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RESEARCH ARTICLE

Building skills for the future of work: Students' perspectives on emerging jobs in the Data and AI Cluster through artificial intelligence in education

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ABSTRACT

The main goal of this paper is to supplement the existing literature with new knowledge in the field of artificial intelligence and education, which relates to the importance of courses in statistics, quantitative methods, and students' perspectives about emerging jobs in the Data and AI Cluster. A multidimensional model of the perceived usefulness of artificial intelligence in students' perspective about emerging jobs in the Data and AI Cluster was formed; it includes constructs students' knowledge of the meaning of "artificial intelligence", their perception of its usefulness in their studies, the perceived ease of use of AI, the perceived usefulness of statistics and quantitative methods, students' perspective on work skills for the future, and their perspective on emerging jobs in the Data and AI Cluster. The empirical research included 197 undergraduate and postgraduate students from the University of Maribor, Faculty of Economics and Business in Slovenia, who had prior knowledge of statistics obtained during their studies. The data were analyzed using structural equation modeling. The main findings of our research are important for curricula development and stress these implications: emphasis on teaching the meaning and importance of AI, integration of AI in coursework, strengthening quantitative skills and developing future work skills that are aligned with emerging trends in the Data and AI Cluster.

Keywords: education; students; artificial intelligence; statistics; quantitative methods

1. Introduction

Due to new technological achievements, artificial intelligence (AI) is increasingly present in everyday life, including in education. The use of digital technologies increases both the production and value of data, creating new opportunities to improve education and education policies and new challenges[1]. Artificial intelligence technologies have taken a big step in recent years, which are increasing day by day and are used in all fields, so there is a need in all fields of studies to develop study programs that address the use of artificial intelligence technology for the development of society and the world[2]. Artificial intelligence is a computer system that performs intelligent tasks usually associated with the human mind, such as interpreting and processing information, learning, reasoning, problem-solving, prediction, and decision-making[3]. AI in education can accelerate personalized learning, provide continuous assessment and feedback to students, and use learning analytics to differentiate the learning process so that it adapts in real-time to students' individual needs[4]. Artificial intelligence will play a key role in personalized learning, manifested in the ability to adapt

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the curriculum's implementation, the curriculum, the content of the curriculum, the pace of learning and the specific needs of each student[5]. With the use of AI, students can focus on real life problems and evaluation of information, since artificial intelligence allows analyzing large amounts of data from different perspectives and in a short time. On the other hand, the effective use of AI, machine learning, data and analytics can enable educators to deliver engaging, immersive educational experiences[6]. AI can help professors increase the effectiveness of their teaching and help them provide the ideal conditions in which their students can learn and grow[7]. By analyzing all available data sources and generating insights that will guide the creation of a personalized learning path, artificial intelligence can save professors a lot of time that would otherwise have to be spent on examining and comparing such data[8]. Data and analytics can also support effective teamwork across a faculty. Subject professors, department heads, counseling and welfare services and school leadership can coordinate efforts and collaborate in the building and delivery of individualized support programs based on a shared set of learnings and indicators[4]. Artificial intelligence in education is one of the most essential learning methods in the modern era[9].

Artificial intelligence offers students at all levels of education a number of significant benefits, each of which can result in enhanced learning experiences and improved learning outcomes[10]. AI's ability to ingest and interrogate vast amounts of data and make connections between disparate data sources can help identify areas where real-time interventions or additional assistance may be required. Extrapolating from this AI makes it possible to devise a tailored or individualized learning pathway for each student, which is specific to them and designed to accommodate their strengths, weaknesses, talents, and challenges[9,11]. Learning with artificial intelligence, in other words, incorporates artificial intelligence technologies into the classroom to improve student learning and teaching[12]. Although AI tools and technologies are being developed primarily for business and industry, many AI tools are already available to educators who want to use AI to improve student learning[13]. For example, some examples of AI tools that can be used in science and math classes are the free AI math learning app PhotoMath and an app that helps identify plant species from photos called Seek by iNaturalist. In language lessons, the Verse by Verse application can be used, where students can write a poem with the help of artificial intelligence and learn about poets, and the Duolingo application for learning foreign languages. Social studies subjects and the arts can use Newspaper Navigator, a search tool for millions of historic newspaper photos, and MuseNet for music research and creation. Tools like Socratic and Brainly can be used in all subjects. For example, an AI chatbot called ChatGPT can write comprehensive essays, writings, programming codes, and solve complex math problems. Artificial intelligence (AI) has experienced major progress in recent years and represents an emerging technology that can be important in the education sector[10]. The research conducted by Kairu[10] on 385 students shows that 39.06% agree that AI will positively influence education and 49.48% agree that AI will influence learning. Some students believed that AI can be used to track student progress (35.79%), improve teacher-student interactions (47.78%) and measure classroom engagement (55.21%). In general, the adoption of AI is expected to accelerate in the coming years as the technology continues to improve and become more widely available[14]. The impact of the use of artificial intelligence will also be seen in the creation of new occupations, with some tasks being automated or augmented by artificial intelligence, while others will remain the domain of human workers. All this will create new students' perspectives about emerging jobs in the Data and AI Cluster[15].

On the other hand, statistics and AI are interconnected fields that complement each other in many ways. Statistics provides the mathematical foundation that underlies many AI techniques, while AI provides powerful tools to solve statistical problems that were previously too complex for humans to handle. The study by Jordan and Mitchell[16] discusses the connection between statistics and AI by highlighting the role of statistical methods in machine learning, and the need for statistical methods to address challenges such as data bias,

fairness, and privacy in AI applications-statistics and machine learning are deeply intertwined, and advances in one field can inform and benefit the other. Therefore, it is not surprising that statistics, as an interdisciplinary scientific field, plays a substantial role in the theoretical and practical understanding of AI and its future development[17], which is extremely important for students and their role as future competent participants in the labor market. The development of AI systems and their theoretical underpinning has benefited greatly from computer science and statistics research, and many procedures have been developed by statisticians. Recent advances such as extreme learning machines show that statistics also provides important contributions to the design of AI systems, for example, by improved learning algorithms based on penalized or robust estimation methods.

We wanted to supplement the existing literature with new knowledge in the field of artificial intelligence and education, which relates to the importance of courses in statistics, quantitative methods and students' perspectives about emerging jobs in the Data and AI Cluster. Therefore, we developed a multidimensional model of the perceived usefulness of artificial intelligence in students' perspective about emerging jobs in the Data and AI Cluster. The basis for conceptual model developed in this paper is the expanded technology acceptance model (TAM model) that is based on the psychological interaction of the user with the technology and addresses the question of how users accept and use information technology[18,19]. The TAM has been used in a variety of studies and many different industries. It consists of a conceptual framework that beliefs about a technology's ease of use and usefulness predict attitudes towards the technology and subsequent acceptance and use[18–21].

The conceptual model, developed in this paper, includes the multidimensional constructs and relationships among them: (1) the perceived usefulness of statistics and quantitative methods; (2) the perceived ease of use of AI; (3) the student's perceived knowledge of the meaning of artificial intelligence; (4) students' perception of the usefulness of artificial intelligence in their study; (5) students' perspectives on work skills for the future; and (6) students' perspectives about emerging jobs in the Data and AI Cluster.

The present research explores the new perceptions of students on the usefulness of artificial intelligence and what skills they think are necessary for the future in the business field. In a rapidly changing society, it is very difficult for students to adapt to the changing conditions occurring in the social environment. From this point of view, it is therefore necessary to organize a pedagogically effective process[22]. Also, according to Sumakul et al.[23], many studies have shown the importance of students' perceptions in ICT technology integration, but only very few incorporate the perceptions regarding AI in the research model.

