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Factors Affecting Faculty Members' Readiness to Integrate Artificial Intelligence into Their Teaching Practices: A Study from the Saudi Higher Education Context

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Abstract. Artificial intelligence (AI) has been around for about three decades. However, use of AI in pedagogy on a large scale and examination of its impact on teaching practices in higher education are under-researched topics. This study examined the readiness of 465 faculty members at King Faisal University in Saudi Arabia to integrate AI into their teaching practices as well as the factors influencing that readiness. A 46-item online survey was used to collect data. The results show that the respondents demonstrated an average readiness to integrate AI into their teaching (M = 3.40, SD = 0.841). Statistically significant correlations were found at the 0.01 significance level between faculty members' readiness to incorporate AI into teaching and the perceived benefit of AI in higher education and teaching; attitudes towards AI; behavioral intentions to use AI; and facilitative conditions for AI use. Significant differences were found at the 0.05 significance level regarding faculty members' readiness to integrate AI into their teaching according to gender, age, and teaching experience. However, no statistically significant differences were found at the 0.05 significance level in terms of faculty members' readiness to integrate AI into their teaching according to college type or academic rank. Thus, it is recommended that faculty members' readiness to integrate AI and their knowledge of and skills concerning AI and how to use it to improve educational institution outcomes be enhanced.

Keywords: artificial intelligence; attitude; behavioral intention; faculty members; higher education

1. Introduction

In the twenty-first century, artificial intelligence (AI) has taken on more significance. AI-driven technologies have impacted many areas of labor (Ng et al., 2021) and have had significant effects on culture, diversity, communication,

information, science, and education, particularly as these areas are linked with other topics, including sustainability, environmental protection, gender equality, peace, justice, and poverty (COMEST, 2019; Saudi Data & AI Authority, 2022). These topics are important to national and international development and policy-focused organizations (UNESCO, 2022). According to international policy recommendations, common goals should be pursued through various contextualized approaches. These include the promotion of the inclusive and equitable use of AI in education, utilization of AI to improve education and learning, development of job and life skills with AI, and protection of education data to ensure AI use is morally and openly accountable (UNESCO, 2019). In April 2021, the United Nations Educational, Scientific and Cultural Organization (UNESCO) published *AI and education: Guidance for policymakers*, aiming to increase policymakers' readiness for AI utilization (Miao et al., 2021). The publication provides a general introduction to AI, covering its opportunities, risks, key terminology, trends, implications for teaching and learning, and how learning institutions may prepare students for the AI era (UNESCO, 2022). The Beijing Consensus on Artificial Intelligence and Education (BCAIE) (cited in Miao et al., 2021) claimed that all member states are urged to "*be cognizant of the emergence of a set of AI literacy skills required for effective human–machine collaboration, without losing sight of the need for foundational skills such as literacy and numeracy*" (p. 6). To develop a sizable pool of local AI experts with the knowledge necessary to design, program, and develop AI systems, the BCAIE further advised that mid- or long-term plans be made and urgent actions taken to support higher education and research institutions in developing or enhancing courses and research programs to develop local AI talent (Miao et al., 2021).

Several United Nations organizations in the field of AI (including the World Bank Group, the United Nations Children's Fund [UNICEF], and UNESCO), governments, and higher education institutions worldwide have begun to assemble researchers and collaborators (e.g., software developers, policymakers, and educators) to create curriculum guides, equipment, learning and teaching methods, content knowledge, and evaluation strategies to provide students with AI literacy and awareness (Saudi Data & AI Authority, 2022; Su et al., 2022). As a country that is open to the latest technological revolutions, the Kingdom of Saudi Arabia (KSA) has become interested in AI as an integral part of Vision 2030, launched to embody the nation's aspirations and hopes for its citizens (Mahfuz, 2023). The Saudi Data and Artificial Intelligence Authority aims to create a vibrant ecosystem to advance a fundamental conceptual understanding of AI and its applications. As such, real change will be brought about, and a knowledge economy will be built on a strong foundation laid by domestic and international companies working in the data and AI domains (Saudi Data & AI Authority, 2022).

