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Artificial Intelligence for Career Guidance – Current Requirements and Prospects for the Future

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Abstract

Career guidance in the era of life-long learning faces challenges related to building accessible services that bridge education and employment services. So far, only limited research has been conducted on using artificial intelligence to support guidance across higher education and working life. This paper reports on development on using artificial intelligence to support and further career guidance in higher education institutions. Results from focus groups, scenario work and practical trials are presented, mapping requirements and possibilities for using artificial intelligence in career guidance from the viewpoints of students, guidance staff and institutions. The findings indicate potential value and functions as well as drivers and barriers for adopting artificial intelligence in career guidance to support higher education and life-long learning. The authors conceptualize different modes of agency and maturity levels for the involvement of artificial intelligence in guidance processes based on the results. Recommended future research topics in the area of artificially enhanced guidance services include agency in guidance interaction, developing guidance data ecosystem and ethical issues.

Keywords: agency, artificial intelligence, career guidance, data, ethics, higher education

Wide-ranging and dynamic changes in working life have increased the dynamism of the labour market and transformed attitudes towards careers. There is a rising demand for learning across all education levels and age groups. This poses novel challenges for career guidance services at higher education institutions.

The focus on continuous learning highlights the need for lifelong career guidance (Toni & Vuorinen, 2020). In Finland, a national strategy for lifelong guidance positions career guidance to support individuals to be able to recognize their skills and mirror them with not only the opportunities and needs of the labour market, but also the opportunities to develop their competence (Strategy for Lifelong Guidance, 2020). This enables individuals to make meaningful plans and decisions relating to education and career paths. The expectation is that investment in guidance services can reduce dropouts, enhance completions of degrees and speed up transitions to labour market. Innovative lifelong career guidance practices can support these through upskilling and reskilling competencies and by enhancing career adaptability (Barnes et al., 2020).

Growing demands exist on the delivery and development of services for career guidance, extending the expected uses and broadening the scope of services. Various actors within the educational system, labour market as well as the social and health sector provide career guidance. As needs for guidance grow it is necessary for them to utilize digital services to save resources as well as increase value to career guidance (Toni & Vuorinen, 2020). Smart technologies can play a role in supporting both guidance practitioners and lifelong learners.

This article addresses supporting career guidance through novel technology. A multiple methods study is reported on the adoption of artificial intelligence (AI) for enhancing career guidance services in higher education. Requirements and opportunities for guidance interventions through intelligent technologies are analysed based on results from focus groups, scenario work and practical trials. Based on these, further research directions are recommended, including the effects to agency, emerging career information environment and maturity levels for leveraging AI in career guidance.

Literature Review

Guidance, Career Guidance and Lifelong Guidance

Guidance aims to support individuals building their own life paths by enhancing their ability to use their own capabilities and resources (Peavy, 2000). Guidance covers a range of individual and collective activities relating to information delivery, counselling, competence assessment, support, and teaching decision-making and career management skills (Council of the European Union, 2008).

Career guidance refers to services and activities intended to assist individuals, of any age and at any point in their lives, to make educational, training and occupational choices and to manage their careers (OECD, 2004). Within this definition, both individual and group guidance activities are included. The services range from information provision, to self-assessment and on to counselling with professional guidance staff. In recent years, the focus of career guidance has turned to needs for reskilling and upskilling within continuous education (Toni & Vuorinen 2020).

Agency in Guidance

Guidance aims to support the agency of the students. Agency is necessary and needed for students in the learning process, constructing knowledge and engaging in collaborative practices (Jääskelä et al., 2020). Agency as a concept comprises activity to prioritize, choose, and consider what is important and worth aspiring for and make decisions on one's professional identity and life (Eteläpelto et al., 2013).

Bandura (2001) describes three modes of agency: personal agency, proxy agency and collective agency. Personal agency is the direct mode of agency, exercised by the individual. Proxy agency consists of relying on others in acting and relying on other persons' resources and knowledge. Collective agency is constructed in groups through shared, collective acts.

In education these modes of agency have been modelled in pedagogical learning agents (Kim & Baylor, 2006), where such agents proved useful for modelling the social-cognitive perspectives of human and technological agents. Jääskelä et al. (2020) have also utilized the agency construct in investigating the use of learning analytics in the construction of agency.

