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AI for Learning – Views on Impacts to Teachership in the Era of Artificial Intelligence

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Abstract:

Artificial Intelligence (AI) is an umbrella term for systems that can act in cognitive processes in a human-like and human-enhancing manner, e.g., in learning, problem solving, and pattern recognition. According to models of technology adoption, several factors influence the actual implementation of a new system within an organization and in an individual's professional practice. These factors include e.g. job relevance, demonstrable results, individual experience with technology, and voluntariness to adopt the new system.
This research studies employees' views and expectations of AI applicability and its impact to teachership within a Finnish higher education institution (HEI). Survey data was collected from different schools and units from all hierarchical layers of the HEI, a University of Applied Sciences. Views on AI were assessed in relation to the core tenets of a teacher´s professional guidelines as expressed in the Comenius' Oath.
This research contributes to the AI research by shedding light on how people within the HEI evaluate the impacts of AI into their future operating environment, pointing out also the potential obstacles for AI adoption in this specific context.

Keywords: Artificial Intelligence, higher education, human-machine interaction, learning, ethics, teachership

1. Introduction

Educational professions are typically seen to include complex and value-laden processes and, thus, teaching is seen as a profession which is not easily replaceable by technology (Frey & Osborne, 2017). AI in education (AIEd) has been researched for about 30 years, but as Zawacki-Richter et al. (2015) claim, "despite the enormous opportunities that AI might afford to support teaching and learning, new ethical implications and risks come in with the development of AI applications in higher education." The issues that need considerations are e.g. the principles of and responsibilities for algorithms running AI as well as control on access to student-level data and data anonymity. This view has called for extended research on the ethical impacts of AIEd. The transition towards AI-driven or AI-supported education is not to be understood or studied solely by focusing on the performance measures of technology.
This paper investigates how the personnel of a HEI interpret the opportunities and challenges in adopting AI-technologies. We focused on the differences in the perceptions of self-efficacy, pace of adoption, the magnitude of expected impact as well as negative/neutral/positive positioning of the changes stemming from the application of AI-technologies in the educational context.

The research questions set for the study are:
RQ1: How do the respondents evaluate the potential impact (both in magnitude and quality) of AI in education?
RQ2: What is the perceived preparedness of the respondents to adopt AI in educational processes in different organizational levels (individual, unit, and the whole HEI)?

2. Literature review

2.1. Defining artificial intelligence

As it is typical for a technology area that is under rapid evolution, the very definition of AI seems to be an evolving one. Wang (2008) stated that the essence of intelligence is the principle of adaptation to the environment even while being equipped with insufficient knowledge and other resources. Thus, an intelligent system relies on finite

processing capacity, works in real time, is open to unexpected tasks and is able to adapt and learn (Wang, ibid.). Typically, when AI issues are surveyed among non-expert populations, more practice-focused definitions are used. For example, in a study of adoption of emerging technologies within the HRM practitioner community, Saukkonen et al (2019) defined AI as "a field of computer science dedicated to solving cognitive problems commonly associated with human intelligence, such as learning, problem solving and pattern recognition".

2.2. Purpose and ethical base of education and teachership

Education is closely linked to ethics, as teachers engage in moral commitments in their everyday practices (Martin, 2013). In addition, teaching practice is influenced by different political, economic, administrative, and experiential factors (Martin, ibid.). Malone (2020) comments that despite the clear need for intentional ethics education that would act as an affirmation of accepted professional ethical values, ideals, and principles, actual investments in such education are often lacking. Since it can be claimed that education is also an ethical effort in Higher Education Institutions (HEIs), different stakeholders involved in the learning processes should be aware of their professional and institutional ethics. However, only a fraction of students take ethics courses focused on their professions in universities (Gülcan, 2015). This kind of ethical education would provide learners with ideas on what is right and allow them to make suitable decisions about ethical issues in their future professions (Gülcan, ibid.). According to Day (2019), teachers with a high commitment to their profession act with quality, vocation, calling, and moral purpose. The moral purpose defines the nature of professionalism in teaching: teachership can be considered a vocation that requires deep personal commitment, as well as a profession with clear ethical codes (ibid.).

