

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

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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.

Keywords

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

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.

Kulcsszavak

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

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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+ project³ 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.

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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