AI is a general term that refers to computing systems that can perform human-like functions, including learning, adapting, synthesizing, self-correcting, and using data for complicated processing tasks, with little human input (Hamet & Tremblay, 2017; Popenici & Kerr, 2017). AI has significantly changed how education is delivered. It offers teachers and students a wealth of information, allowing the educator to employ cutting-edge teaching and learning techniques.

This contrasts with traditional learning, in which one-time classes are planned and learners' physical presence is required. Additionally, with AI, the learner can access the subject matter 365 days a year. Future AI learning resources may be updated for similar uses. With AI technologies, students may learn at their own pace and skip over pointless content. Today, AI appears to be a promising alternative to traditional classroom instruction, particularly in remote lifelong learning and training cases. Additionally, it can enhance conventional classroom learning (Voskoglou & Salem, 2020). Thus, researchers have argued that students should be educated about the potential of AI from a young age and that everyone should have at least a fundamental grasp of it (Laupichler et al., 2022; Yang, 2019). The call for the use of AI in education is growing, placing more demands on all parties involved, especially the educators in charge of guiding the teaching and learning process (Ayanwale et al., 2022). They should have an awareness of and practical skills related to AI. Accordingly, educators who know how to utilize AI may replace those who do not (Xu, 2020). The effectiveness of AI in education is anticipated to be strongly tied to educator knowledge, skills, and readiness to apply AI.

2. Literature Review

2.1 AI in Higher Education

The future of higher education is inextricably tied to advances in new technologies and the computing power of emerging intelligent machines (Popenici & Kerr, 2017). Innovations in AI in this area present new opportunities and concerns for teaching and learning in higher education and could significantly alter the governance and internal structure of institutions (Nasrallah, 2014; Silander & Stigmar, 2019). In the 2018 EDUCAUSE Horizon report, AI and adaptive learning technologies were highlighted as significant advancements in educational technology (EDUCAUSE, 2018). The 2019 report predicted that higher education institutions would increasingly employ AI within two to three years, maximizing the potential of coexisting technologies for digital and physical items (EDUCAUSE, 2019).

AI development is accelerating and has significantly affected higher education services (Popenici & Kerr, 2017) and academic programs. For instance, several forms of AI, such as the Blackboard platform, are already being utilized by universities; this was seen as an especially effective solution for continued studying during the novel coronavirus 2019 (Covid-19) pandemic. Moreover, the College of Computer Science and Information Technology at King Faisal University (KFU) offers a postgraduate program in AI and cybersecurity. The program was founded to keep up with KSA's Vision 2030. Furthermore, in August 2022, the Artificial Intelligence Unit at KFU, in cooperation with the Abdel Moneim Al-Rashed Foundation, held the first AI camp, introducing the trainees to the concept of AI and its fields, applications, and current trends and the concept of machine learning, a subscience of AI (King Faisal University, 2023a).

According to Kuleto et al. (2021), AI could meet many social and educational demands of higher education institutions and students. In such institutions, faculty members and students increasingly use tools and applications powered

by AI technology (Della Ventura, 2018). Technologies based on AI offer possibilities for the realization of individualized learning for students, accompanied by greater motivation, engagement, and independence (Chen et al., 2020; Cox et al., 2019; Della Ventura, 2018). AI heightens learners' critical thinking and curiosity as part of the learning process, which benefits educators looking to provide more engaging learning experiences (EDUCAUSE, 2019).