In the context of this study, Finland, one way to promote and communicate these ethical commitments is the Comenius Oath. The Oath is based on the works of a 17th century Czech philosopher J.A. Comenius in order to set guidelines for the core values and principles for educators across disciplines. Globally, there are several national or even state-level (e.g. USA/Mass.) loyalty oaths to be used within education. The oath bearing Comenius´ name was introduced for teachers in 2017 by the Trade Union of Education in Finland.. New teachers are proposed but not demanded to take this Oath to demonstrate their commitment to the ethical values and practices of their profession, in a similar manner as the Hippocratic Oath for medical ethics. (Kuusisto and Tirri, 2021). In the current study, the potential effects of AI for education are mirrored against this Oath.

2.3. AI for education and learning

Development of AI applications and impacts in education has long roots, stemming from works such as Beck et al. (1995), where the authors focused on such themes as computer-based trainings, computer-aided instruction, and intelligent tutoring systems. Following this early interest, AI for education got stuck in the doldrums. As Welham (2008) put it: "The initial optimism in the 1980s that AI in its many different forms could revolutionise the way in which learning and training could be undertaken has waned. A large number of government-funded initiatives to support the use of technology in learning still continue but they seldom include specific emphases on the use of AI."

Lately the discussion has no longer concerned whether AI can contribute to education, but rather on wider and deeper AI adoption. Woolf et al. (2015) propose AI supports long term educational goals by providing (1) mentors for every learner; (2) learning 21st century skills; (3) interaction data for learning; (4) universal access to global classrooms; and (5) lifelong and life-wide learning.

2.4. Technology adoption and acceptance

Acceptance of emerging technologies to a professional field is affected by multiple factors beyond the technological capability and efficiency of the new solutions. Technology acceptance framework (TAM) by Venkataram & Davis (2000) points out that individual and organizational variables such as perceptions of usefulness and ease-of-use of the systems, subjective norms, quality of (new) system output, and the assessed relevance of the technology can all affect the adoption process. Perceptions and attitudes can then lead to intentions use new technology and, finally, actual usage of the novel technology.

Technology adoption is a gradual and stage-based process. The model by Venkatesh and Davis in 2000 (Figure 1) looks at technology acceptance from the level of a unique decision-maker/individual.
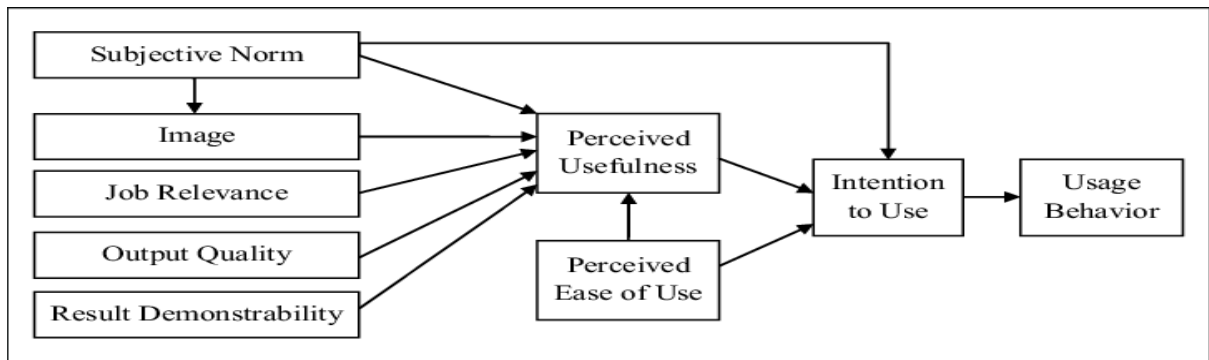
Figure 1. Technology acceptance model (Venkatesh and Davis, 2000).

