible criteria in the use of AI systems in decision-making processes is their global and intertwined scale. Faced with this situation, a response based on the development of small-scale forms of experimentation and monitoring is proposed. In this way, the responsible decisions must come from the result of the application of testing processes implemented in a controlled manner in very limited local areas. These controlled tests make possible to know the repercussions of the use of these technologies in specific areas and different cases. Since AI has global effects, it is difficult to think on a local scale, and it is precisely this scale that must be introduced in governance.

Multiplicity

This issue is also related to the different forms of technological development that AI is adopting. Just as in politics there is more than one model (different parties with different ideologies proposing different actions), AI for governance must also represent this diversity. There is no single technological answer. This proposal developed during the discussion represents a powerful alternative to the technocratic determinism that often accompanies AI: Technology gives us tools to find the best solution, but there are always many better possible solutions. In this sense, it is considered essential to accompany the emergence of open-source experiences, experimental techniques, etc. that allow the development of bottom-up strategies that represent this multiplicity of possibilities that AI can offer in governance.

Education and training of citizens and professionals

AI is a technology that in its design and development is so far removed from everyday life, that among experts it is considered that the population is not sufficiently educated to be able to make decisions about how AI should be used. Although, at the same time, it is considered that the public needs to make decisions and decide the course of AI. For this reason, the group of experts and non-experts points out the need to train citizens in the operation, potential and possible effects of AI.

"We must have an educated population"

Participant in the expert focus group

"Rules must be put in place and citizens must be at the centre... and these citizens must be educated. There must be ethics in AI. And engineers don't have to do it"

Participant in the expert focus group

In the same way, AI experts themselves consider that they too do not have sufficient knowledge to be able to decide on ethical and social issues, a knowledge that should be integrated in an interdisciplinary manner.

> *"I think that we lack more technical people, more knowledge about the evolution of society [...]. And also on the other side, to the people who are more in the field of governance [...] who also understand this new colleague that they have on the way everywhere ... At an educational level, we must try to make an effort to integrate this AI into the entire knowledge base out there."*
>
> *Participant in the expert focus group*

CONCLUSIONS

In the framework of the Erasmus+ HEDY – Life in the AI era project, we have conducted two focus groups with experts and non-experts in AI to discuss the impact of AI governance on our society. Focus groups are unique tools in qualitative research where the interaction of participants allowed the organisers to collect different social actors' opinions and questions, concerns and debated ideas, thus providing complementary information to that available in the literature.

We have identified for instance that there are two different yet complementary visions that we called restrictive and disruptive that make it possible to cope with the complexities of opinions, concerns and proposals regarding the use of AI systems in the governance.

From a restrictive point of view, the dilemmas posed by the utilisation of AI can be limited and solved by establishing a very clear line as to why AI can be used or not. There is also common association of AI with science fiction imaginaries and the idea that AI can solve all problems of any kind. In contrast, from a disruptive view, AI marks a turning point in contemporary societies with no possibility to go back.

There is however a prevalent agreement for both visions that it is vital to talk about the boundaries of AI system development since their use may have gravely detrimental effects on people's lives or may replicate ethically dubious societal paradigms. The boundaries are vague, and it is challenging to come to an agreement on an ethical, political, or legislative framework that can control the growth of AI. The conflict between a number of guarantees for the citizens and, at the same time, competitiveness in research and innovation is one of the challenges that arises in this regard.

For example, one of the main concerns in the field of governance is that certain large companies or corporations are accumulating a lot of knowledge about the behaviour of the population, which implies a lack of guarantees that these data or this knowledge is carried out respecting principles or agreed ethical values.

In conclusion, AI is a technology that in its design and development is so far removed from everyday life that the experts believe that the population is not trained enough to make decisions about how to use AI. The experts themselves consider they do not have enough knowledge to decide on ethical and social issues alone. For this reason, it is considered necessary that citizens should be able to make decisions and decide on the course of AI. Teachings, courses and trainings in schools and higher education institutes are needed

to train citizens in the operation, potential and possible effects of AI and to facilitate the use and adoption of AI for young people and future generations.