Technology in Guidance

Digital tools can provide individuals with novel opportunities to access guidance any time or place as well as expanding the range of services offered. The potential benefits of using technology in career guidance include improved accessibility, increased access to information, assessment, and networks as well as lowered overall costs and improved cost-effectiveness (Sampson et al., 2020). The ongoing pandemic has increased the need for distance and digital services for guidance (Cedefop et al., 2020).

Guidance staff have traditionally used technology in three ways, providing: 1) learning and career information supporting career building, 2) automated interaction like career assessments, simulations or games and 3) choices of communication (Hooley et al., 2015). The development of integrated or blended guidance – guidance via digital means – requires guidance professionals and service designers to plan what technologies to use and how (Bakke et al., 2018).

The integration of new and emerging technologies into guidance services depends not only on the users' skills or technical solutions, but also on the willingness of guidance organizations and professionals to adapt (Kettunen & Sampson, 2019). The extent to which technology is integrated into guidance practices varies based on the capacity and technological orientation of staff (Kettunen et al., 2013).

AI in Education and in Guidance

In this study, artificial intelligence is defined as intelligent agents that receive percepts from the environment and take actions that affect that environment, following the definition by Russell and Norvig (2016). These agents can mimic cognitive functions such as learning, understanding, reasoning and problem solving.

The uses of AI in education have been developing for decades. Moreno-Guerrero et al. (2020) describe the trends in the study of AI in education between 1956 and 2019 based on a bibliometric analysis, concluding that while early studies centred more on technological process, more recent investigations focus on the development of AI as situated in pedagogical process.

The recent advances in AI are expected to have profound impacts on future labour markets and competence requirements, as well as enabling new ways of learning and teaching (Tuomi, 2018). According to research and review studies (e.g. Khare et al., 2018; Martiniello et al., 2020; Zawacki-Richert et al., 2019), AI can be used in education to support various functions such as student self-regulation, motivation and well-being, personalized learning support and feedback, learning process support, assessment and evaluation, profiling and prediction, usability and accessibility, resourcing, and competence management.

There exist few studies on the affordances of AI in career guidance. Khare et al. (2018) investigated the effect of artificial intelligence on the student experience, including support throughout students' studies. They concluded that AI can positively influence students and organizations, structures, processes and people that make up educational systems. While Khare et al. do not explicitly situate their study within guidance, the practical examples along the student lifecycle support the reflection on skills and learning opportunities and transitioning to working life, which comprise major functions of career guidance.

Digital services are at the core of education services for the future. However, technology does not serve only a utilitarian role in education. AI and education have a manifold relationship (Attwell et al., 2020; Roll & Wylie, 2016; European Commission, 2019). First, AI-related competences should be built up in education as they are required for future work environments where AI is utilized. Second, AI-based technology may be utilised in learning and teaching processes, integrated into existing learning environments, or by leveraging intelligent environments for educational purposes. Third, AI should also be further developed for the purposes of education.

When artificial intelligence technology is used in guidance interaction, it may also change or moderate the creation of agency. Ågerfalk (2020) posits digital agency as the capability of machines to act autonomously, but on behalf of humans, organisations and institutions. The impact of AI on digital career guidance practices could thus be further studied through agency.

Method

Framework and Research Questions

This article contributes to the body of work on digital technologies, namely artificial intelligence, in career guidance, education and lifelong learning. This study was conducted using the theoretical framework of socio-cognitive agency and its extensions to human-technology interaction.

The following research questions were posed:

- What requirements for using artificial intelligence in career guidance are identified by students and staff?
- What possibilities exist for using artificial intelligence in career guidance?

Methodological Approach

The study employed a multiple methods approach. Complementary methods were used seeking elaboration, enhancement, and clarification of the results obtained via one method with the results from other methods (Greene, 2007). Following a convergent parallel design, the different strands of the research were performed independently, with results brought together in the overall interpretation (Creswell & Plano Clark, 2011).

Research ethics practices of the participating universities were followed and necessary permits obtained from individual informants. Participants were recruited via advertisements from students and staff of participating organizations, representing potential users. For scenario workshops, public events and snowball sampling were also used. Participants gave permissions to use their personal data in trials. Privacy notices were issued according to the EU General Data Protection Regulation.