From the first hints of capabilities of a new technology, also called as "technology trigger", it takes typically from 5 to 15 years until a wide market adoption (Linden and Fenn, 2003). Mikalef et al. (2018) state that one factor behind this phenomenon is the presence of multiple dimensions of organizational inertia that new technologies face for adoption in a firm context. These development-hindering forces take economic, political, socio-cognitive, negative psychology, and socio-technical forms (ibid.). One recent study indicates that these obstacles become articulated as uncertainties of technology choice and total cost of implementation (Saukkonen et al., 2019). According to Moore (1999) the reception of novel technologies materializes in five separate stages, where the customer cohort ready to adopt a technology in a given stage of market development differs from the preceding and succeeding cohorts. The accumulative technology adoption (Figure 2) starts from innovative customers and proceeds via early adopters and early majority to finally late majority and laggards, most potential lifetime users of a new technology joining at the third and fourth stages. Since a HEI consists of various schools and units as well as people with differing occupational roles, contents, and backgrounds, it is plausible to assume that the stage-like pattern of technology adoption would be applicable to this context.
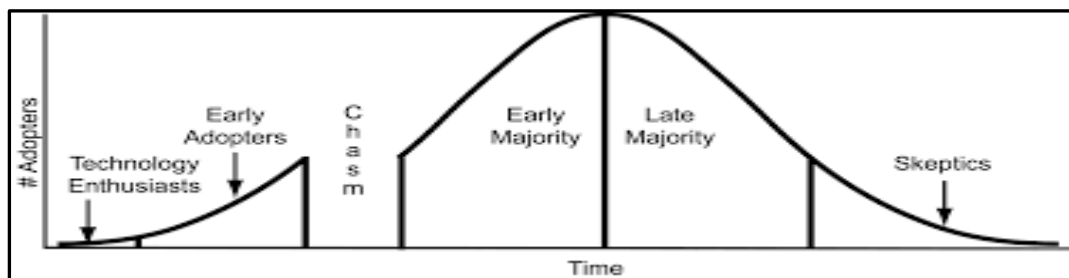

Figure 2. Technology adoption life-cycle curve (TALC) (Moore, 1999)

2.5. Ethical considerations of AI for education

The rapid development of AI technologies has brought up concerns on the viability and plausibility of the development and usage of such systems, as well as ethics and societal legitimacy of AI development (Rodrigues, 2020). The SHERPA-project of the European Union (2021) published seven recommendations for ethical standards for AI, such as a) establishing a strong regulatory framework for AI, b) coupling teaching of technical AI competence with teaching of ethical dimensions, and c) establishing ethics officer positions in AI-intensive organizations (EU, 2021). Because building and getting acceptance for different ethical measures takes place at a slower pace than AI development and usage, the unclear stance on ethics and legality can be an obstacle to AI deployment.

Related to ethical considerations specific to the educational purposes, research and discussion have brought up topics such as cloud-based and AI-backed learning platforms (Rad et al., 2018). However, in a recent empirical study, Latham and Goltz (2019) found that despite the worries of privacy and sensitive data treatment, respondents were receptive to the usage of AI algorithms within education. This was seen partly due to the usage of social media and acceptance of the lowered privacy prevalent in the context of the sampled population. However, Zawacki-Richter et al. (2019) comment that the voice of educators is sparse in AI for education (AIEd) research and discussion. The conclusions of their review reflect on a lack of critical reflection of challenges and

risks of AIEd, the weak connection to pedagogical perspectives, and the need for studying the ethical and educational approaches further when applying AIEd in HEis.

3. Research approach and method

This research is of an exploratory nature. Exploration in seen as a viable research approach when the research aims at (1) scoping the magnitude of a particular phenomenon, (2) generating ideas about that phenomenon, or (3) testing the feasibility of establishing more extensive studies regarding the phenomenon (Bhattacherjee, 2012).

The data was collected within the personnel of a Finnish HEI in February-March 2021 as a voluntary and anonymous online survey using the Webropol-survey tool. In this study, we used the following demographic variables: Respondent's age, work experience, educational level, field of science and the main content of the job at the HEI. The respondents' self-perceived knowledge level of AI was measured by their views on the impact (in magnitude and in positivity/negativity i.e., the quantitative and qualitative impact) of AI adoption to purposes, principles, and contents of Higher Education reflected against the statements in the Comenius' Oath. The survey also included a question about the sources where personal AI knowledge base was obtained. Finally, the perceptions of the HEI/Unit/Individual belonging to tech adoption cohorts of TALC-model were assessed.

The dataset consisting of 80 respondents of the total personnel of 744 people was analyzed using descriptive statistics. The respondent sample represented the overall personnel relatively well. Of the respondents, 56 % were women (59 % of personnel total) so the gender structure of the sample was representative. The median age was close to 50 years both among the respondents and the personnel in total. Looking at the respondent pool via categories based the main content of their jobs, it can be stated that there was an overrepresentation of the teaching personnel (56 % of the sample/48 % of the personnel), whereas RD&I-personnel were represented in a balanced way (15 %/15 %), and other personnel categories (e.g., management and support functions) were underrepresented (29 %/37%). The more active participation of the teaching personnel is understandable, as the survey focused on educational themes. However, all personnel groups within the studied HEI participate in the planning and implementation of education, so addressing the survey to all employees was justified, as it enabled us to investigate the views across occupational groups. The study did not proceed to analyze deeper the differences between different respondent groups, as the technology adoption cohorts made of 80 respondents in total would have made the cohorts too small for statistical analysis.