In our research, the students of the business school who take courses in statistics and quantitative methods in their undergraduate and postgraduate studies, so we wanted to investigate whether such courses are important for the students' perception of the usefulness of artificial intelligence in their studies and job search.

2. Literature review and hypothesis

2.1. Artificial intelligence in education and students' perception of the usefulness of artificial intelligence in their study

Artificial intelligence affects all aspects of human life, including education. Artificial intelligence could affect the teaching and learning process, bringing new challenges and requirements for professors and students in the field of education[24,25]. In other words, AI could change how professors teach and how students learn. AI in education offers a lot of potential for personalizing learning and democratizing education around the world[11]. It includes AI-driven educational systems, intelligent agents, autonomous scoring and assessment, and learner-support Chabot's for learner-to-learner/instructor communication and collaborative learning[26]. In

education, AI is used as knowledge representation, automated inference engine, natural language processing, computer vision, and robotics. AI and big data support personalized learning[13]. The research by Rodzman et al.[12] developed a personalized learning system (intelligent online assessment and revision) applying rule-based machine learning methods to improve the learner's performance in Malaysia. They reported 60% improvement in the learners' performance due to using the designed system. The research by Homes[27] developed a system based on AI and image-processing techniques for analyzing and classification of learner's behaviors. The research by Melesko and Eugenijus[28] presented an AI and semantic clustering-based learning analytics software agent for determining learners' learning styles. The research by Birjali and Mohammed[29] designed an adaptive e-learning model for learning and assessment based on big data and map reduced-genetic algorithm. Learning analytics include gathering and analyzing learners' related data in order to better understand and optimize the learning process[30]. Learning analytics can possibly exploit data to support learners by offering evidence-based knowledge and prediction of personal learning needs through the automated collecting of activity data from learners' interactions with learning technologies[31,32]. Study according to Sumakul et al.[23] was aimed at investigating how students perceive the use of AI in their learning. The data was collected through semi-structured interviews with 8 EFL (English as a Foreign Language) students at a university in Indonesia who had experience with the use of an AI app in their writing class. The results showed that the students had positive perceptions towards the use of the AI app. The students enjoyed the learning, and the AI app helped the students in their writing. The AI used in this study was a free web app called Plot Generator. This app offers the creation of a wide range of plots, such as movie scripts, opening lines, fairy tales, opening lines, and short stories. In general, all participants showed positive perceptions towards the use of the Plot Generator in their writing class. Regarding perceived ease of use, all eight participants agreed that the Plot Generator was easy to use. In education, students' perceptions play an important role in determining the successful integration of a particular technology into the learning activities.

Additionally, students will use technology if they think it is easy to use and beneficial to their learning. These are explained by the terms perceived usefulness and perceived ease of use in Davis' technology acceptance model[33]. The model shows the interplay of some factors affecting the use of technology. Perceived usefulness and perceived ease of use would influence the intention to use which would later affect usage behaviour; how a person would use technology[33]. A study by Kim[34] on artificial intelligence chatbots on improving English grammar skills. The study took place in Korea. The participants of the study were 70 university students. Also, the participants were from different language proficiency levels. It was between beginners, intermediate and advanced. The study aimed to discover the effect of artificial intelligence chatbots in improving foreign language university learners. Moreover, the type of the research was quantitative research. The participants were divided into two groups. The experimental group was taught grammar by using chat with the Replika app. The other group was taught grammar skills by talking with their partner. In addition, the data was collected through pre-tests and post-tests. The result of the study showed that both groups improved in grammar skills, but the group that used chatbots showed more noticeable improvement. The author found that artificial intelligence chatbots positively impacted Korean learners in learning foreign languages. Another study conducted by Obari and Lambacher[35] on using artificial intelligence to improve the English language skills of native Japanese students. The participants of the study were 47 undergraduate students. The study results showed that both groups improved in English language skills. The authors confirmed that artificial intelligence improved English language skills incorporated with 21st century skills. Davis[33] claims that when a technology is perceived to be easy, it is likely to be accepted by users. In the context of this paper, when this AI app is perceived to be easy to use, it would be likely that the students in their learning would accept it. According to this, the following two hypotheses are proposed:

H1: The student's knowledge of the meaning of AI has a positive impact on students' perception of the usefulness of AI in their study.

H2: Perceived ease of use of AI has a positive impact on students' perception of the usefulness of AI in their study.

2.2. Importance of statistics and quantitative methods in education for perceived ease of use of AI

Similar to the use of statistical support software by educational institutions to align with study programs and levels of study, quantitative methods in general apply. Research by Šebjan and Tominc[36] has shown that the need to learn about statistics exists at all levels of study. Undergraduate studies in statistics mainly focus on data management, data analysis, and numerical analysis. At the master's level, however, the use of statistics becomes more demanding, with an emphasis on multivariate methods[37]. Doctoral programs aim to equip students to use statistical tools for research independently. Some subjects require research activities, including data collection and analysis, for which students need a strong foundation in statistical knowledge[38]. The complexity of statistical knowledge increases with each level of education. Students who perform data analysis in undergraduate and postgraduate studies can effectively carry out their work with good statistical knowledge and familiarity with statistical software packages such as SPSS and other similar tools[36]. The impact of artificial intelligence on human life is revolutionary, and the field of education is no exception. Artificial intelligence has the potential to transform the way we approach education by providing insights into how students learn, personalizing the learning experience[14], improving decision-making processes, and modeling the intricate interaction between student learning, the knowledge domain, and the tools that facilitate learning. By addressing the inadequacies of traditional teaching methods and the complexities of the educational system, AI can help overcome education-related challenges[39]. Advanced algorithms and models have made statistics an essential component of AI, enabling a better understanding and adaptation of data and paving the way for an invincible future. Statistical parameters such as regression analysis, clustering techniques, algorithms, classifiers, and other tools are instrumental in driving AI towards superior results[40,41]. Thus, AI and statistics are intertwined and indispensable to each other. As an interdisciplinary scientific field, statistics plays a crucial role in both the theoretical and practical understanding of artificial intelligence and its future development[17]. According to Friedrich et al.[17] and Steyn[42], statistics can be considered a fundamental element of artificial intelligence. With its expertise in data evaluation, from formulating precise research questions to designing studies and analyzing and interpreting results, statistics naturally complements other disciplines in teaching, research, and practice. Also, statistics plays a critical role in understanding artificial intelligence, as they provide the foundation upon which data is built and connected to finance[1]. Statistical analysis has become indispensable for evaluating the financial market and assessing an investor's risk. Thus, statistics is the key tool that serves as a point of intersection between AI and finance[43]. Knowledge of statistics and quantitative methods is crucial for students to incorporate artificial intelligence into their studies, enhancing their perception of the necessary skills for securing future employment[42]. Thus, the following hypothesis is proposed:

H3: Students' perceived usefulness of statistics and quantitative methods has a positive impact on their perceived ease of use of AI.