Focus groups. Seven focus group sessions on the use of AI in career guidance were run dedicated to either higher education students (total 11 persons) or guidance staff (14 persons). Discussions were facilitated on ideal guidance situations, use of technology to support guidance, and development needs in guidance services. Thematic analysis was conducted on qualitative researcher notes from focus groups.

Scenario work. Scenarios or design fictions (Cox et al., 2021) were co-created as narratives encapsulating possible futures where AI is used to support student guidance. Seven scenario workshops were organized with higher education and vocational education guidance staff (n=333). An iterative design process was employed, where the scenarios were gradually refined. First, workshop discussions were used to form initial scenario narratives. Feedback was gathered in subsequent co-design workshops based on which the scenarios were then elaborated. The scenarios serve as the output of the research as well as being used as part of a process of raising awareness (Tsekleves et al., 2017) on AI.

Trials. Two sets of practical trials were conducted utilizing AI in guidance services. AI applications were developed based on previous surveys at the institutions to support 1) course recommendations 2) job recommendations and 3) skills profile creation. Higher education students (n=179) and vocational education students (n=103) participated in the development and trials in their institutions, giving input via hackathons, design jams, workshops and qualitative user testing organized. Surveys requested feedback on the first trial and qualitative feedback was gathered for both trials. Trials utilized personal data of the students, curriculum data, national qualification data and job ads from various public and commercial web portals. The applications combined machine learning and data mining techniques with existing commercial mobile student services and AI components.

Findings

Requirements for AI in Career Guidance

In focus groups, artificial intelligence solutions were envisioned to support students in studies and career planning but also in self-management. Students welcomed the use of AI in career guidance. They emphasized the importance of accessible and timely guidance, whether delivered by AI or humans. AI was seen to have a role via detecting weak signals and potentially giving a “nudge” towards guidance interventions before either the student or staff would know to act.

Students described that any AI-enabled process should be part of everyday learning activities, not a separate application. Students brought up needs to manage their schedules and workloads, and to find suitable study methods. Students described needs for better communication and feedback with teachers and students. Students also mentioned the importance of peer support and discussed the potential role of AI in mediating this.

Students envisioned that artificial intelligence could support them in recognising their strengths and weaknesses, enabling their development. They wanted to use AI to compare their skills to the competence requirements of specific fields or positions, as well as general working life competences. They saw potential in AI applications that propose studies, thesis topics, work placements and jobs based on skills, experiences and interests. Staff envisioned a role for AI in recognition and accreditation of prior learning as well as predicting future competence needs. Staff discussed the competence or skill data used by AI. They recognized that while various data sources already exist, these are not necessarily available for students. Collating this data via AI would enable students to have a more active role in their own learning and career planning.

Guidance staff saw artificial intelligence in a supporting role to their work, balancing out the benefits and risks of incorporating technology into the guidance process. Staff hoped that AI applications could assist them in routine administrative tasks and relying information. This would free up time which they felt would be better used interacting with students in order to create relationships and build trust, and to engage in case management.

Staff also recognised that AI technology could replace human effort in some areas, changing their role and tasks. Staff cautiously welcomed this, with the expectation that the utilization of AI would enable them to allocate time to tasks where human interaction is needed. “Human touch” was considered valuable for finding opportunities, supporting decisions, detecting silent signals, interpreting affective states, motivating and encouraging, creating a safe atmosphere as well as relaying empathy and hope. Staff described these from the viewpoint of the skills needed while students described preferring human counsellors in these situations.

Finding, accessing and relaying information on for example curricula and schedules was considered difficult and time-consuming. Students and staff envisioned that AI could assist in delivering the right information at the right time. They described a proactive process, extending to information not yet needed to be known. Students and staff envisioned that AI would advise to book a guidance session when needed, supporting case management. This would enable staff to “triage” cases, taking action more quickly when needed. Staff stressed the significance of designing how to determine the urgency and importance of issues. Both students and staff hoped AI would aid in detecting and visualizing study progress based on the activity and performance data generated on online learning platforms and other digital services.