4. Results

The respondent sample included people with varying knowledge and experience of AI as Figure 3 shows, though a clear majority perceived their knowledge of AI to be at a modest/basic level in general terms.
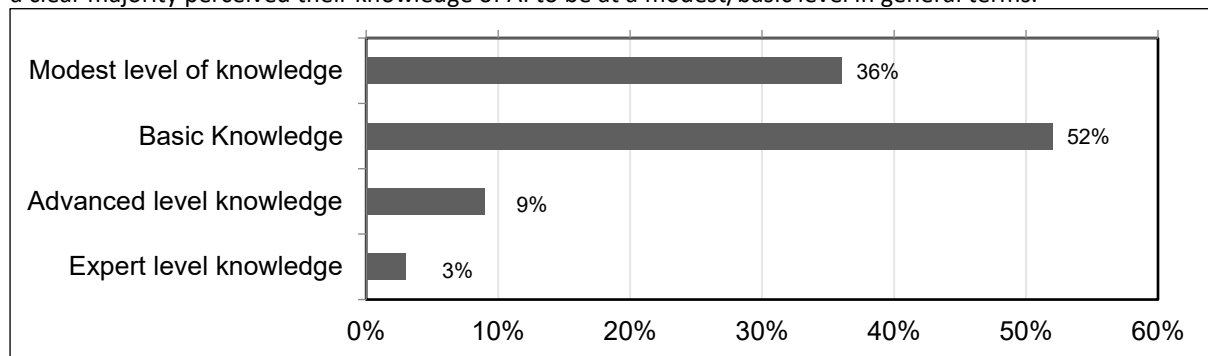

Figure 3. Respondents´ self-perceived level of AI-knowledge

However, when compared to their colleagues at the HEI-level, 33 % identified themselves to the cohort of above the average level, 25 % to the average level, and 52 % to the below average level in AI knowledge. When

compared to the peers at the respondents' own unit, the cohort of above average knowledge was chosen by only 20 %, average level by 30 %, and below average by 50 % of the respondents.

The most mentioned sources of AI knowledge (Figure 4) were mass media (74 %), professional media (46 %), and professional discussions within the HEI (39 %). AI knowledge that was based on personal practice (using, researching, or teaching AI) or formal AI-related studies were still rare in the HEI at the time of the data collection. The same knowledge sources also stood out when asking the respondents to rank the three most important sources of AI knowledge.

no knowledge — 1%
— 74%
Professional media — 46%
— 25%
Professional discussions within the HEI — 39%
— 18%
Scientific publications — 25%
— 13%
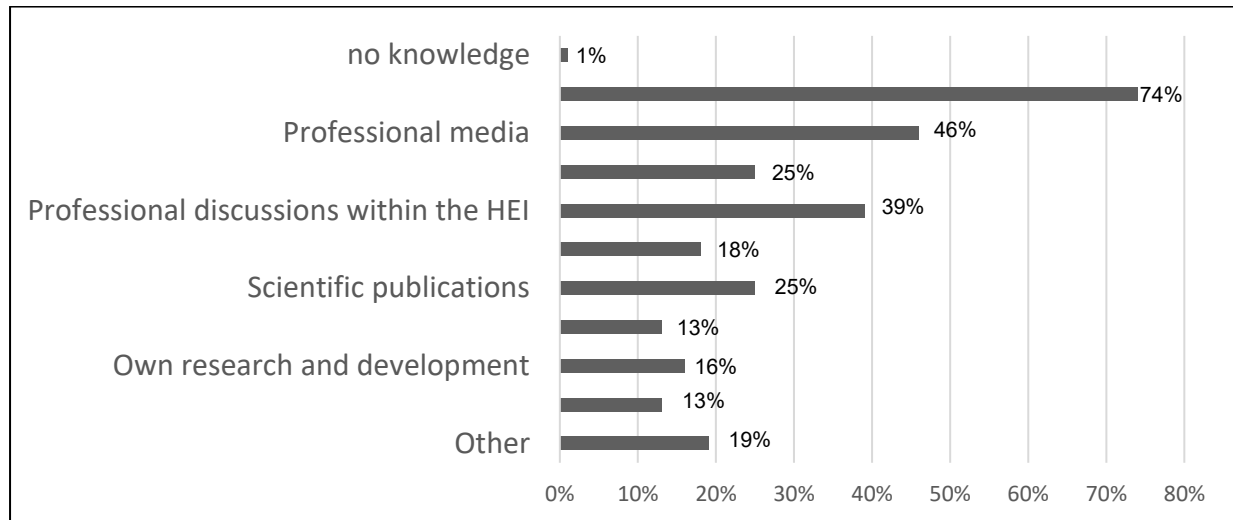Own research and development — 16%
— 13%
Other — 19%