2.3. Exploring students' perceptions: The usefulness of artificial intelligence in their studies and the skills they need for the future workplace

According to Boulay[44], AI has three primary roles in education: (1) supporting individual students; (2) assisting the entire class; and (3) helping entire cohorts of students. At the individual level, the emphasis is on customizing teaching methods and approaches to meet the specific needs of each learner. These efforts have

led to the development of "Intelligent Tutoring Systems", which have been shown to be just as effective as human tutors[44]. AI in education serves multiple purposes. At the class level, AI aims to assist teachers in managing the entire class, rather than just individual learners. Some important applications of AI in the classroom include tutoring, grading, and virtual reality-based learning, which work to improve the teaching and learning experience through effective collaboration between teachers and AI[6,45]. At the cohort level, AI analyzes learners' interactions with the system and adjusts the learning system based on the success and failure of those interactions. Key applications at this level include identifying at-risk learners, monitoring learners' interests, behaviors, and performance, and predicting dropout rates[39]. Artificial intelligence and machine learning drive growth and innovation in all industries, including education[46]. According to e-learning industry[40], AI capabilities will be integrated into approximately 47% of learning management tools in the next three years. The pandemic has drastically changed the educational landscape, necessitating the use of technology for remote learning. As a result, 86% of educators believe technology should be integral to education[40]. AI can enhance learning and teaching, enabling the education sector to evolve and benefit students and professors. AI-powered tools provide students with access to learning anytime and anywhere, allowing them to learn at their own pace without waiting for an educator[47]. Moreover, students from all over the world can obtain high-quality education without incurring travel and living expenses. By identifying a student's knowledge gaps, artificial intelligence can create a personalized study schedule for each learner, maximizing their efficiency[48,49]. Through this approach, AI tailors' studies to meet the specific needs of each student, resulting in a better learning experience. The application of artificial intelligence has transformed the evaluation of students' strengths and weaknesses[50]. By analyzing vast datasets from images, videos, and feedback systems, AI can quickly identify a student's areas of proficiency and limitations. This enables teachers to access appropriate resources to help students reach their full potential and track their progress more accurately[51]. As AI continues to evolve, it will be increasingly effective in identifying areas for improvement in teaching and measuring student performance. This advancement ushers in a new era of educational success, where every student has an equal opportunity to achieve, and none are left behind[52]. The goal of education is to equip students with the necessary skills to thrive in a rapidly changing world, we must address the impact of AI technology and prepare our students for the future[53].

Considering this perspective, we must ask ourselves what learning with AI will involve and what essential skills we should teach our students now to equip them for the future workforce. With AI's impact on the educational landscape, what skills should we prioritize imparting to prepare students for upcoming employment opportunities? For example, Mun[15] emphasizes that the top 5 global skills for 2025 are analytical thinking and innovation, active learning and learning strategies, complex problem-solving, critical thinking and analysis, and creativity, originality, and initiative. The emerging jobs in the Data and AI Cluster are Artificial Intelligence Specialists, Data Scientists, Data Engineer, Big Data Developer, and Data Analysts. The top 5 skills in the Data and AI Cluster are Data Science, Data Storage Technologies, Development Tools, Artificial Intelligence, and Software Development Lifecycle[15]. It is evident from these findings that, in addition to technical and conceptual skills, we must also develop life skills in learners to prepare them for success in a future where humans and robots coexist. Additionally, as AI technology grows, data literacy, the ability to extract meaningful insights from data, will become an increasingly important skill[54,55]. Therefore, it is hypothesized:

H4: Students' perception of the usefulness of AI in their study has a positive impact on students' perspective on work skills for the future.

H5: Students' perspective on work skills for the future has a positive impact on students' perspective about emerging jobs in the Data and AI Cluster.

Also, there are various thinking models and methods related to learning efficiency and artificial intelligence. For example, two such models are theory of inventive problem solving (TRIZ)[56] and extension theory (Extenics)[49]. TRIZ focuses on systematic approaches to innovation and creative problem-solving. In the context of education, TRIZ can be applied to enhance students' critical thinking and problem-solving skills[57]. It encourages students to identify contradictions, analyze patterns, and find innovative solutions to educational challenges. Exploring the potential application of TRIZ in the context of AI education could provide insights into how this thinking model can be utilized to improve learning efficiency and promote creative thinking in relation to emerging jobs in the Data and AI Cluster[58]. Extenics is a multidisciplinary field that combines systems theory, mathematics, and cognitive science. It focuses on the study of complex systems and the extension of knowledge beyond traditional boundaries. Extenics aims to provide a theoretical foundation for dealing with uncertainty, complexity, and multidimensional problems[49]. It offers a framework for problem-solving and decision-making in complex environments. In the context of education, Extenics can contribute to the development of innovative teaching methods that address the challenges posed by the integration of AI in the curriculum. By applying Extenics principles, educators can explore new approaches to optimize learning processes, adapt to individual students' needs, and create a more efficient educational environment[49,59–61]. On the other hand, **Figure 1** shows a multidimensional model of the usefulness of artificial intelligence in students' perspective about emerging jobs in the Data and AI Cluster. The term "Data and AI Cluster" refers to a specific grouping or domain that encompasses the fields of data science and AI. In this context, a cluster refers to the coming together of related disciplines or industries, forming a cohesive unit or community focused on a particular area of expertise. In educational contexts, the Data and AI Cluster often pertains to the study and integration of data science and AI concepts into curricula, preparing students to understand, analyze, and apply these technologies in various professional settings. It involves fostering skills in statistical analysis, quantitative methods, programming, data manipulation, and machine learning, among others, to empower individuals to leverage the potential of data and AI in their careers[15,55]. The model is based on an expanded version of the TAM, incorporating six multidimensional constructs. Šebjan and Tominc[36] summarize that the TAM is a widely recognized and frequently utilized model for assessing the usefulness of IT solutions, software support, and technologies across various scientific fields. The findings according to Šebjan and Tominc[36] highlighted several key relationships within the research model. Firstly, the perceived usefulness of statistics played a crucial role in shaping perceptions of the usefulness and ease of use of SPSS. Moreover, teacher support significantly contributed to the ease of using SPSS. Perceived compatibility with students' academic needs positively influenced the perceived usefulness of SPSS and the intention to use it in the future. Additionally, higher perceived ease of use of SPSS corresponded to a higher average perceived usefulness. While the conceptual model showed no significant differences between undergraduate and postgraduate students, there were statistically significant differences in the perception of the usefulness of SPSS and statistics between the two groups. Also, the study emphasized the importance of statistics in shaping perceptions of the usefulness and ease of use of SPSS. It also underscored the significant role of teacher support in facilitating the effective use of SPSS. Additionally, the findings highlighted the need for educational institutions to consider the compatibility of statistical software with the academic needs of students to ensure its relevance and applicability in their future careers. Sánchez-Prieto et al.[62] presented a theoretical model of technology adoption aiming to explain students' adoption of AI-based assessment tools. The model builds upon the TAM and expands it with relevant constructs for adopting this technology, including perceived usefulness, perceived ease of use, attitude towards use, behavioral intention, trust, resistance to change, and subjective norm. Study of Noh et al.[63] aimed to expand the TAM by including external factors of technology access and online learning skills. The TAM model was utilized to investigate university students' usage of digital tools and the factors that influence their intention to use these tools. Online learning skills refer to the

students' proficiency in operating computers and utilizing online tools, while technology access encompasses the condition of their computer, internet access, and availability of adequate software. Based on the results obtained from 370 UiTM Terengganu students, it was found that online learning skills had a stronger influence on perceived usefulness and perceived ease of use compared to technology access. The study revealed that perceived ease of use and perceived usefulness significantly influenced students' attitudes towards using digital tools. If students perceive that using digital tools during open and distance learning (ODL) will be easy, clear, and beneficial for enhancing their performance, they are more likely to have a positive attitude towards using these tools. Furthermore, the study found that the intention to use digital tools during ODL was primarily influenced by perceived usefulness, although attitude also played a significant role. This indicates that if students believe that using digital tools will enhance their learning effectiveness and improve their overall learning experience, they are more inclined to utilize these tools. The research demonstrated that a significant number of students have a positive intention to use digital tools in their learning activities during ODL. This suggests that students are prepared and willing to embrace digital tools for online learning. TAM aims to elucidate the factors influencing an individual's decision to adopt or avoid a specific technology or IT solution when carrying out a task, thus we built the conceptual model of our research on TAM.