Scenarios for Future of AI for Career Guidance

Scenarios encapsulated the potential roles of AI in career guidance into narratives. The scenarios were linked to various phases along the study path, from initial application to studies, across studies and transition to employment, and linked to competence development within the continuous learning paradigm. The working of intelligent technology was described both from the viewpoints of student and staff as well as describing implications for the higher education institutions at large.

The following were the most elaborated among the resulting twenty-one scenarios:

- Supporting career planning: supporting decision making throughout career, promoting available career services based on situational information
- Enhancing interaction in counselling: matching students and counsellors, collating previous guidance discussions to a knowledge base

- Recognizing and verbalizing existing skills: creating a competence portfolio, recognizing generic competences from work experience
- Comparing competences to goals and needs from working life: offering self-assessment tools for competence mapping, inferring competence gaps based on profile data
- Anticipating guidance needs and case management: collating information on the student for staff to see at a glance, prioritizing tasks for staff
- Recognizing networks: enabling access to up-to-date information sources on career services, leveraging existing contacts for employment opportunities

In scenarios, staff envisioned services they could use as aids when delivering guidance interventions, such as automated Q&A solutions, scheduling aids and analytics dashboards. For analytics, early warning detection systems were planned, but also systems that would highlight student successes. Staff indicated that they would like to collaborate on AI-enabled platforms, sharing information between guidance professionals.

For their students, staff described potential AI assistants for fact checking information online in social media and for recognizing skills via self-reflection. When discussing the potential of AI for student use, staff assumed that it might depend on the individuals and their career planning needs and capabilities.

Staff included mentions of the information and services available and necessary for implementing the scenario. The scenarios raised concerns linked to student privacy (personal data access, sensitive data) and the potential to enhance existing bad practices or biases. Questions were raised about data quality, both regarding the data available for AI and the AI outputs. The threat of being replaced by AI was voiced, accompanied by arguments on the irreplaceability of human effort in guidance. Staff expected AI to "outperform" them in consistency of interventions and recognizing underlying patterns in data and interactions. The necessary competences in organizations for acquiring, developing and running AI-enabled services were a concern.

Practical Trials of AI in Career Guidance

The first practical trial was conducted with an AI-enabled application that recommended courses and employment based on student's current study records and enrolment information. Information about available jobs and work placements came from a public database of employment offices. Notifications were sent via a mobile student app at their institution.

Giving feedback on the trial, students reacted positively to the idea of receiving suggestions and assistance ("I have so far only received one set of recommendations. They were appropriate, encouraging and rather timely"). They gave positive feedback on receiving information on the advancement of their studies ("it was encouraging to see that my studies are progressing, as I want to graduate soon"), sometimes linked to their wellbeing ("it was nice to get a message reminding me to also take rest").

Students appreciated the features of the app but found the accuracy of the AI-powered suggestions lacking. The usefulness of the app was rated at a median of 6 (out of 10, n=101) in an online survey a month into the trial. Out of the 63 students who responded they had received course suggestions 56% indicated that these courses were relevant to them. Some however noted that they were already attending the recommended courses. Lack of relevance was attributed to, for example, location ("I cannot take this course as distance learning"),

schedule ("the courses might be interesting but do not currently fit my schedule") or study field ("the suggestions are not within my major Tourism and service business, but in the field of health care"). Out of the 82 students who responded they had received job suggestions 62% indicated that these jobs were not relevant to them. Lack of relevance was attributed to, for example, location ("of course the AI does not know that I do not live in Finland"), field of work ("I am not interested in work in financial administration") or career stage ("jobs available were not for beginners").

Students wished both the information used and the delivery of the messages would be developed into more personalized direction. Students were curious to understand why certain courses or jobs were suggested and how they could provide more information for the AI on for example interests not (yet) reflected in their study or career data. Students expressed frustration when receiving multiple similar messages on the advancement of their studies, requesting more varied communication and frequently updating information.