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Expert and non-expert perspectives on AI's impact on skills and competencies and education	**Szakértői és nem szakértői perspektívák az MI készségekre, kompetenciákra és oktatásra gyakorolt hatásáról**

ALVES MOREIRA, Ana I.[1] – JAKOBI, Antonia L. P.[2]

Abstract

The emergence of Artificial Intelligence (AI) and, generally speaking, Industry 4.0 is causing changes to people's lives. One such change is in the required skills and competencies for the jobs of the future. Thus, it is pertinent to understand expert and non-expert perceptions regarding these changes and if the educational system is adequately addressing them. The objective of this study was to compare expert and non-expert remarks and whether these corroborated previous findings on the topic. We conducted one focus group with non-experts and one questionnaire with experts. Results showed that experts and non-experts broadly agreed with the existing findings. Experts mentioned skills and competencies that were gaining relevance and becoming obsolete, whilst non-experts focused on skills and competencies that are gaining relevance. As for education, experts tended to focus on where it was lacking, whilst non-experts concentrated on the potential of AI for education. Finally, regarding jobs, experts and non-experts generally agreed with each other and previous findings on the topic.

Absztrakt

A mesterséges intelligencia (MI) és általában véve az Ipar 4.0 megjelenése változásokat hozott az emberek életében. Az egyik ilyen változás a jövő munkahelyeihez szükséges készségek és kompetenciák terén figyelhető meg. Ezért fontos megérteni a szakértők és nem szakértők véleményét ezekről a változásokról, és arról, hogy az oktatási rendszer megfelelően kezeli-e őket. A tanulmány célja az volt, hogy összehasonlítsa a szakértői és nem szakértői észrevételeket, és hogy ezek megerősítik-e a témával kapcsolatos korábbi megállapításokat. Egy fókuszcsoportos kutatást végeztünk nem szakértőkkel és egy kérdőívet szakértőkkel. Az eredmények azt mutatták, hogy a szakértők és a nem szakértők nagyjából egyetértettek a meglévő megállapításokkal. A szakértők megemlítették azokat a készségeket és kompetenciákat, amelyek egyre fontosabbá váltak és elavultak, míg a nem szakértők az egyre fontosabb készségekre és kompetenciákra összpontosítottak. Ami az oktatást illeti, a szakértők inkább arra összpontosítottak, ahol hiányzik, míg a nem szakértők a mesterséges intelligencia oktatásban rejlő lehetőségeire koncentráltak.

Keywords

Artificial Intelligence, skills and competencies, education, labour market, qualitative research

Kulcsszavak

Mesterséges Intelligencia, készségek és kompetenciák, oktatás, munkaerő piac, kvalitatív kutatás

[1] ana.moreira@aidlearn.pt | ORCID: 0000-0003-3572-3412 | Jr. Project Manager at Studies & Projects Unit of AidLearn | Junior projektmenedzser az AidLearn Tanulmányok és Projektek Egységénél
[2] antonia.jakobi@aidlearn.pt | ORCID: 0000-0003-2182-6939 | Jr. Project Manager at Studies & Projects Unit of AidLearn | Junior projektmenedzser az AidLearn Tanulmányok és Projektek Egységénél

INTRODUCTION

Much discussion has been made regarding Artificial Intelligence (AI) and its emergence; however, there is no consensual definition of the term. Indeed, Kok et al. [1] highlight that they could find four definitions of AI in the New International Webster's Comprehensive Dictionary of the English Language. One focused on the area of study within computer science and how to develop computers able to "engage in human-like thought processes." Another focused on what most regular people tend to imagine when it comes to AI: machines capable of learning, adapting, self-correcting, and more characteristics akin to human intelligence. The third definition referred to AI as the possibility of extending human intelligence through computers. And finally, the fourth definition stated "the study of techniques to use computers more effectively by improved programming techniques." Dobrev [2] originally defined AI as "a program which, in an arbitrary world, will cope not worse than a human," which he then updated into "AI will be a program which makes more than 70% average success in the selected set of worlds" to avoid ambiguity regarding the use of human and to define a concrete success percentage needed for it to be AI [2].