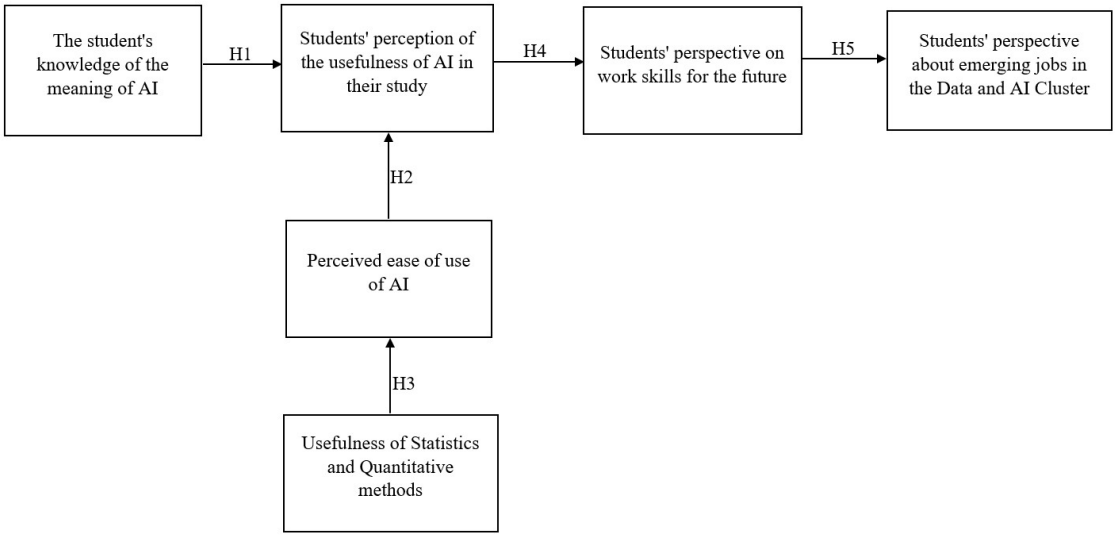

Figure 1. The conceptual model and hypotheses.

3. Methodology

3.1. Data and sample

From 1st December 2022 to 31st January 2023, 197 undergraduate and postgraduate students from the University of Maribor, Faculty of Economics and Business (Slovenia) who had prior knowledge of SPSS statistical software support during their studies were surveyed via an online questionnaire. Of the total number of students surveyed, 48% were undergraduate, and 52% were postgraduate students. The distribution of students who responded to the questionnaire based on their field of study were as follows: 2% from the field of strategic and project management, 3% from international business economics, 7% from economics, 7% from accounting, auditing, and taxation, 8% from entrepreneurship and innovation, 8% from management informatics and electronic business, 16% from finance and banking, 28% from marketing, and 21% from management, organization, and human resources.

3.2. Measurement instrument

A closed-type online questionnaire was employed as the research instrument. The students were asked to rate their agreement with the provided statements on a 5-point Likert-type scale ranging from 1, which corresponds to "strongly disagree", to 5, which corresponds to "completely agree". Items for construct usefulness of statistics and quantitative methods were adopted from Šebjan and Tominc[36], items for construct the student's knowledge of the meaning of AI were adopted from Mansor et al.[41] and IBM, items for constructs students' perception of the usefulness of AI in their study and perceived ease of use of AI were adopted from Chai et al.[24] and Rabah and Mukhallafi[25]. Items for constructs students' perspective on work skills for the future and students' perspective about emerging jobs in the Data and AI Cluster were adopted from Selenko et al.[55] and Mun[15]. In **Table 1**, we present the measurement scales for each construct.

Table 1. Items for each construct.

Construct	Item
The student's knowledge of the meaning of artificial intelligence (SKAI)	SKAI1: In my opinion, AI makes faster business decisions based on outputs from cognitive technologies. SKAI2: In my opinion, AI technologies save time and money by automating and optimising routine processes and tasks. SKAI3: In my opinion, AI Solutions give businesses an opportunity to reinvent themselves to stay relevant in the digital age. SKAI4: In my opinion, AI solutions offer enormous benefits for businesses, including personalised marketing, inventory management, customer service, operational automation and recruitment. SKAI5: In my opinion, AI increases productivity and operational efficiencies in businesses. SKAI6: In my opinion, AI has a wide range of uses in businesses, including streamlining job processes and aggregating business data. SKAI7: In my opinion, cloud-based artificial intelligence apps are quicker in processing big data and producing results thereof (these undiscovered insights give companies the edge they need to be more competitive in the marketplace). SKAI8: In my opinion, AI solutions can predict outcomes based on data analysis, such a sales volume, demand, and stock volumes (this enables companies to make more effective decisions).
Students' perception of the usefulness of artificial intelligence in their study (SPUAI)	SPUAI1: In my opinion, AI clarifies many points the teacher cannot cover in his/her explanation. SPUAI2: In my opinion, AI fulfills and complements all students learning needs. SPUAI3: In my opinion, AI enables students to obtain additional educational support for what the the teacher does in a classroom. SPUAI4: In my opinion, learning through artificial intelligence will make learning less terrifying than learning it using the traditional way. SPUAI5: In my opinion, AI changes the way how students acquire skills in certain subjects. SPUAI6: In my opinion, the teacher's role will diminish when the student uses artificial intelligence to learn certain subjects. SPUAI7: In my opinion, using AI affects the ability to communicate with the teacher.
Perceived ease of use of AI (PEUAI)	PEUAI1: I think that using AI would contribute to faster learning. PEUAI2: I think that using AI technologies would save me a lot of time in studying. PEUAI3: I think that using AI can allow me to complete obligations and activities faster in my studies. PEUAI4: I think that using artificial intelligence could improve my study results. PEUAI5: I think that using AI could improve my study performance. PEUAI6: I think that with the help of AI, it would be easier for me to follow my studies and fulfill all my study obligations regularly.

Table 1. (*Continued*).

Construct	Item
Usefulness of statistics and quantitative methods (USQM)	USQM1: Using expertise in statistics and quantitative methods enables me to accomplish learning activities and obligations more quickly. USQM2: Using expertise in statistics and quantitative methods are improving my study grade average. USQM3: The use of expertise in statistics and quantitative methods improves my study efficiency. USQM4: Expertise in statistics and quantitative methods is useful. USQM5: Expertise in statistics and quantitative methods makes my study obligations simple.
Students' perspective on work skills for the future (SPWS)	SPWS1: Analytical thinking and innovation are important skills to have in the workforce. SPWS2: Active learning and learning strategies are important skills to have in the workforce. SPWS3: Complex problem-solving is an important skill to have in the workforce. SPWS4: Critical thinking and analysis is an important skill to have in the workforce. SPWS5: Creativity, originality, and initiative are important skills to have in the workforce. SPWS6: Using statistics and quantitative methods to solve problems is an important skill to have in the workforce. SPWS7: A good background in programming, logic, data structures, language processing, and cognitive learning theory are important skills to have in the workforce.
Students' perspective about emerging jobs in the Data and AI Cluster (SPEJ)	SPEJ1: I see myself as an artificial intelligence specialist. SPEJ2: I see myself as a big data specialist or developer. SPEJ3: I see myself as a data analyst. SPEJ4: I see myself as a machine learning engineer. SPEJ5: I see myself as a robotics engineer. SPEJ6: I see myself as a computer vision engineer. SPEJ7: I see myself as digital marketing and strategy specialist. SPEJ8: I see myself as a process automation specialist. SPEJ9: I see myself as a software and applications developer.