Figure 4. Origin of AI knowledge (multiple choice, percentage of respondents mentioning the knowledge source)

Table 1: Chi-square differences between the perceived level of AI knowledge and the source for AI knowledge (n = 80). Note. T = typical, AT = atypical, adjusted residuals that exceed +/- 2. * $p < .05$, ** $p < 0.01$, *** $p < 0.001$

Knowledge level	Knowledge source Mass media $\chi^2(3) = 7.83$*	Professional media $\chi^2(3) = 12.40$**	Professional discussions outside HEI $\chi^2(3) = 4.12$ ns	Professional discussions within HEI $\chi^2(3) = 1.84$ ns	Studies in AI $\chi^2(3) = 9.00$*	Scientific publications $\chi^2(3) = 8.13$*	Usage of AI-based systems $\chi^2(3) = 17.84$***	Own research and development $\chi^2(3) = 13.77$**	Own teaching on AI $\chi^2(3) = 22.32$***
Modest	24	6_AT	4	10	1_AT	3_AT	1	1_AT	3
Basic	31	25_T	14	18	9	12	4	7	2_AT
Advanced	4	5	2	3	3	4_T	4_T	4_T	3_T
Expert	0_AT	1	0	0	1	1	1	1	2_T

As Table 1 shows, the people who self-assessed their knowledge to be advanced or expert level based their knowledge on academic sources and own practice (in AI usage, research and education), whereas the lower level knowledge relied more on professional media.

Altogether 85 % of the respondents described their overall attitude to AI as positive (somewhat or clearly positive), 11 % as neutral and 4 % as (somewhat) negative. More specifically, the attitudes towards the role of AI *in education* were 76 % positive, 20 % neutral, and 4 % negative. To summarize, the respondents had some reservations on the usage of AI in educational context.

When the respondents were asked to compare the whole organization with other HEIs, their unit with the other units within the whole organization, and themselves compared to the five categories of the TALC-model, the results (Figure 5) repeated the same pattern, independent of the point of reference. Thus, based on these results