Despite heterogeneous definitions of AI, the emergence of the fourth industrial revolution (Industry 4.0) is consensual, and it is causing changes to all the different aspects of people's lives [3]. This is the topic being addressed in the Erasmus+ HEDY project, within which this research was conducted. One pertinent aspect to discuss is AI's impact on the educational and training systems, how they are coping with the newly required skills and competencies, and its effect on the labour market.

Indeed, due to its accelerated development. Firstly, due to automation, some jobs are disappearing. Secondly, people are now more likely to use AI at work due to its ubiquitousness. In fact, about 50% of organisations report using AI [4]. Because of this, education and training institutions must create conditions towards promoting the required learners' skills and competencies for this rapidly changing world.

To this end, we will start by discussing AI's current and expected impacts on skills and competencies.

LITERATURE REVIEW

Current impacts of AI on skills and competencies

Education is core to reskilling and combating people's distrust and fear over automation and digitalization replacing humans [5] – [7]. In fact, most Europeans favor governments limiting the implementation of automation and digitalization in workplaces as a way to protect jobs and keep people employed [5], [7]. However, the changing nature of work and the implementation of new technologies are unavoidable, and 37% of respondents to the Gartner 2019 CIO survey stated they had already deployed AI and/or would do so in the near future to try to stay ahead of their competition or at the very least not get left behind [8]. Additionally, earlier reports on AI-focused and implied people would be abandoned and replaced by technology, which contributed/served to corroborate people's misconceptions and fears regarding AI. Nonetheless, newer reports have instead concentrated on how AI creates jobs and/or allows workers to have more fulfilling roles by being freed from manual and/or dangerous work [9] – [11].

Moreover, AI can help increase workers' skills and competencies [11], [12]. One need only look at the example of KONE, which has installed the Internet of Things (IoT) in their elevators and used AI to analyze the data, allowing technicians to be informed about potential issues and perform preventative maintenance [12]. Additionally, whilst not necessarily AI in itself, hybrid simulation training has shown great potential in nursing and health professions [13]. Due to this, the HYBVET Erasmus+ project[3] is expanding this type of training to CVET.

Indeed, one significant promise in AI lies herein: the valorization of those skills and competencies that are impossible to be replicated by robots. Per Frey [14], "complex social interaction and creativity are the most difficult things to automate." Indeed, due to this fact, educators are unlikely to be replaced by AI despite its increased implementation in education, partially due to the pandemic, which made it of the utmost necessity [15]. Thus, one pertinent skill that has gained relevance in the age of AI has been critical thinking. In this age where fake news can be easily dispersed through social media, critical thinking skills and validating sources are paramount [16]. Critical thinking allows people not only to reach conclusions based on the currently available evidence but also to have their beliefs challenged in regards to accuracy and relevance due to newer or different sources and modify them accordingly [17]. Additionally, social skills remain particularly relevant due to their difficulty in being automated. Other pertinent skills are the ability to adapt to change, teamwork, problem-solving, communication, and helping customers in project management and using IT [17].

It is noteworthy to underline that, regarding skills and competencies, AI has not yet been integrated to such an extent that there would be a demand for it outside of data science and engineering, software engineering and development, and business development and sales [18]. Shiohira [4], however, emphasizes that even non-professionals will need to be capable of implementing AI mechanisms in different working sectors. As an example, there already existing fields of applications in the area of human resources.

As identified by Guenole et al. [19], these can be during recruitment and within the career development of employees. More precisely, during recruitment, AI can identify and rank job candidates and their attributes based on advertised jobs and their respective requirements. Such selection tools are used to facilitate a candidate's choice and are particularly interesting for employers with a large number of applicants. With the aid of the created list and rank, a human makes the final decision. Regarding career development, AI technology is used for mapping employment patterns to improve the business and workers' performances. This means, for example, using AI to analyze which progression opportunities are most valuable to an employee to promote a transition and/or progress in their career. Moreover, AI can be implemented in the shape of a chatbot offering coaching and counseling regarding the career. And finally, many companies (as much as educational institutions) already use learning management systems (which work with AI) to deliver and provide training throughout their organisation, enabling an assessment and scheduling of the contents adjusted to the learning individual.