3.3. Statistical analysis

We utilized the statistical package for the social sciences (SPSS) and WarpPLS software to examine data reliability, validity and to perform structural equation modeling (SEM). During the initial stage, we conducted exploratory factor analysis (EFA). Additionally, we evaluated Bartlett's Test of Sphericity, Kaiser-Meyer-Olkin statistics (KMO > 0.5), and significance levels ($p < 0.05$). We scrutinized factor loadings ($\eta \geq 0.5$), variable communality ($h > 0.4$), and factor eigenvalues ($\lambda \geq 1.0$) during the EFA process[64]. To assess the SEM model, we employed several criteria: average path coefficient (APC) ($p < 0.05$), average R-square (ARS) ($p < 0.05$), average adjusted R-square (AARS) ($p < 0.05$), average block VIF (AVIF < 5.0), average full collinearity VIF (AFVIF < 5.0), Simpson's paradox ratio (SPR ≥ 0.7), the R-squared contribution ratio (RSCR ≥ 0.9), statistical suppression ratio (SSR ≥ 0.7), nonlinearity substantiated by an association causality direction ratio (NLBCD ≥ 0.7), and goodness-of-fit (GoF ≥ 0.5)[65]. Also, we assessed the measurement instrument's reliability and validity while considering Cronbach's alpha ($\alpha > 0.7$), index of communality, and redundancy. To evaluate convergent validity, we applied the criteria by Hair et al.[66] and that of Fornell and Lacker[67], which require AVE > 0.5 and CR > 0.7, as well as the criterion by Byrne[68], which requires CR > AVE. To test for multicollinearity, we used VIF < 5.0[69]. In hypothesis testing, we examined the path coefficient for causal links in the model (β or γ), t-value, significance level ($p < 0.05$), and Cohen's effect indicator (f^2), with effect sizes of 0.02, 0.15, and 0.35 for small, medium, and large effects[70].

4. Results

To determine whether conducting an exploratory factor analysis was appropriate, we performed the Kaiser Meyer Olkin measure of sampling adequacy (KMO ≥ 0.5) and Bartlett's test of sphericity ($p < 0.05$)[64]. The results presented in **Table 2** confirmed the suitability of factor analysis, as all communalities were above 0.40, and all factor loadings were above 0.60[66]. Moreover, we assessed our research measurements' internal consistency and reliability using Cronbach's alpha coefficient, which yielded high reliability for all measurement scales (Cronbach's alpha > 0.80). The total variance explained was 61.127% for the student's knowledge of the meaning of AI, 69.217% for students' perception of the usefulness of AI in their study, 66.647% for perceived ease of use of AI, 65.589% for usefulness of statistics and quantitative methods, 62.327% for students' perspective on work skills for the future, and 62.534% for students' perspective about emerging jobs in the Data and AI Cluster (**Table 2**).

The research model's quality assessment indicators are shown in **Table 3**.

Table 2. Factor analysis results.

Construct	Item	Communalities	Loadings	Cronbach's alpha
The student's knowledge of the meaning of artificial intelligence (SKAI)	SKAI1	0.541	0.736	0.902
	SKAI2	0.582	0.763	
	SKAI3	0.645	0.803	
	SKAI4	0.677	0.823	
	SKAI5	0.483	0.695	
	SKAI6	0.580	0.761	
	SKAI7	0.485	0.696	
	SKAI8	0.507	0.712	
KMO = 0.909; Bartlett's Test of Sphericity: Approx. *Chi-Square* = 675.726, *df* = 28, $p < 0.001$ Cumulative percentage of explained variance: 61.127%				
Students' perception of the usefulness of AI in their study (SPUAI)	SPUAI1	0.564	0.751	0.881
	SPUAI2	0.748	0.848	
	SPUAI3	0.649	0.813	
	SPUAI4	0.645	0.774	
	SPUAI5	0.715	0.857	
	SPUAI6	0.522	0.721	
	SPUAI7	0.715	0.857	
KMO = 0.790; Bartlett's Test of Sphericity: Approx. *Chi-Square* =1016.615, *df* = 21, $p < 0.001$ Cumulative percentage of explained variance: 69.217%				
Perceived ease of use of AI (PEUAI)	PEUAI1	0.652	0.807	0.907
	PEUAI2	0.636	0.798	
	PEUAI3	0.573	0.757	
	PEUAI4	0.732	0.856	
	PEUAI5	0.762	0.873	
	PEUAI6	0.643	0.802	
KMO = 0.830; Bartlett's Test of Sphericity: Approx. *Chi-Square* = 814.947, *df* = 15, $p < 0.001$ Cumulative percentage of explained variance: 66.647%				
Usefulness of statistics and quantitative methods (USQM)	USQM1	0.703	0.821	0.867
	USQM2	0.769	0.877	
	USQM3	0.781	0.884	
	USQM4	0.774	0.880	
	USQM5	0.692	0.819	
KMO = 0.852; Bartlett's Test of Sphericity: Approx. *Chi-Square* = 479.023, *df* = 10, $p < 0.001$ Cumulative percentage of explained variance: 65.589%				

Table 2. (*Continued*).

Construct	Item	Communalities	Loadings	Cronbach's alpha
Students' perspective on work skills for the future (SPWS)	SPWS1	0.584	0.765	0.864
	SPWS2	0.579	0.761	
	SPWS3	0.629	0.793	
	SPWS4	0.673	0.820	
	SPWS5	0.621	0.802	
	SPWS6	0.657	0.810	
	SPWS7	0.635	0.807	
KMO = 0.874; Bartlett's Test of Sphericity: Approx. *Chi-Square* = 524.962, *df* = 21, $p < 0.001$ Cumulative percentage of explained variance: 62.327%				
Students' perspective about emerging jobs in the Data and AI Cluster (SPEJ)	SPEJ1	0.676	0.822	0.892
	SPEJ2	0.779	0.885	
	SPEJ3	0.776	0.881	
	SPEJ4	0.743	0.862	
	SPEJ5	0.662	0.813	
	SPEJ6	0.745	0.864	
	SPEJ7	0.781	0.886	
	SPEJ8	0.626	0.791	
	SPEJ9	0.698	0.878	
KMO = 0.902; Bartlett's Test of Sphericity: Approx. *Chi-Square* = 1304.863, *df* = 36, $p < 0.001$ Cumulative percentage of explained variance: 62.534%				

Table 3. Model fit and quality indicators.

Quality indicators	Calculated values of indicators of model
APC	0.483, $p < 0.001$
ARS	0.517, $p < 0.001$
AARS	0.462, $p < 0.001$
AVIF	2.146
AFVIF	2.893
GoF	0.375
SPR	1.000
RSCR	1.000
SSR	1.000
NLBCD	1.000

Table 3 indicates that the indicators APC, ARS, and AARS have statistical significance ($p < 0.001$), whereas AVIF and AFVIF have values below 5.0 and are considered suitable. The GoF indicator assesses the effectiveness of the conceptual model[65], and the GoF result indicates a highly effective model. Furthermore, the indicators SPR, RSCR, SSR, and NLBCD are appropriate and higher than the minimum recommended values. **Table 4** presents indicators of the quality of the structural model.

Table 4 shows that the latent variables' R^2, adjusted R^2, and Q^2 coefficients exceed zero. Moreover, all constructs exhibit a CR greater than 0.7, and their AVE values exceed 0.5, confirming their convergent validity. Additionally, the CR values are higher than the AVE values. The VIF values, which range from 1.834 to 2.721 (VIF < 5.0), confirm that collinearity did not affect the results of the structural model. **Table 5** presents the SEM results, including the structural coefficients of the links in the basic structural model.

Table 4. Indicators of quality of the structural model.