Students hoped that they could utilize services like these when enrolment was timely and that the offering would also cover continuous education opportunities. They asked for practical features for setting up reminders and receiving study technique tips. Students envisaged that AI would mine and manage "important information" from online learning platforms, portfolios, personal email and student services serving to collate their data, enable them to control deadlines and locate appropriate services. Possible social features arose during the co-design process and via feedback, supporting networking with other students, building communality and keeping in touch with students and staff. Students recommended giving the AI "some personality"– selecting a random persona was suggested to make it more approachable. There were ideas to increase engagement and playfulness of the interaction, visualizing achievements and encouraging progress.

The second trial was conducted with a web application that utilized labour market information from commercial sources and made use of skills data more extensively. Before courses or jobs were recommended, students in two groups (n = 5 & n = 3) created their personal competence profile by compiling documents (e.g. CV) and inputting skills terms via a dedicated user interface. This resulted in a skills profile students could update when browsing courses or job ads, further refining the matches. The idea was to make the skills profile explicit, increase the visibility of the underlying matching, and enable more accurate matching.

Qualitative feedback indicates that students experienced value in verbalizing their skills and searching job ads and courses via the application. In addition to personal profiles, users experimented with creating general skills profiles for common professions in their domain, for example, sales, accounting, human resources, project management. Junior students in particular explained they are not familiar with the skills requirements of certain jobs and appreciated having a tool to explore these.

Discussion

Role of AI in Career Guidance

In focus groups, students and staff envisioned similar roles for the AI in information delivery, case management and intelligent analytics. Students tended to form concrete service ideas and describe interactions with the AI tool. Students cast AI into roles that ranged from discovery tool to pedagogical companion in their education, extending the uses to self-management tasks

(Sampson et al., 2003). Staff described AI-enabled guidance processes where the AI was an assistant to staff, rather than directly to the student.

Scenarios prompted guidance professionals to conceptualize (Tsekleves et al., 2017) new career services, where AI could be leveraged for the benefit of the student, staff and institutions. Staff even named these services and described what functionalities they should have, what data they would run on and how they would be used. When discussing the potential of AI, staff estimated that would depend on the student and their needs. References were made to matching the type and level of guidance to individual needs and types of students (Sampson et al., 2003).

Staff raised discussion about the respective roles of humans and AI. They voiced concerns, stressing the importance and role of human interventions even when facilitated by the AI process. This might reflect cautionary attitudes towards new technology and the need to mediate the interaction of students with technology. Participants envisioned a career guidance process where human and artificial effort and competences would be combined, similarly to Khare et al. (2018) who argue for a synergistic integration of human and AI support for student success. In addition to maximizing benefits, an integrated approach also moderates the risks of technology use (Fusco et al., 2020).

By Bandura's (2006) criteria, AI is not an agent as it lacks moral agency. However, the concept of proxy agency can be employed for the joint agency that users and tools possess (Neff & Nagy, 2018). This is indeed how participants described the process of developing and using AI-powered tools in guidance: extending their own competences and resources with the tools, wanting to "outsource" or "delegate" tasks to their envisioned AI collaborators capable in information retrieval, optimization, and visualization.

The construction of agency in AI-enabled guidance can be seen as an interactive process where agency can manifest via multiple modes. Table 1 details the potential role of AI in guidance on a continuum, giving examples from the study. The role of AI moves along a continuum from tool to assistant, then collaborator and eventually to coach (Kantharaju et al., 2018). This echoes the reality-virtuality continuum posited by Milgram and Kishino (1994) and the concept of augmenting human capabilities with technology (Raisamo et al., 2019).

The agency construed along the continuum expands from direct personal agency exercised with the aid of AI, to proxy agency mediated through the AI, to collective agency created together with AI and possibly even the type of symbiotic or artificial agency. Symbiotic agency is agency constructed within the human-technology interaction, where technology mediates human experiences, perceptions and behaviour, and human agency affects the uses of technology (Neff & Nagy, 2018). Kuijer and Giaccardi (2019) argue that conceptions of "artificial agency" should not focus on autonomy but the process of learning, situated and sustained in interaction. In both these constructs and along the agency continuum, the respective roles of human and machine adapt in interaction to perform optimally together.

Leveraging AI in career services may affect existing structures. Further study on the effect of AI-enabled interventions on the construction and mediation of agency in guidance is necessary in order to develop services that leverage the affordances of students, staff and technology. The construction and modes of agency should be made visible as this would further students' self-reflection and self-regulation as well as the development of guidance practices (Jääskelä et al., 2020).