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[3] The HYBVET project is an Erasmus+ project funded by the European Commission. It is the collaboration of seven partner organisations from five European countries. See more at http://www.hybvet.eu

As a final consideration of current changes caused by AI, one also must consider the new jobs created by it as there is a need for people to train AI (i.e., train the AI to do the intended work), explain outcomes to AI (i.e., explain how AI reached a particular conclusion to the layperson), and sustain responsible use of AI (i.e., ensure that AI systems are working correctly, safely, and being used responsibly) [11]. These new jobs create a need for new skills and education; thus, some places like the ProgeTigerProgramme - which started in 2012 in Estonia - are beginning to promote the implementation of programming and robotics into the educational curricula for pre-school and primary school students but also at the vocational level to prepare people for the labour market of the future [4].

Expected impacts of AI on skills and competencies

There is little doubt that AI will impact humans' way of living. While much attention has been paid to the fear of jobs being replaced by machines, less focus is put on the perspective that it is not the jobs themselves that will become inherently obsolete, but rather that the way of working will shift and that specific skills and competencies will gain importance whilst others will be discarded [18]. In fact, the benefits of using AI systems highly depend on the competencies and skills of those operating them, with the lack of AI skills being the number one problem for enterprises within AI projects [18]. Therefore, implementing an AI consciousness and related challenges in the educational curriculum has been identified as crucial to tackling the change in working experiences and businesses [20].

According to a recent adaptation of typology by Paschen et al. [12], AI as a driver of innovation within companies can work either as competence-enhancing or competence-destroying. The first promotes existing skills and knowledge, and the latter obsoletes them. This typology can be specifically valuable for managers to identify and predict the impact of implementing AI on their company's competencies. Whereas at the moment, as the authors observe, most AI applications foster competence-enhancing innovations, in the future, an increase of competence-destroying innovations is predicted due to the amelioration of machine learning, problem-solving, and reasoning [12].

With the pandemic, AI has become more widely used in education and is likely to be the way of the future in education. A working paper by Pedró et al. [15] highlights the opportunity of AI to enhance personalisation and better learning outcomes. More specifically, AI enables (marginalised) people to benefit from learning despite being unable to be there in person. It facilitates the possibility of adjusting and personalising the working progress of the individual by offering ways to create learning plans, preferences, and pathways. This can, for instance, be through the help of a MOOC, through which not only a vast number of learners can be reached but also includes a flexible learning approach for learners of all kinds. On the side of educators, AI technology can depict a tool for the assessment of grades, as well as an aid for the implementation of the lesson and the monitoring of discussion groups. Due to the socio-emotional and creative components of effective teaching, Pedró et al. [15] rate the replacement of educators by AI technologies as rather unlikely. Nonetheless, they underline the importance of educators being able to adapt to the new digital era by developing new skills. According to Luckin et al. [21], these include:

- an understanding of AI systems to decide about their respective values;
- research and data analytical skills to comprehend the collected data;
- management skills to manage all disposable resources;

- critical thinking to interpret both the up and downsides of AI and the skills necessary for its usage;
- the ability to delegate specific tasks to AI technology to have more time for other aspects of teaching and coaching.

A paper by Chen et al. [22] further distinguished three main areas of how AI can function in education: administration, instruction, and learning (see 1. Table).

	The work AI can do in education
Administration	Perform the administrative tasks that consume much of the instructors' time, faster, such as grading exams and providing feedback.
	Identify the learning styles and preferences of each of their students, helping them build a personalized learning plan.
	Assist instructors in decision support and data-driven work.
	Give feedback and timely and direct work with students.
Instruction	Anticipate students' performance in projects and exercises and the odds of dropping out of school.
	Analyse the syllabus and course material to propose customized content.
	Allow instruction beyond the classroom and into higher-level education, supporting collaboration.
	Tailor teaching methods to each student based on their personal data.
	Help instructors create personalized learning plans for each student.
Learning	Uncover the learning shortcomings of students and address them early.
	Customize university course selection for students.
	Predict the career path for each student by gathering data.
	Detect learning state and apply the intelligent adaptive intervention to students.