Constructs	CR	AVE	R^2	Adj. R^2	Q^2	VIF
The student's knowledge of the meaning of AI	0.825	0.743	(–)	(–)	(–)	2.013
Students' perception of the usefulness of AI in their study	0.849	0.765	0.465	0.448	0.372	1.946
Perceived ease of use of AI	0.876	0.817	0.578	0.463	0.398	2.317
Usefulness of statistics and quantitative methods	0.893	0.832	(–)	(–)	(–)	2.126
Students' perspective on work skills for the future	0.856	0.789	0.563	0.441	0.328	1.834
Students' perspective about emerging jobs in the Data and AI Cluster	0.927	0.854	0.582	0.503	0.486	2.721

Note: (–) values cannot be calculated because the construct is a baseline.

Table 5. Standardized path coefficients for the proposed model.

Hypothesized path	Path coefficient (γ)	Sig.	Effect size (f^2)	Standard error	Link direction	Shape of link
SKAI → SPUAI	0.286	$p < 0.01$	0.362	0.021	Positive	Nonlinear
PEUAI → SPUAI	0.463	$p < 0.01$	0.398	0.024		
USQM → PEUAI	0.558	$p < 0.01$	0.426	0.022		
SPUAI → SPWS	0.329	$p < 0.01$	0.375	0.022		
SPWS → SPEJ	0.571	$p < 0.01$	0.449	0.023		

Note: SKAI—the student's knowledge of the meaning of artificial intelligence, SPUAI—students' perception of the usefulness of AI in their study, PEUAI—perceived ease of use of AI, USQM—usefulness of statistics and quantitative methods, SPWS—students' perspective on work skills for the future, SPEJ—students' perspective about emerging jobs in the Data and AI Cluster.

The results in **Table 5** show that the student's knowledge of the meaning of artificial intelligence has a positive impact on students' perception of the usefulness of artificial intelligence in their study (SKAI → SPUAI = 0.286, $p < 0.01$). Additionally, perceived ease of use of AI has a positive impact on students' perception of the usefulness of artificial intelligence in their study (PEUAI → SPUAI = 0.463, $p < 0.01$). Also, the perceptions of usefulness of statistics and quantitative methods has a positive impact on perceived ease of use of AI (USQM → PEUAI = 0.558, $p < 0.01$). The results show that students' perception of the usefulness of AI in their study has a positive impact on students' perspective on work skills for the future (SPUAI → SPWS = 0.329, $p < 0.01$). Furthermore, students' perspective on work skills for the future has a positive impact on students' perspective about emerging jobs in the Data and AI Cluster (SPWS → SPEJ = 0.571, $p < 0.01$). The Cohen's coefficient values for all constructs show that the effect of predictive latent variables is of high strength. Based on these findings, we confirmed hypotheses H1–H5.

5. Discussion

Education is an integral aspect of life, and a good education is crucial for achieving success. To enhance the education system for students, changes are continually being made worldwide, ranging from teaching methodologies to curricula[6,71]. One technology that is revolutionizing multiple domains and changing the world is artificial intelligence. Education is one domain where AI is poised to make significant changes[45]. AI is developing new solutions for teaching and learning, catering to different situations. Several schools and colleges worldwide are already using AI in education, and it has provided a fresh perspective on education for professors, students, parents, and educational institutions alike[48,72]. However, AI in education does not aim to replace human professors with humanoid robots, but to use computer intelligence to assist professors and

students, thereby enhancing the education system's effectiveness. In the future, the education system is likely to have numerous AI tools that will reshape the educational experience[49,51]. As we mentioned, the primary objective of AI in education is not to replace professors entirely but to serve as an aid for both professors and students[5]. AI systems can be programmed to offer customized learning to students. This approach enables each student to learn uniquely based on their level of understanding and requirements[6]. By comprehending the needs of each student, professors can create a personalized study plan for every student. With the continuous advancement of AI, machines may even be capable of recognizing the facial expressions of students during the learning process and identifying any difficulties they may be experiencing[7,8]. Accordingly, AI can modify the teaching approach to cater to individual student's needs. AI-powered programs and personalized learning alleviate the stress of studying for students[10]. Virtual assistants enabled by AI offer comprehensive explanations whenever students have questions[52]. In conventional teaching methods, students may be hesitant to ask questions in front of the whole class, but virtual assistants can help resolve this issue. While these assistants may not be able to answer all questions accurately, they can provide valuable assistance for basic queries, helping learners feel more confident and reducing their stress levels[9,23]. On the other hand, in today's world, where data availability is rapidly increasing, knowledge of statistics and quantitative methods has become more crucial than ever. Students require a sound understanding of quantitative methods to comprehend academic research, conduct their own research, and enhance their employability in the job market[17,73]. Statistics and quantitative methods, a key component of business curriculum, significantly contribute to developing quantitative skills and other managerial competencies. This is because quantitative skills, such as statistical analysis, are essential in supporting problem-solving abilities and enhancing the decision-making process[74,75]. Thus, statistics plays a vital role in helping individuals develop the necessary skills and competencies required to succeed in business[76].

Despite the rapidly changing landscape of education, many schools still struggle to incorporate the latest digital technologies that can revolutionize teaching methods. Students have unique learning styles, varying interests, and learn at different paces, resulting in a lack of personalized attention and educational approach. Artificial intelligence can play a critical role in tailoring and adapting learning to suit each student's specific needs, goals, and abilities through personalized programs. By filling any learning gaps, personalized learning can be particularly effective in bridging the achievement gap between students who are struggling and those who are excelling. Also, automating tasks that were once tedious, repetitive, and time-consuming, resulting in high levels of stress and decreased productivity, can now provide a boost to teachers' efficiency, freeing up their time to modify their day-to-day practices as necessary. Chincholi[47] emphasizes that AI can fulfill various essential requirements in education, including gaining insights through data analysis, automating processes, and interacting with students and faculty. According to Winstone and Carless[77] in higher education, classes often have a large number of students, making it difficult for teachers to provide individualized guidance effectively. Additionally, it can be challenging for instructors to identify which course activities and resources would be most beneficial as action recommendations to help students improve their learning and performance. Effective feedback and action recommendations are crucial for self-regulated learning and are significantly linked to student learning and performance[78]. For example, Jill Watson, an AI teaching assistant developed by Goel and Polepeddi[79], can enhance communication between instructors and students by independently responding to student introductions, posting weekly announcements, and answering frequently asked questions. AI scoring systems, such as the one created by Perin and Lauterbach[80], enable faster communication of grades between students and instructors. AI systems provide constant feedback to both students and instructors on learning progress and goals[81]. Ross et al.[82] created online adaptive quizzes that improve student motivation and engagement by providing personalized learning content. On the other hand, although AI presents promising opportunities, students and instructors may perceive its impact negatively. For example, students

could perceive indiscriminate data collection and analysis through AI systems as a privacy breach, as evidenced by the Facebook–Cambridge Analytica data scandal[81,83]. Students may also perceive the behavior of AI agents that ignore the risks of data bias or algorithmic bias as discriminatory[84,85]. Instructors express concern that overreliance on AI systems could hinder students' ability to learn independently, solve problems creatively, and think critically[51]. To gain insight into the impact of AI systems in online learning environments, it is crucial to understand how students and instructors perceive them. Thus, by utilizing big data analytics and artificial intelligence appropriately, it is possible to develop personalized learning experiences. Personalized learning provides each student with a distinctive educational approach that is customized to their specific abilities and requirements. This approach could significantly enhance student motivation and decrease the likelihood of dropouts. Moreover, it enables professors to better understand each student's learning process, allowing them to teach more effectively. AI-based learning systems have the potential to provide valuable insights to professors regarding their students' learning styles, abilities, and progress. By doing so, these systems can recommend personalized teaching methods that cater to individual student needs. For instance, some students might require additional attention or tutoring to overcome learning difficulties or challenges, while others might require more advanced study materials or assignments to remain intellectually stimulated. In either case, AI learning systems can help students achieve their full potential and prevent dropouts by detecting issues early on and implementing corrective measures promptly.