AI adoption was not seen as being subject to organizational inertia, as the person-level intentions were matched with perceptions of how the adoption of AI proceeds in different organizational levels.
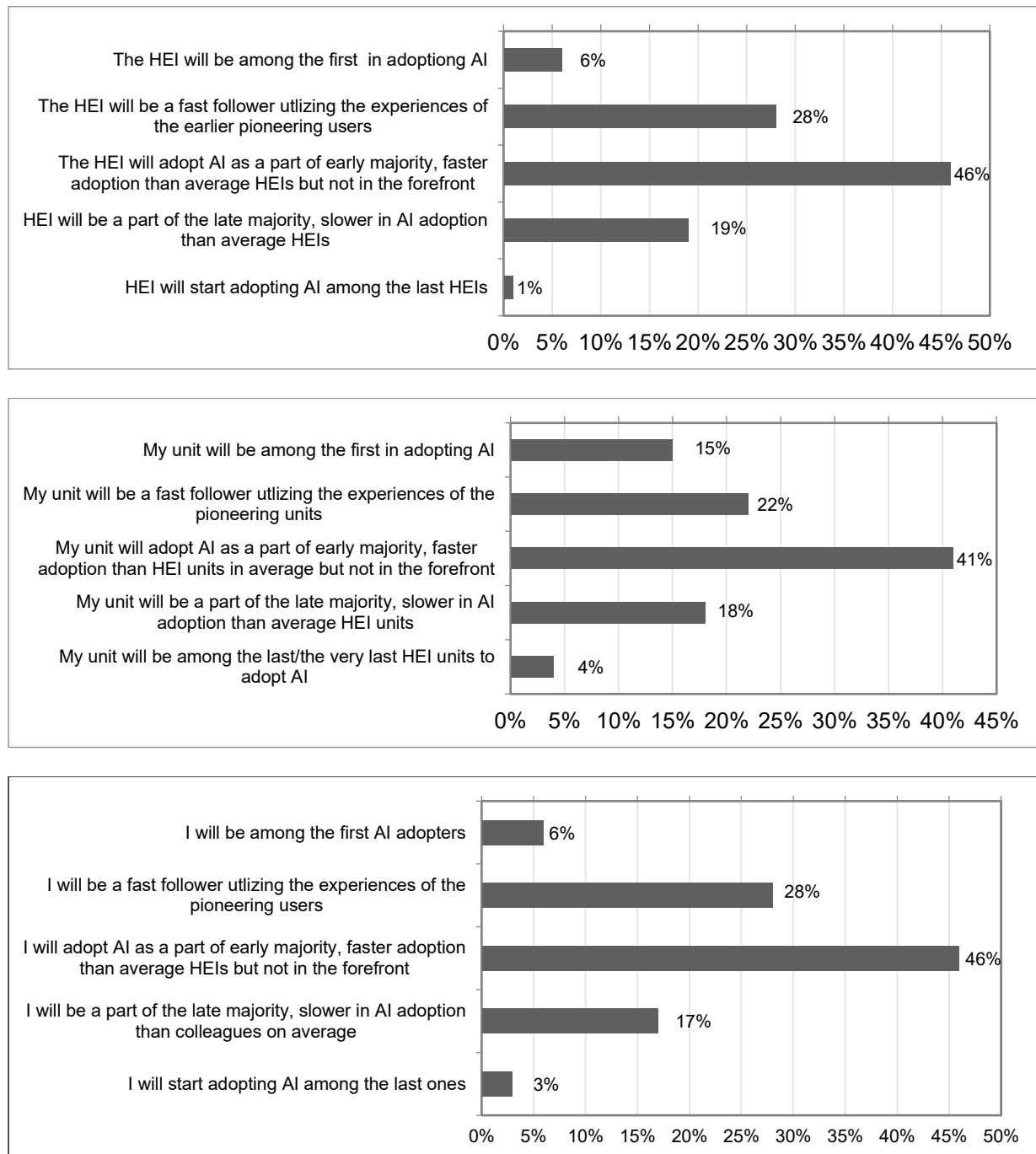

Figure 5. Assessments of HEI/unit/individual belonging to AI adoption cohorts according to the TALC-model

The overall view on *the magnitude of the impact of AI* to the ethical dimensions of education (as expressed in the Comenius' Oath) are presented in Table 2a. Both the highest values (in **bold** font and cells shaded in darker grey), as well as the lowest values (in *italic* font and cells shaded with lighter grey) for the average scores and standard deviations of each item are highlighted. The results show joint trust in the potential of AI to enhance education in a way that serves the needs of learners for the future (high average in the values of impact and low standard deviation). The other elements perceived as highly impacted by AI were related to the renewal of human knowledge reserves (although with relatively high deviation, so that the views on the impact differed between respondents) and the role of AI in teachers' efforts to improve in their profession.

The lowest impact of AI was associated with issues related to the protection of individuals' right to form their own convictions and to be protected from exploitation. On average, these dimensions were ranked as technology-neutral, but as the standard deviation indicates, there were discording views on these issues. In addition, the commitment to the goals of the teacher profession and collegial support were seen rather as being rather unimpacted by AI technology.