1. Table: The functions of AI in educational scenarios [22, p. 75272].

While implementing AI in an educational context provides many benefits, the downsides of this process should not be neglected. According to Pedró et al. [15], developing a comprehensive public policy for implementing AI to foster sustainable development is essential. Even though AI itself can depict an opportunity for inclusion, for example, through the possibility of distant learning, challenges such as electrical, hardware, and internet availability, data costs, basic ICT skills, the language as well as cultural appropriateness of content are only some aspects that need to be taken into consideration. This is specifically the case for "less developed" countries, which are in danger of being left behind

even more if those challenges are not recognized and thoroughly tackled. Similarly, AI consists of the data it is fed; therefore, the quality and inclusiveness of such should be one of the main priorities when developing AI technologies. Through transparency and a clear ethical code, it is possible to prevent AI from perpetuating inequalities [15].

Regarding implementing curricular modules fostering AI skills and competencies for the future, digital competencies and computational thinking have been identified as the most crucial. Scholars agree that integrating such content is essential to ensure a beneficial transition into the AI era [20], [23].

Indeed, Dondi et al. [23] concluded that the need for physical, basic cognitive, and manual skills would reduce due to the taking over through AI. In contrast, higher cognitive, technological, social, and emotional skills will be more demanded. The authors have identified 56 DELTAS (distinct elements of talent, attitudes, and skills) split across 13 skill groups divided into four main categories – Cognitive, Interpersonal, Self-leadership, and Digital. These include the aforementioned critical thinking, teamwork, etc., as well as digital fluency and citizenship, software use and development, and understanding of digital systems. These findings are in line with other recent research, such as Anton et al. [18], Rampersad [24], and Shiohira [4], highlighting the necessity for data, technological and digital knowledge as much as competencies in problem-solving, empathy, communication, innovation, critical thinking, and teamwork.

RESEARCH METHODOLOGY

To explore similarities and differences between experts and non-experts on the impact of AI on skills and competencies, we formed two focus groups, one with experts and one with non-experts. Focus groups are a qualitative research approach that has consistently shown effectiveness when it comes to generating a robust understanding of individual beliefs and attitudes on a particular topic [25].

However, the focus group with experts had to be transformed into a questionnaire due to conflicting schedules. This questionnaire was created with equivalent questions to the focus group and more focused open-ended questions to ensure the needed information. Additionally, a disclaimer was placed asking them to write as much as possible for each question.

All participants were guaranteed anonymity.

Planning and implementation of the focus group with non-experts

To assess non-expert beliefs and attitudes regarding AI's impact on skills and competencies, and education, one focus group was conducted. The persons selected to participate in the focus group were invited either personally or via e-mail, drawing from the researchers' networks. It was explicitly stated that no previous knowledge was necessary for participation, as this focus group centered on non-experts. One moderator and one assistant managed the focus group, which was conducted online and recorded. This recording was later transcribed. Additionally, the assistant took notes throughout the focus group, which lasted approximately one hour. The questions asked during the focus group can be seen in 2. Table.

Opening	1. Please state your name and degree/studies.
Introduction	2. Could you please speak about your current professional activity/ the focus of your studies/ the field of expertise of your studies?
Transition	3. What is your first association when someone mentions Artificial Intelligence (AI)?
	4. Did you ever have any kind of interaction with AI in your educational career?
Key questions	5. Can you think of other ideas on how AI could be applied in education and universities?
	6. Could you provide any examples of how AI could influence (disappearing/emerging) future jobs – in general and in your (future) profession?
	7. In your opinion, which skills and competencies are becoming obsolete and which are gaining relevance in the age of AI?
Ending	8. Of all the topics discussed, what do you think is the biggest takeaway from this discussion?