5.1. Theoretical implications

Table 5 shows that the student's knowledge of the meaning of artificial intelligence has a positive impact on students' perception of the usefulness of artificial intelligence in their study. **Table 2** shows that the most important role of student's knowledge of the meaning of artificial intelligence is that AI solutions offer enormous benefits for businesses, including personalized marketing, inventory management, customer service, operational automation, and recruitment followed by AI solutions give businesses an opportunity to reinvent themselves to stay relevant in the digital age. Furthermore, results show that the most important role of students' perception of the usefulness of artificial intelligence in their study is that AI changes the way how students acquire skills in certain subjects followed by AI fulfills and complements all students learning needs. Also, **Table 5** shows that the perceived ease of use of AI has a positive impact on students' perception of the usefulness of AI in their study. **Table 2** shows that the most important role of perceived ease of use of AI is enhancing students' study performance. According to Kairu[10], AI not only facilitates customized learning for students but can also provide feedback to both professors and students on the effectiveness of a course. Several online course providers currently use feedback-based AI systems to assess student progress and alert instructors of critical performance issues. These AI-driven systems enable students to receive appropriate support, while professors can identify areas requiring improvement in their teaching[35]. Instant feedback to students helps them understand their mistakes and provides guidance on how to improve. Identifying gaps in learning within the education system can be challenging due to the limited time professors have to teach and their inability to identify where students may be struggling or confused. To address this issue, AI-driven programs are increasingly being used in the education sector[11,26]. Students with learning disabilities, such as those who are deaf, hard of hearing, or visually impaired, face significant academic challenges and require extra time and care. However, innovative AI technology is offering new ways of interacting with these students. AI-enabled tools can be trained to provide specialized support for students with special needs[86]. One of the greatest benefits of AI in education is universal access to study materials. With universal access, students can learn at their own pace and from anywhere. They can explore concepts on their own time without relying solely on a tutor. Additionally, students have access to high-quality courses and learning materials from around the world, all from the comfort of their own homes[12,48]. Chincholi[47] emphasizes that the education landscape is

rapidly changing with the influence of technology. Among these technological advancements, AI and machine learning are particularly impacting the education sector in numerous ways. Contrary to some commonly held beliefs, the use of AI in education extends beyond grading student assessments, and this technology has the potential to benefit both professors and students significantly. Thus, based on our research and literature review, we found that the potential of artificial intelligence in the realm of online education and classroom teaching is vast, encompassing a wide range of possibilities from tailored student learning to the automation of professors' daily tasks and AI-based evaluations. AI-powered tutoring systems, for instance, can offer personalized support and feedback to students by adjusting educational materials to their unique learning styles and levels of knowledge. With the help of AI teaching assistants, professors can now save time on answering repetitive and straightforward questions posed by students in online forums, allowing them to allocate their time towards more valuable work. Additionally, AI analytics makes it possible for professors to decipher student clickstream data, thus enabling them to gain insights into their performance, progress, and potential. At the same time, we found that students are aware of the importance of intelligence in the business field. According to the studies by Kambur and Akar[2], and Agarwal et al.[3], artificial intelligence has become a ubiquitous presence across industries, driving significant transformations in business processes. As more and more businesses recognize the potential of AI solutions, they are now in a race to understand how to effectively integrate them into their operations. Along with other emerging technologies such as cloud computing, machine learning, and big data, the benefits of AI are no longer up for debate, as the world actively seeks to leverage its power. From improved chatbots for customer service to predictive recommendations and data analytics to deep learning tools, AI has become a widely-adopted competitive tool in the business world.

Table 5 shows that perceived usefulness of statistics and quantitative methods has a positive impact on perceived ease of use of AI. **Table 2** shows that the most important role of usefulness of statistics and quantitative methods is that the use of expertise in statistics and quantitative methods improves students' study efficiency followed by expertise in statistics and quantitative methods is useful. The next important role of the usefulness of statistics and quantitative methods is that using expertise in statistics and quantitative methods improves students' study grade average. According to Tengesdal and Griffin[75] and that of Hijazi and Zoubeidi[76], irrespective of the industry, market, economic sector, or any other distinction, statistics provide individuals and groups with the means to solve problems and capitalize on opportunities. This discipline can offer valuable insights and support in any situation where relevant data can be collected, analyzed, interpreted, and presented to work toward a pragmatic resolution. Obtaining an applied statistics knowledge can equip students with the skills to pursue a diverse range of careers, including traditional roles such as statistician, as well as emerging and high-demand positions like data scientist and biostatistician[74]. Professionals in these fields, such as statisticians and data scientists, play an essential role in the data analysis process. They ensure that data-gathering methods are appropriate and accurate, and then use statistical models and related tools to analyze large volumes of data. By leveraging this information, they arrive at data-driven conclusions that influence major decisions[42]. Statistics and quantitative methods enable students to merge their theoretical knowledge with practical skills on how statistics and quantitative methods can be applied across a broad range of industries and organizations. Quantitative methods and statistics play a crucial role in the development and application of AI, providing essential expertise in data analysis, study design, and interpretation of results. While computer science contributes significantly to AI systems, statistics has been an integral part of the field from the outset. It can optimize data collection and preparation, including sample size, sampling design, weighting, and experimental design, for subsequent evaluation with AI techniques. Moreover, the quality measures of statistics and their inference methods can assist in the evaluation of AI models[17]. According to the studies by Baloğlu et al.[87], Iddo and Ginsburg[88], and Ncube and Moroke[89], many college and university undergraduate programs mandate statistics courses. We have already mentioned that using expertise in

statistics and quantitative methods improves students' study efficiency. Students also stress that the use of AI can enhance their study performance. On the other hand, as a compulsory component, enrolled students may face challenges such as negative attitudes, high statistics anxiety, and insufficient statistical knowledge[90,91]. Addressing these issues may involve developing students' statistics self-concept, which refers to evaluating their competence in this domain. Therefore, it is crucial to understand and measure academic self-concept, especially statistics self-concept. However, According to Filiz[71], the existing indicators for measuring statistics self-concept are problematic due to their vague and diverse definitions. Therefore, it is essential to critically evaluate widely-used data collection tools for statistics self-concept and teaching methods to enhance university students' statistics self-concept. Additionally, the study revealed that web augmented learning approaches and computer-assisted lectures with digital teaching materials had a greater statistical impact on students' statistics self-concept than active learning approaches, courses based on mutual respect, and the combination of lecturer-centered lectures and computer-assisted lectures. Research has shown that the level of AI-related preparedness that students perceive can considerably impact their learning behavior and decisions regarding future studies[92,93]. Thus, to maintain students' interest in learning about AI technology, it is crucial to establish a strong foundation of knowledge, demonstrate its relevance, boost their confidence, and alleviate anxiety through well-crafted curriculum design. A key objective of current and future educational programs should be to enhance students' preparedness for a future where AI plays a significant role.