Table 1
Modes of AI in Career Guidance

Mode	Role of AI	Role of human	Examples from study	Agency
AI as coach	AI acts as an interactive virtual career coach with its goal, developing career guidance practices and processes	Human guides the development of AI and data environment	Virtual career coach mentors students throughout life on career and education choices. Personal learning aid proposes competence development methods based on previous performance and preferences.	Symbiotic/ Artificial
AI as collaborator	AI learns and performs career guidance practices in real-time together with staff for a shared goal	Human works together with AI, teaching it and validating its working regularly	Virtual online counsellor delivers 24/7 guidance alongside staff. Automated weak signals detection combines with staff interventions for dropout prevention.	Collective
AI as assistant	AI assists humans in their career guidance practices in chosen areas with well-defined goals	Human assigns tasks to AI and accepts its results by case	Virtual assistant schedules meetings as needed between students and staff. Smart calendar app creates a study schedule based on enrolments and personal preferences.	Proxy
AI as tool	AI is used by humans in career guidance practices in singular tasks with set goals	Human uses AI-based tools and brings context to its results	Discovery tool maps ads against a fixed skills profile for job recommendations. Dashboard collates labour market data for analysing future competence requirements for redesigning curricula.	Personal

Expectations for AI in Career Guidance

Results from the trials reflect requirements for AI in career guidance. Students expected personalized suggestions according to location, interests, and schedule. This reflects student-centred guidance but also overall expectations towards digital services and underlying personal data. Across trials the need for a holistic learner profile became evident, ranging beyond education into personal information (e.g., interests) and informal learning (e.g., hobbies).

AI-enabled guidance services were considered inherently more accessible due to digital delivery. It was noted that their utilization requires digital devices and competences. This creates a potential conflict if students are unable to benefit from digital services, expected to enhance accessibility in temporal and spatial aspects. In order to account for accessibility, we need to pay attention to factors in the socio-technical system design, underlying algorithms and the interplay between automated and human actions (Holmes et al., 2021).

In focus groups and scenarios AI was expected to analyse vast amounts of data, mine patterns and enable proactive interventions. The trials delivered straightforward suggestions as decision-making aids but more holistic career information "wizards" were envisioned that follow student progress over longer periods. Students experimented with creating future skills profiles for professions, which could be useful for guidance staff in communicating requirements of career options.

Staff expected AI to enable them to redirect resources to more complex cases (Martiniello et al., 2020) and students benefitting from personal guidance (Sampson et al, 2003). Staff stressed the need for human connection for encounters and communication in career services, arguing for a strategic combination of human and artificial effort. Such an integrated approach (Hooley et al., 2015) could combine benefits from various technologies and moderate risks. It should be further investigated what are the areas of guidance where AI could bring most added value and how value is co-created in guidance interaction with humans and technology.

AI was seen also as a tool for guidance staff. This type of adoption could facilitate the rollout of new technology and enable development of AI-enabled services without immediate disruptions for students. Supporting staff collaboration was also a potential application of AI, echoing co-careering conceptualized by Kettunen et al. (2013) in the use of social media.

Staff wanted to clarify the responsibilities regarding AI, stressing trust and transparency within the guidance process. It was not obvious under what domain this might fall. In other words, AI in guidance might be a pedagogical (teachers), digital (IT department), or even a management (leadership) issue. This connects to the finding that the role of AI in career guidance is seen dual-fold (to support the student and to support the staff supporting the student) and that the respective roles of guidance staff and AI are diverse (staff in the foreground and AI in the background or vice versa).

Utilizing technology in guidance places novel demands on staff competences and attitudes towards technology. The particular competence requirements arising from AI have yet to be studied. Competences are required not only to use the tools in providing guidance but also for developing the services. When dealing with AI, competence for developing services would include both developing teaching data sets as well as validating the AI models. These comply with Sampson et al.'s (2020) suggestions that guidance staff should actively participate in the design, use, and evaluation of technological interventions. This evaluation should be holistic, covering the integration of AI into the process and goals of guidance in order to avoid problems and maximize the effectiveness of services.