2. Table: Non-expert focus group questions, self-editing.

Planning and implementation of the questionnaire for experts

The questionnaire were addressed to experts who had to fulfill the following criteria:
- having a university degree;
- working in technology or education and training fields.

The applied questions are shown in 3. Table.

Opening	1. Please state your name and place of employment.
Introduction	2. Could you please write a little about your current professional activity?
Transition	3. What is your first association when someone mentions Artificial Intelligence (AI)?
	4. Could you provide an example of an Interaction you've had with AI?
Key questions	5. Could you provide examples of jobs that are disappearing due to AI?

	6. What about jobs that are changing due to AI?
	7. And jobs that are appearing due to AI?
	8. Which of the three conditions (jobs appearing, changing, disappearing) do you think is the most common consequence of AI and why?
	9. Do you think AI is freeing workers from menial and dangerous jobs and allowing them to take more worthwhile jobs; or do you think AI is only replacing workers and is causing/will cause unemployment to rise?
	10. What skills and competencies are becoming obsolete in the age of AI?
	11. What skills and competencies are gaining relevance in the age of AI?
	12. Some experts define AI as competence-enhancing or competence-destroying. The first promotes existing skills and knowledge and the latter makes them obsolete. Which do you think is the most likely scenario for AI now and in the future?
	13. Do you think education and training providers are offering adequate training for the competencies that are gaining value now and in the future? Please provide examples of places that are promoting said competencies.
Ending	14. What do you think is the biggest takeaway about AI on these topics and/or do you wish to make any final remarks?

3. Table: Expert questionnaire, self-editing.

RESULTS

Data from the Focus group and questionnaire was treated as per the indications of Bloor et al. [26]. That is, it was indexed, then there was data storage and retrieval, and, finally, it was interpreted. We opted to use NVivo for conducting the analysis.

Thus, following this logic, participants' answers could be assigned to the following four categories: General thoughts on AI, Jobs and AI, Education and AI, and Skills and Competencies and AI.

Non-experts

Five master's degree students or recent graduates accepted this invitation to participate in the focus group. The vast majority of the participants (4 out of 5) had a psychology background ranging from organizational and business psychology to social psychology and intercultural relations. The other participant's background was in accountancy and mechanics. Of the five participants, 3 were men, and 2 were women.

General thoughts on AI tended to be regarding direct applications of AI. Indeed, participants highlighted "search engines such as Google", "I think about the virtual assistants like Alexa by Amazon", and, "I think about self-driven cars such as the Teslas". However, other general thoughts on AI could also be identified, for example, "concepts such as machine learning" and "human simulation intelligence" as well as programming languages themselves "I think it was C++". Finally, we could also identify some uncertainty regarding what is AI: "for the average user, it's unclear what is AI and what is not".

Concerning Jobs and AI, most answers focused on jobs disappearing due to AI. Indeed non-experts identified cashiers, bank tellers, and generally "mechanical and somewhat monotonous jobs are eventually going to disappear". Nevertheless, they also identified some jobs that they think would appear or are becoming more relevant such as programmers and AI managers. Additionally, the participants assumed education jobs and jobs in medicine to be subject to change due to AI.

As for Education and AI, non-experts mainly focused on current AI applications and their potential for the future. They emphasized how using Google, particularly Google translate, is ubiquitous in education and often not identified as AI, but also some potential future applications of AI in education such as "a more personalized learning for students" and "some bureaucracy related to the teaching and learning process, I don't know, like... like when you are a professor, you have to fill in lots of forms that take time away from teaching and learning classes". Indeed, as aforementioned, the consensus among the non-expert group was that jobs in education would change and adapt.

Finally, when it comes to Skills and Competencies and AI, non-experts' answers focused on skills and competencies that are gaining relevance or should gain increased relevance for the age of AI. They mentioned emotional intelligence skills, creativity, critical thinking, digital skills, and the ability to adapt. Nevertheless, they also pointed out that these skills wouldn't necessarily become more widespread: "there is a difference between what is important and what would be promoted. And I don't truly know what competencies... aside from the obvious like, OK, digital competencies and stuff... that would actually be promoted by an AI world in itself".