Table 2a: Quantitative AI impact to the elements of Comenius' Oath

	1= AI has no impact	2= AI has a minor impact	3 =AI impact not small nor big	4=AI has quite a big impact	5= AI has a very big impact	Mean	Std. Dev.
As a teacher I am engaged in educating the next generation, which is one of the most important human tasks.	2.70%	20.30%	27%	36.50%	13.50%	**3.33**	**1.11**
My aim in will be to renew and pass on the existing reserve of human knowledge, culture and skills.	1.30%	8%	26.70%	48%	16%	**3.69**	0.88
I undertake to act with justice and fairness in all that I do.	12%	24%	34.70%	20%	9.30%	2.9	**1.14**
I promote the development of my students, so that each individual may grow up as a complete human being in accordance with his or her aptitudes and talents.	8%	17.30%	44%	24%	6.70%	3.04	**1**
I will strive to assist others responsible for working with students in their educational functions.	8.10%	14.90%	37.80%	32.40%	6.80%	3.11	*0.13*
I will not reveal information that is communicated to me confidentially.	18.70%	12%	25.30%	41%	6.90%	3.12	*0.12*
I will respect the privacy of students and protect their physical and psychological inviolability.	18.70%	16%	29.30%	49.20%	7.00%	2.97	0.14
I will endeavour to shield the students in my care from political and economic exploitation.	22.60%	12%	34.70%	58%	7.10%	*2.84*	0.18
I defend the rights of every individual to develop his or her own religious and political convictions.	24.30%	10.80%	33.80%	66.00%	7.20%	*2.76*	0.21
I will make continuous efforts to maintain and develop my professional skills.	1.40%	9.30%	29.30%	40%	20%	3.68	0.14
I commit myself to the common goals of my profession and to the support of my colleagues in their work.	25.30%	8%	41.30%	18.70%	6.70%	*2.73*	*0.13*
I will act in the best interests of the community at large and strive to strengthen the esteem in which the teaching profession is held.	20.50%	6.90%	28.80%	30.10%	13.70%	3.01	*0.09*

As seen in Table 2b, the responses regarding *the qualitative impact of AI* on teaching resonated with the overall positive attitude on AI reported earlier in this study. The potential for most positive impacts of AI were evaluated (in line with the magnitude of impact) to concern the orientation towards the future of the learners, the renewal of the human knowledge pool, and the commitment to individual development in the profession. The elements of the Oath with the least positive views were related to the protection of rights and individualism of the learners. However, even in these cases the assessed AI impact was neutral. An interesting finding related to the items with the highest standard deviations. Compared to the other elements of the Oath, the respondents had more diverse opinions on how AI might impact the protection of privacy and rights of the learners. The respondents had a positive attitude to the effect of AI to the esteem of teacher profession. This suggests that AI is seen as a human-enhancing/human-supportive technology for teachers. The potential of AI in helping teachers to collaborate with other actors working with students was also seen positively.

Table 2b: Qualitative impact of AI to the elements of Comenius' Oath

	1=AI impact clearly negative	2= AI impact somewhat negative	3=AI Impact not negative nor positive	4= AI Impact somewhat positive	5=AI Impact clearly positive	Mean	Std Dev.
As a teacher I am engaged in educating the next generation, which is one of the most important human tasks.	1.40%	6.80%	42.50%	31.50%	17.80%	**3.57**	*0.91*
My aim in this will be to renew and pass on the existing reserve of human knowledge, culture and skills.	0%	1.40%	25%	55.60%	18%	**3.85**	0.83
I undertake to act with justice and fairness in all that I do.	5.50%	9.60%	45.20%	30.10%	9.60%	3.29	*0.96*
I promote the development of my students, so that each individual may grow up as a complete human being in accordance with his or her aptitudes and talents.	2.70%	9.60%	49.30%	31.50%	6.90%	3.3	0.84
I will strive to assist others responsible for working with students in their educational functions.	2.70%	2.70%	48%	39.70%	6.90%	3.45	*0.78*
I will not reveal information that is communicated to me confidentially.	9.70%	13.90%	43.10%	26.40%	6.90%	3.03	*1.1*
I will respect the privacy of children and young people and protect their physical and psychological inviolability.	6.90%	21.90%	43.80%	20.50%	6.90%	*2.98*	**0.99**
I will endeavour to shield the students in my care from political and economic exploitation.	6.90%	17.80%	53.40%	15.10%	6.80%	*2.97*	0.94
I defend the rights of every individual to develop his or her own religious and political convictions.	5.50%	16.70%	52.80%	19.40%	5.60%	*2.98*	**0.96**
I will make continuous efforts to maintain and develop my professional skills	0%	1.40%	28.80%	49.30%	20.50%	**3.89**	*0.73*
I commit myself to the common goals of my profession and to the support of my colleagues in their work.	4.20%	5.50%	52.80%	30.60%	6.90%	3.26	0.93
I will act in the best interests of the community at large and strive to strengthen the esteem in which the teaching profession is held	4.20%	1.40%	54.20%	31.90%	8.30%	3.34	0.92

5. Conclusions

The research questions set for the study can be answered as follows:

RQ1: How do the respondents evaluate the potential impact (both in magnitude and quality) of AI in education?
Our results indicate that overall, the personnel of the studied HEI had a positive perception of AI adoption to the field of education. Based on the findings from our primary data, the adoption of AI technologies in higher education is seen as a necessary update to the skills and capabilities of individuals involved in education. AI adoption would also serve the needs of the new generations impacted by education. There are more critical views on how AI impact to privacy and other individual rights and the personal integrity of the students. In these issues the views also differed between the members of the studied HEI (based on higher standard deviation).