However, the benefits of AI cannot be realized until faculty members, students, and other stakeholders are ready to adopt it (Agarwal, 2006). According to Chatterjee and Bhattacharjee (2020), individuals' behavioral intentions to use AI in higher education in India are significantly impacted by several elements, an example being attitude towards AI. Similarly, Ayanwale et al. (2022) found that the relevance of AI highly predicts educators' readiness to teach AI, while their confidence predicts their intention to teach it. According to Wood and Miller (2021), medical school faculty members claim they lack a fundamental understanding of AI technology but have a broad, deep, and positive interest in and a favorable attitude towards it; they are also interested in training in many AI-related areas. Ahmed et al. (2022) claimed that although most doctors and medical students lack knowledge of AI and its uses, they have a favorable opinion of it in medicine and are eager to adopt it. Finally, Wood and Miller (2021) concluded that diverse teams of educators should teach AI technology longitudinally as part of an integrated curriculum, indicating a necessity to integrate AI into higher education settings.

2.2 AI in Saudi Arabia

AI education is becoming an essential enabler of future opportunities, whereby creativity, knowledge, and the possession of necessary skills will be the keys to success due to rapid developments in digitization. Thus, providing AI education is crucial to ensuring that the future workforce of the field is more inclusive and diverse (Ayanwale et al., 2022). AI is of tremendous interest to the KSA, whose investment in AI has emerged as one of the country's most important objectives across various institutions and industries, with the education sector taking center stage as part of Vision 2030 (Al-Hujaili & Al-Frani, 2019).

One of the most significant aspects of AI applications in the KSA is the NEOM city project, which aims to turn Neom into a smart city with smart services, including smart schools (Al-Hussein, 2019; Alkhamis, 2017). The National Center for Robot Technology and Smart Systems in King Abdulaziz City for Science and Technology offers another example of how the KSA uses AI in education (Mahfuz, 2023). Wakeb, a well-known AI and information technology business, has been established in Riyadh. Among its accomplishments is the delivery of AI software and services across all fields, including education (Al-Hujaili & Al-Frani, 2019). The Robot Olympiad competitions, the most significant of which is the FIRST LEGO competition, are another example of the most significant uses of AI in education in the KSA. These competitions focus on enabling students to use their knowledge to design and create robots as tools in various educational stages (Al-Aqeel & Al-Shammari, 2015).

Ongoing endeavors to develop and apply AI are being undertaken in the KSA. The board of directors of the Saudi crown prince, the head of the Saudi Authority for Data and Artificial Intelligence, presided over the opening of the first and second world summits on AI in 2020 and 2022, respectively (Saudi Press Agency, 2023). The second version of the LEAP conference, held 6 to 9 February 2023, which featured participation from Micro Focus, AuveTech, and other firms and was conducted under the theme "Towards new horizons", is one of the most recent initiatives in the area of AI. At the conference, various international companies announced investments totaling more than US$9 billion to support future technologies, digital entrepreneurship, and emerging technology companies to strengthen the KSA's position as the largest digital economy in the Middle East and North Africa region. The first humanoid robot made by Saudi hands, Sarah, was unveiled at the conference (Abdullah, 2023). The LEAP conference is a global platform and an exceptional event that hosts experts in future technologies and promising distinctive technologies worldwide (Abdullah, 2023).

Saudi researchers are increasingly interested in the use of AI in higher education. For instance, Al-Bagzi (2019) conducted a study to determine how AI applications are used to promote higher education in the KSA and found that such applications consider individual differences and assist students in enhancing their capacity for self-learning. AlAhmari's (2022) study examined dentistry students' thoughts on using AI in dentistry. The results show that most students believed AI could successfully be applied to diagnose diseases.

Alshrane (2022) conducted a study to create a strategy to prepare general education teachers in the KSA for AI trends. Data were collected from faculty members at Imam Muhammad bin Saud University, King Saud University, King Abdulaziz University, Taibah University, Princess Noura University, and the Saudi Electronic University. The results show that the reality of the requirements for developing such preparation was average. The study respondents' responses to the obstacles (physical and human, educational and academic, and administrative) limiting the development of teacher preparation were overwhelmingly positive.