Experts

We had nine responses to our questionnaire with experts. Most questionnaire respondents were male (6 out of 9) and working in tech fields (7 out of 9). Two respondents worked in VET. Whilst the majority are employed in the tech field, they are from different areas: an Implementation Manager of an HR Management software, a network consultant, an IT consultant, a consultant in a start-up network in Europe, a front-end developer, a software engineer, and software and DevOps engineer.

General thoughts on AI tended to be mainly on AI concepts such as machine learning and self-learning software. However, experts also highlighted that nowadays, "Artificial Intelligence refers more to a concept than a specific technology. As the term is being used very loosely, my reaction is to learn more about the specifics in which the term is being mentioned to be able to get a better understanding of the use case or situation that is referred to". Then, the expert group also mentioned some direct applications of AI, such as air transport trackers, chatbots, and AI assistants.

Regarding Jobs and AI, experts had very clear ideas regarding AI-induced shifts and changes to the labour market. For jobs that are disappearing, experts discussed physical and manual jobs such as production in factory assembly lines and toll collectors, but also jobs like advertisement office, nutritionists, assistants, and other white-collar jobs. As for jobs that are changing, most experts mentioned medicine as a profession that is implementing AI systems and gaining from it. Other professions referred to as changing were lawyers and recruiters. Finally, regarding jobs gaining relevance due to AI, experts highlighted jobs requiring data analysis, computer programming, and jobs creating, training, and managing AIs.

On Education and AI, experts primarily focused on how education appears to be (too) slow to change and teach the skills and competencies needed for an AI world. In fact, some expert statements were the following: "the education system is still based on the logic that lots of knowledge must be learned by heart while it now is at the fingertips of everybody at all times. While there has been a small shift towards competency-based education, this is by far not sufficient. More focus on technological education as well as complex problem solving e.g. through project work should take a bigger chunk in the educational strategy", "I would like to start with the curriculum in schools. Here we teach the past. This is highly relevant as we need to learn based on experiences. Nevertheless, I observe that there is not enough room for future education. And we need this future education in fields of new technologies and how to deal with them", and "here should be more computer science being taught in school. Even if the students don't become an IT consultant or a coder, they will learn about creative and analytical thinking and that's good". Nonetheless, one expert provided some good examples of how some European countries are adapting their educational systems toward this education for the future, "Good examples are Germany's requalification programme, which expects to have a positive balance of 600,000 requalified jobs by 2025, and the United Kingdom's programme, which since 2015 has already requalified 1.5 million jobs. More advanced are the cases of the Baltic Republics Lithuania and Estonia, the latter being called today "Digistonia".

Lastly, on Skills and Competencies and AI, experts could provide examples of the changes expected for skills and competencies. Regarding skills and competencies that are becoming obsolete, experts counted those "that can be replaced by machine-learned models are becoming obsolete", such as some data analysis competencies, particularly when related to finding patterns like in stock trading. Other skills mentioned as becoming obsolete were manual work-related skills and even "accounting skills, office skills, language skills". As for the skills and competencies that experts identified as gaining relevance in an AI world, digital and IT skills were often pointed out, as well as soft skills and research skills.

Comparison and contrast

For general thoughts on AI, there seems to be quite an overlap of expert and non-expert answers; both tended to mention concepts such as machine learning and direct applications of AI such as self-driving cars. However, non-experts had more questions about what exactly is AI, which was something that did not show up in the expert group as they had a clearer idea of what is and what is not AI.

Regarding Jobs and AI, experts and non-experts agreed that manual labour jobs are disappearing. However, only experts mentioned that some office and white-collar jobs

would also disappear. As for change, both experts and non-experts agreed that education and medicine are changing. Regarding jobs gaining relevance, experts and non-experts found consent in IT and programming. Only experts highlighted data analysis as a growing field.