Data for AI in Guidance

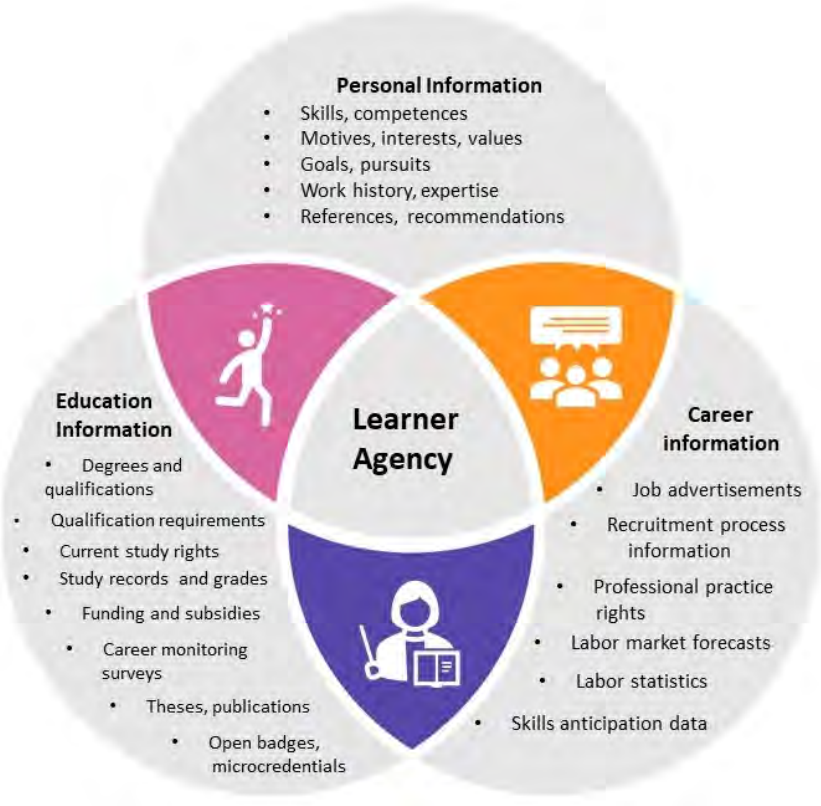
AI was described as an enabler for extending the career guidance information environment and collating data for guidance. Currently the largest bottleneck in leveraging AI technologies in education is a lack of data, especially domain-specific data (Tuomi, 2018). Intelligent tools can be useful in career guidance only if we have meaningful data for them to process. In trials the lack of location and scheduling information rendered AI-powered suggestions of studies or employment irrelevant. Data are needed first for initially training the systems, and then in a continuous and dynamic manner for delivering services. The data used to train future AI models will also shape future services.

New technologies channel greater amounts of information to individuals (Bakke et al., 2018). Further research is needed on which data are useful for the goals of career guidance. Models

and solutions on data sharing across institutions should also be developed as existing data mostly covers formal learning within a single institution. Career guidance extends this into highly dynamic labour market information. Ensuring access and interoperability in the various information sources should be a priority.

Participants referred to various information relevant to career guidance. Figure 1 categorizes these into overlapping personal, career and education information. In continuous guidance, learners should be able to control their own data, submitting it to the platforms and service providers they use for developing competences and accessing career services. This type of "MyData" approach to competence and career information would support learners' agency. Shared data would enable service providers to develop and deliver services accessible throughout an individual's education and work life, not only tied to a specific enrolment or employment.

Figure 1
Career Guidance Information Environment



Ethics and Risks for AI in Career Guidance

The interaction with AI scenarios expectedly (Tsekleves et al., 2017) prompted guidance professionals also to identify a number of unwanted and negative consequences of the service concepts described by them and their colleagues. The risks of overusing or misusing AI (Floridi et al., 2018) were present in these comments. None of the participants raised concern over potential underuse, which results in opportunity costs as the benefits offered by technology would not be realised (Floridi et al., 2018).

The concerns raised by staff related to issues of quality, control, changing roles, confidentiality, privacy and equality in career guidance services as well as necessary competences and resources for providing the AI-enabled services. Students made less explicit remarks about ethical issues. When faced with AI-powered suggestions in trials, student feedback included questions about the data used and how the algorithms work, reflecting a need for transparency.