RQ2: What is the perceived preparedness of the respondents and the HEI to adopt AI in educational processes (at individual, unit, and the whole HEI levels)?
At the time of data collection, majority of the respondents self-evaluated to belong to lower-level categories in AI knowledge. For this TALC-segment in terms of the likely AI-adoption pace the main source of AI knowledge had been mass and professional media. Whereas for those who identified themselves with the advanced knowledge level , own AI-related action (system usage, research, teaching) was typical knowledge base
The studied HEI seems to be adoptive to AI technologies, as the anticipated adoption of AI was following the same pattern at different levels of assessment (organization, unit, individual). This suggests that the organizational inertia was not regarded to be a problem. Interestingly, the belief of respondent is that their unit is likely to in the forefront of AI adoption was clearly stronger (15 %) than the belief that the respondents themselves (6 %) or the whole HEI (6%) would belong to the pioneer/innovator categories of TALC. Potential interpretation for this is that in different units, there are "known champions" i.e. key persons, whose knowledge and preparedness for rapid AI adoption and development could lead the whole unit to a pioneer level.

Theoretical implications

Our findings suggest that the technology acceptance models within organizational context, and more specifically within educational context, should contain the considerations in the ethical dimension. As the AI usage in education is likely to increase at an accelerating speed, the members of HEI community not yet active on AI will face the new technology as a forced change, chosen to use by the organization/management rather than by individual user. The availability of such systems on the level of the organization does not automatically lead to intentions, voluntariness, or actual usage of technology, as the TAM model also states.

Practical Implications

Our respondent pool expressed some concerns as to how teachers and the educational system will be able to act on the issues of integrity protection for the benefit of the learners, educators, and the community at large. These questions challenge the teacher role and identity in the AI-laden future to a certain extent. The Comenius' Oath, which is still largely in use, appears to be a statement so general by its nature that it mostly bends also to the needs of the AI era. However, our results indicate that educational institutions should evaluate, discuss, and even update their ethical principles in the new technology context, since the ambiguity of ethical implications of new technology can either lead to unwanted consequences of AI adoption (if ethical concerns are ignored) or hinder its development (if ethical concerns are not solved in time).

6. Discussion

When studying a rapidly developing AI technology landscape and its implications, the conclusions and contributions of a single study face the risk of obsolescence. Therefore, longitudinal studies are needed to update the findings and cumulatively add to the knowledge of AI adoption and attitudes to AI.
Due to potential context specificity, a comparative study with other HEIs in the same societal setting or in different national contexts would add value to the contribution to the field of study. Another important strategy would be to aim for a deeper understanding of the way people construct their meanings and interpret the opportunities and challenges of emerging technologies to their occupation and professional identities. To achieve that, qualitative research on these topics would serve the purpose. Action research combining the actual

technology usage and combining actual technology usage with the investigation of how it impacts professional contents and identities would offer more understanding of the patterns of technology adoption.

The research in hand did not test the feasibility of the existing ethical code of educator´s profession. However, it can be stated that the ethical code chosen as an instrument of the study – the Comenius' Oath – is of very general nature and there were minor differences perceived AI impacts to the elements of the code. This result indicates that more specific principles and rules are needed to guide actors in educational context to implement AI systems in a just and ethical way.

As the findings indicate, the overall responsiveness to AI was on a high level despite the self-perceived modest level of current AI knowledge. This suggests that in order to understand attitudes for new technologies - following the idea by Shepman and Rodway (2020) – both comfortableness with the new technology and capability in the new technology should be studied.

Our study touched the meta-level of ethics research i.e. it investigated principles and concepts of ethics in an AI-laden future. The level of normative ethics was present in the used professional Oath as a potential normative base, but as we state above, needs more pragmatic adaptations to match the new operating environment where AI is present. At pragmatic level, applied ethics that means actions that the HEI and its members take in their operations is the final outcome of implementation of ethics e.g. to AI-enhanced education. We propose that organizations independent of their field of activity would proceed logically if they discussed 1) on meta-level what ethics mean in their context to 2) how it should be applied as processes and principles and finally 3) what practical steps are taken so that the AI supported processes established will become organizational and individual practices in an ethically accepted manner.

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