In Education and AI, non-experts focused more on the potential future application of AI to education and how it could improve the educational system. Experts, on the other hand, opted instead to highlight that the educational field has been slow to change.

Finally, on Skills and Competencies and AI, experts' and non-experts' answers appear to overlap on the skills and competencies necessary for an AI era, mainly soft skills and digital and IT skills. Notwithstanding, only experts mentioned skills that are becoming obsolete in an AI era, with these skills being mostly related to the jobs identified as disappearing.

DISCUSSION

With the emergence of Industry 4.0 and with the great promise of AI implementation, some patterns could be identified when it comes to its impacts, particularly the required skills and competencies for the labour market, as much as the necessary adaptation to these changes by the current educational systems. In fact, experts and non-experts highlighted the need for critical thinking, soft skills, digital and IT competencies, interpersonal skills, and research and data analysis skills. This is corroborated by the literature which has tended to emphasise the necessity for these skills and competencies [4], [14], [16] – [18], [20], [21], [23], [24].

Regarding whether education is adapting and promoting the aforementioned skills and competencies, non-experts focused on the potential of AI's implementation in education and how it could be used to automatise specific bureaucratic tasks and help educators develop student-specific learning paths. This goes in line with the findings of Chen et al. [22] and Niemi [27]. Experts, on the other hand, opted to highlight the shortcomings of educational systems when it comes to updating themselves and how they might be failing people by not adequately preparing them for the future. Nevertheless, they also highlighted some good examples at this level, such as "Digistonia", whose ProgeTigerProgramme was highlighted by Shiohira [4] as an example of education adapting and preparing children for the future.

When it comes to jobs, responses from both experts and non-experts align with the literature that manufacturing and manual/repetitive jobs with the potential to be automated are disappearing, whilst jobs dealing with creating, training, and managing AI are emerging [4], [9] – [11]. Additionally, experts and non-experts stressed how some jobs, specifically medicine, education, and recruiting, are changing and benefitting from implementing AI. This corresponds with Paschen et al. [12], Pedró et al. [15], and Guenole et al. [19].

Finally, remarks regarding general thoughts on AI served only towards assessing the level of knowledge participants had regarding AI. As expected, experts demonstrated greater knowledge and understanding than non-experts, with non-experts at times stating that they were unaware they were using AI (e.g., Google translate) and also confusing some other software and methodologies with AI (e.g., Kahoot, QR codes).

LIMITATIONS

Whilst qualitative data, such as that obtained from focus groups and questionnaires with open-ended questions, is a valuable source of insight and information on a topic, it also suffers from having smaller sample sizes. Indeed, one limitation of this study is the sample size which makes the results not necessarily generalizable. Additionally, the fact that the sample was of convenience and that all participants had a university degree means the data may not represent the general population's views on the topic. This is particularly true when it comes to the non-expert group. Furthermore, as it is a qualitative study, there is also the possibility of researcher bias in interpreting the data. Finally, though the expert questionnaire did result in very pertinent answers, and there is little reason to assume experts would change their opinions even had they disagreed through a discursive interaction, the fact remains that by using a questionnaire instead of a focus group, interaction data for the expert group was lost.

CONCLUSIONS

Experts and non-experts agree with the literature regarding the needed skills and competencies for an AI world. As per the literature, these skills and competencies were critical thinking, soft skills, IT and digital competencies, interpersonal skills, and research and data analysis skills. When it comes to education in such a world, the views of experts and non-experts also align with the literature on the topic, with non-experts preferring to focus on the potential of AI in education and experts focusing instead on how education is failing to evolve and adapt fast enough to this rapidly changing world. As for the labour market and how jobs are being affected by Industry 4.0, experts and non-experts also corroborated the existing literature. They stated that jobs that can be easily automated would disappear, with experts also highlighting some middle-class jobs to disappear in the future. Both experts and non-experts underlined how education, medicine, and recruitment are implementing and improving their competencies thanks to AI. As for jobs appearing, both groups stressed these jobs would be mostly related to creating, training, and managing AI.

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