Recently, policy efforts have been directed towards sustainable development and risks associated with AI in the education domain (Pedró et al., 2019; European Commission, 2021). These do not yet address the specific dynamics and potential of AI in career guidance. The recent AI ethics guidelines by the European commission (n.d.) may serve as a basis for elaborating shared guidelines for AI developers and guidance staff.

Methodological Issues and Implications

The convergent parallel multimethod approach aided in clarifying and enriching findings across methods. The focus groups served to mine existing user needs, scenarios extended them further into possible futures and trials provided a space to experiment on specific implementations. The contribution of various methods, including creative ones, was beneficial to the study on the role of AI. Research on human-technology interaction should be multidisciplinary, involving viewpoints and methodology from such varied fields as education, cognitive psychology, human-computer interaction, artificial intelligence, social psychology, and communications (Kim & Baylor, 2006).

The limitations of this study include biases in the participating groups and context-specificity in the national environment. The case studies relied on volunteers, which may bias participants towards technology enthusiasts. Care was taken to ensure multiple ways of engagement in workshops (voice, chat and anonymous commenting) to enable wide participation. Student age varied but most (86%) were in their first or second year of studies during trials. Wider trials are planned for advanced application.

Finland has a harmonised and effective education system, considered one of the most successful in the world (Laukkanen, 2007). The existing infrastructure made it possible to utilize certain data sources in trials, which may be unavailable elsewhere. The AI applications built for this study were mature but not cutting-edge technology. They were in Finnish for usability. There are known issues in Finnish language models for AI, caused by compound words and suffixes. Further training of the model and work on cross-language interoperability is needed.

The findings of this study can be applied when planning and designing technology-assisted career guidance services, as well as monitoring the uptake and results of AI interventions. The authors apply the maturity model of Saari et al. (2018) to the use of AI into career guidance, mapping out maturity levels in organizations (Table 2). This model supports planning of intelligent technology use and its continuous assessment. The development should tie into the digitalization strategies in higher education as well as artificial intelligence roadmaps.

Conclusion

The current technological advances and their implications for society pose a manifold challenge for education. There is a need to prepare students, staff and organizations for AI-enabled education, as well as to develop AI to better understand the education domain.

This study investigated the possibilities and requirements for using AI in career guidance, including mapping out future research considerations. Technology is not simply a tool in guidance, as it has the potential to extend and transform services and practices. AI can serve students and staff in the various modes within career guidance services, depending on user needs, staff competences and organizational capability for leveraging technology.

Table 2
AI Maturity in Career Guidance

Maturity level	Data	Technology	Processes	Services	Competences
AI-trans-formed guidance	A holistic structured data ecosystem of external and internal information in real time	Interactive AI used seamlessly in career guidance practice	Human–AI cooperation in career guidance is planned and daily	AI scaled into career guidance, creating measurable value	Active contribution by organization to AI applications in career guidance
AI-integrated guidance	Data management designed for AI and integrated into guidance processes at organization level	Real-time AI models utilized for various career guidance activities	AI integrated into career guidance at a process level	AI is an integral part of career guidance services	Networked AI team cooperates with external stakeholders and reports to management
AI-informed guidance	Valid data available in a structured format in discrete subdomains	Separate tools for AI utilized in career guidance tasks in batch mode	Automation enhanced with AI in individual use cases within career guidance	A roadmap for AI in career guidance exists, and standalone implementat ions are initiated	AI experts work as a team, bridging guidance with other processes such as research
AI-aware guidance	Career guidance data legally validated for use in AI	Traditional analytics tools used in career guidance	AI opportunities identified from career guidance processes	User needs for AI in career guidance surveyed and evaluated	Individual resources and competences for AI exist or are available through partnerships

The authors have provided suggestions for the use of AI in career guidance processes. Artificially augmented guidance is already becoming technologically accessible. However, the visions in this article remain largely unrealized or of low maturity. Further research and development are needed to develop AI-related competences, design AI career guidance solutions that add value to student and staff, integrate AI into guidance processes and roles

sustainably, enrich career data ecosystems, and ensure trustworthiness of artificial intelligence technology.

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