Moreover, results in **Table 5** show that students' perception of the usefulness of AI in their study has a positive impact on students' perspective on work skills for the future. Additionally, results show that students' perspective on work skills for the future has a positive impact on students' perspective about emerging jobs in the Data and AI Cluster. According to **Table 2**, critical thinking and analysis are the most significant skills that students perceive as important for future work. The next important skill that students perceive as important for future work is using statistics and quantitative methods to solve problems. The third important skill that students perceive as important for future work is a good background in programming, logic, data structures, language processing, and cognitive learning theory are important skills to have in the workforce. Additionally, creativity, originality, and initiative are perceived by students as the fourth important skills for future work. Moreover, the most important role of students' perspective about emerging jobs in the Data and AI Cluster is digital marketing and strategy specialist, which big data specialist or developer, data analyst, software and applications developer, and computer vision engineer follow. Ensuring student preparedness has been a longstanding goal of technology-focused education, emphasizing equipping students with the appropriate knowledge, attitude, and skills for professional success in the knowledge economy of the 21st century[93]. In this context, AI-related courses should not only impart knowledge related to AI but also empower students and instill in them a sense of confidence to engage in their future professions. Empirical studies have demonstrated a positive correlation between AI-related education and student readiness for an AI-driven future[49,94]. As students acquire greater knowledge and proficiency in AI-related concepts and skills, they will likely develop increased confidence in navigating an AI-driven future[72]. Confidence is defined as an individual's belief in their ability to execute a desired behavior successfully (e.g., "I can accomplish this task")[95]. Many scholars have highlighted the significance of confidence as a factor influencing students' performance and preparedness[49]. According to Komarraju et al.[96], higher confidence levels in one's abilities are positively correlated with the perception of being prepared and ready for relevant educational or work opportunities. According to a study conducted by IBM and Morning Consult[97], teenagers are aware that skills such as artificial intelligence (AI) and data science will greatly influence their future careers; however, they feel inadequately prepared to work with these technologies. The study revealed that 68% of surveyed students believe that AI will significantly impact their career and life, yet 34% feel unprepared to use it effectively. The survey also assessed the students' knowledge of emerging technologies, willingness to learn, and interest in

technology careers. The results showed that 56% of students are interested in pursuing a technology career because most jobs require the use of technology. Additionally, while 60% showed an interest in emerging technology areas, such as cloud, tech, and cybersecurity, AI is the emerging tech that most students want to learn more about.

5.2. Curricula development implications

Based on the results of our research presented in this paper, the following curricula development implications can be made:

- Emphasis on teaching the meaning and importance of AI: the positive path coefficient between SKAI and SPUAI suggests that students' knowledge of the meaning of AI is significantly related to their perception of its usefulness in their studies. Therefore, curricula development should include courses that teach the basics of AI, its applications, and its potential impact on different industries.

- Integration of AI in coursework: the positive path coefficient between PEUAI and SPUAI suggests that students' perception of the usefulness of AI in their studies is significantly related to their perceived ease of use of AI. Therefore, curricula development should focus on integrating AI in coursework, making it easy for students to use and apply AI-related concepts and tools.

- Strengthening quantitative skills: the positive path coefficient between USQM and PEUAI suggests that students' perception of the ease of use of AI is significantly related to their perception of the usefulness of quantitative skills. Therefore, curricula development should focus on strengthening students' quantitative skills, including statistics, mathematics, and programming, to enable them to apply AI-related concepts and tools effectively.

- Developing future work skills: the positive path coefficient between SPWS and SPEJ suggests that students' perspective on work skills for the future is significantly related to their perspective about emerging jobs in the Data and AI Cluster. Therefore, curricula development should focus on developing future work skills that are aligned with emerging trends in the Data and AI Cluster, including skills related to data analysis, machine learning, and AI development.

Curricula development should focus on developing a comprehensive understanding of AI-related concepts, tools, and skills and their practical applications in different industries. This will enable students to be well-prepared for emerging job opportunities in the Data and AI Cluster and contribute positively to the growth and development of this field.

There is no doubt about the importance of AI in the pedagogical and learning process. However, the article focuses on how students can perceive the meaning of AI in their studies and future role in the labor market. Therefore, the research also has two implications:

1) Study program creators should design programs to give statistics and quantitative methods an important place since the economy increasingly relies on big data. This will help students gain expertise in these areas and stand out in the job market.

2) Students should also be taught about the meaning and content of AI, so they can form a positive attitude towards its usefulness in their studies and employment.

5.3. Limitations and further research

Our study is limited to students at the Faculty of Economics and Business, University of Maribor, Slovenia. Replication of the study in different contexts is recommended for future research, that should replicate the study in different contexts, including different educational institutions, different levels of

education, and different geographic regions, to test the generalizability of the results. Also, Shivers-Blackwell and Charles[98] discovered that female students displayed a significantly greater readiness for technological change compared to male students. According to Ertl et al.[99] and Lee et al.[100], in education fields such as science, technology, engineering, and mathematics, male students are generally favored over female students. As artificial intelligence continues to emerge as a significant technological advancement with the potential to impact workplaces and education, it is crucial for further research to investigate the effects of gender differences on AI-related student readiness.

Also, to enhance the sample size for future research, we intend to collaborate with other institutions. By establishing collaborations with educational institutions that offer similar programs or curricula, we would gain access to a larger and more diverse group of students. This collaborative approach would enable us to broaden the scope of our research.

Future research should also focus on the investigation of the role of other variables: The study focused on the relationship between students' knowledge, perceptions, and perspectives related to AI. However, other variables, such as personality traits, cognitive abilities, and motivation, may also play a role in students' engagement with AI. Therefore, further research should investigate the role of these variables in predicting students' engagement with AI.

While TRIZ, Extenics, and other thinking models have their own merits and applications, they were not within the scope of our study. Future research could explore the integration of these thinking models in educational settings and investigate their impact on learning efficiency and problem-solving abilities in the context of AI. Thus, TRIZ and Extenics are two thinking models that could be explored in the context of education and their potential relevance to learning efficiency with artificial intelligence. While they were not explicitly mentioned in the paper, they represent examples of additional factors that could be considered in future research to enhance the conceptual model and hypotheses related to the topic.

Another very important future research focus is the examination of the long-term impact of AI education. This study focused on the immediate impact of AI education on students' engagement with AI. However, it is unclear how AI education may impact students' future career choices, job performance, and overall career trajectories. Therefore, further research should examine the long-term impact of AI education on these outcomes.

6. Conclusion

As previously discussed in the literature review, the workforce is on the verge of a transformation due to the rapid advancement of artificial intelligence and emerging technologies. According to experts, robots are likely to replace several jobs that are currently performed by humans, while technology's progression will also lead to the creation of new jobs. These impending changes carry significant implications for the education sector. It is crucial for schools to equip their students with the necessary skills to remain competitive in the job market, while postsecondary institutions must offer relevant education and training opportunities to students. Furthermore, technology's innovations will provide new tools to support educators, students, and those who are seeking employment or retraining opportunities. This paper presents an overview of some of the most important considerations we must consider regarding the implications of technological advancements in AI for education. More specifically, this paper adds to the existing literature by providing new insights on the role of artificial intelligence in education, particularly with respect to the significance of courses in statistics and quantitative methods, as well as students' perspectives on work skills for the future and students' perspectives on emerging jobs in the Data and AI Cluster. To this end, we have developed a multidimensional model that highlights the utility of artificial intelligence from students' perspectives on emerging jobs in the Data and AI

Cluster. By teaching students analytical thinking, problem-solving skills, and teamwork, they will remain competitive in a constantly changing job market. AI is increasingly used across various industries to enhance processes, create immersive experiences, and supplement human expertise. The integration of AI in education offers several advantages, including streamlining routine tasks and providing valuable data insights to inform personalized learning experiences and curriculum development. With AI, teachers and administrators can optimize their time and resources, leading to better student outcomes and more efficient support for all stakeholders involved in education.

Author contributions

Conceptualization, MR, PT and IV; data curation, MR; formal analysis, MR, PT and IV; funding acquisition, PT; investigation, MR, PT and IV; methodology, MR and PT; project administration, MR; supervision, PT and IV; validation, MR and IV; visualization, MR and PT; writing—original draft preparation, MR, PT and IV; writing—review and editing, MR, PT and IV.

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Conflict of interest

The authors declare no conflict of interest.

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