AlAhmari (2022) claimed that including AI technology in education is necessary. Moreover, Al-Habib's (2022) research demonstrated that educational experts moderately agreed on the reality of employing AI applications in training faculty members in Saudi universities. However, the research found that there are obstacles that limit the use of AI applications in such training, such as a lack of a clear vision for universities to employ AI applications, a lack of experts in AI applications in Saudi universities, and the weak conviction of some universities and faculty members regarding the importance of AI applications. Al-Subhi (2020) found a low degree of AI-application use in education by faculty members at Najran University. There was agreement among the study subjects concerning the challenges that prevent the use of these applications. Challenges included the belief that their use requires more effort compared to traditional methods, a lack of awareness of the importance of using AI in education, and a large number of

learners in classrooms. Other challenges were weak incentives provided to faculty members who use modern technologies, a lack of adequate training programs for the use of AI applications in education, and insufficient time to train educators or to use these applications during lectures. Al-Subhi (2020) suggested providing higher education environments with the facilities and resources necessary to employ AI applications in learning.

Although AI has been around for nearly 30 years, educators remain unsure of how to use it pedagogically on a larger scale and how it could impact teaching and learning in higher education (Zawacki-Richter et al., 2019). Research has shown that educators' AI expertise is insufficient for instruction (Sanusi, 2021). Moreover, some educators remain concerned about the potential effects of AI on learning and teaching (Zawacki-Richter et al., 2019). Based on this review, it appears that no research has been undertaken in Saudi higher education to investigate how ready faculty members are to handle upcoming AI applications in their institutions and the factors that influence their readiness. Therefore, the present study intends to fill this research gap.

It is therefore crucial to determine educators' readiness to integrate AI into the educational environment and the factors influencing that readiness. As such, the following research questions addressed in the current study focus on AI in both higher education and the KSA overall:

1 To what extent are Saudi faculty members ready to integrate AI into their teaching practices (including their behavioral intentions and attitudes towards integrating AI)?
2 What are the perceived benefits of AI in higher education and teaching?
3 What facilities and resources are available for integrating AI into faculty members' teaching practices?
4 Is there a correlation between faculty members' readiness to integrate AI into teaching and the perceived benefits of AI in higher education and in teaching, attitude towards AI, behavioral intentions to use AI, and facilities and resources regarding AI use?
5 Do faculty members' readiness to integrate AI into their teaching differ according to gender, age, academic rank, college type, or years of teaching experience?

2.3 Conceptual Framework

The literature review indicated that Chatterjee and Bhattacharjee's (2020) research was a suitable conceptual framework for the current investigation, given the comparable research goals and contexts of the studies. According to their structural model, six factors influence the adoption of AI in higher education. These are: perceived risk, performance expectancy, effort expectancy, facilitating conditions, attitude, and behavioral intentions. However, the variable of perceived risk was excluded here, as it mainly relates to administrative tasks unrelated to the focus of this study. Furthermore, performance expectancy was termed the perceived benefits of AI in teaching.

Moreover, the effort-expectancy variable was incorporated into the perceived benefits of AI in teaching and attitude variables. Finally, another variable, the perceived benefits of AI in higher education, was created. Unlike Chatterjee and Bhattacharjee's (2020) work, the current study considered several independent variables (e.g., age, gender, and experience) that could influence faculty members' readiness. Thus, overall, the theoretical framework of the present study (see Figure 1) predicted that the following factors might influence faculty members' readiness to integrate AI in a higher education context:

- *Perceived benefits of AI in higher education*: This factor was interpreted as faculty members' optimism that AI use would significantly improve the standards, standing, and worth of higher education institutions on the educational, social, and national levels.
- *Perceived benefits of AI in teaching*: This factor also considered performance expectancy. It was interpreted as the degree to which faculty members thought that using a new system would enable them to significantly improve their job performance (Sugandini et al., 2018; Venkatesh et al., 2003).
- *Facilities and resources*: This factor described the degree to which faculty members thought the necessary technological and supporting infrastructure was readily available to facilitate the use of a new AI system (Venkatesh et al., 2003).
- *Attitude towards AI*: This factor refers to the degree to which faculty members view a specific behavior favorably or unfavorably (Ayanwale et al., 2022).
- *Behavioral intention*: This factor was an indicator of how faculty members used the technology (Rahman et al., 2020).

The following independent variables were used: gender, age, academic rank, college type, and years of teaching experience. The faculty members' readiness was defined as "*the degree to which an individual feels confident about oneself in disseminating AI education*" (Ayanwale et al., 2022, p. 2) in higher education institutions.

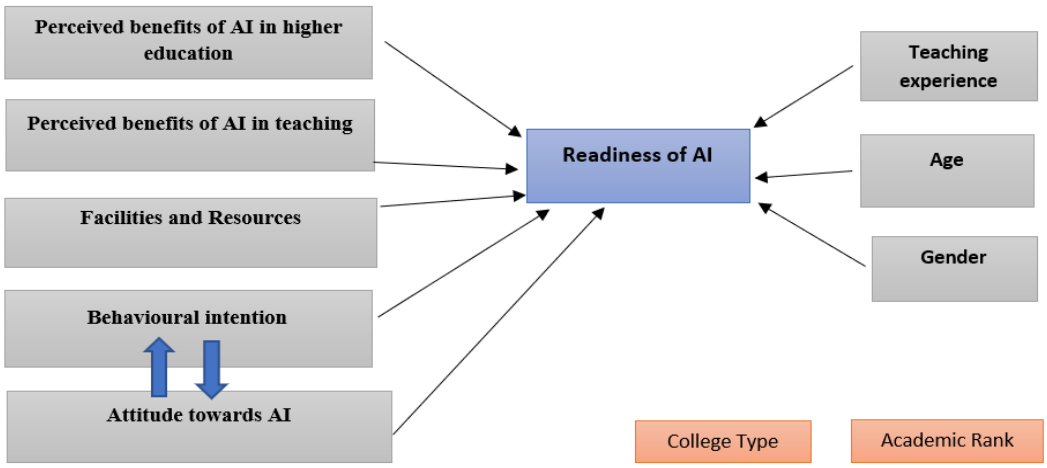

Figure 1: Analysis framework of factors influencing faculty members' readiness to use AI

3. Method

3.1 Study Setting and Sample Selection

KFU, a public Saudi university, was the subject of this investigation. The study population consisted of all faculty members at the university, numbering 2004 according to the university's human resources statistics for the year 2022–2023 (King Faisal University, 2023b). The availability sampling method was used, whereby an electronic link to the study questionnaire was created and sent via the university email to all faculty members, inviting them to participate in the study. This research used a survey methodology, and the data were quantitatively analyzed. Cohen et al. (2002) claimed that a survey approach is ideal when the researcher wants to explain the characteristics of current situations, set benchmarks to which current conditions can be compared, or determine the connections between certain events. A survey obtains information that is inferential, descriptive, and explicative. It can also be easily distributed to large populations, is anonymous, and offers a wealth of information and a comprehensive view of a topic area (Johnson & Onwuegbuzie, 2004).

3.2 Study Instrument: Development and Administration

The research questions were addressed via a questionnaire created using the scales from the work of Ayanwale et al. (2022) and Chatterjee and Bhattacharjee (2020). The questionnaire comprised one open-ended question, which allowed for any commentary on the topic under investigation, and several closed-ended questions. It was designed to take 8 to 10 minutes to complete and employed a five-point Likert scale with the following options: *strongly agree* (5), *agree* (4), *neutral* (3), *disagree* (2), and *strongly disagree* (1).

The questionnaire was divided into two sections. The first gathered information on respondents' gender, age, academic rank, college type, and years of teaching experience. The second elicited data on AI, breaking it down into the following six axes: *perceived benefits of AI in higher education* (7 items; $\alpha = 0.85$), *perceived benefits of AI in teaching* (14 items; $\alpha = 0.91$), *attitude towards AI* (7 items; $\alpha = 0.89$), *readiness to use AI* (6 items; $\alpha = 0.93$), *behavioral intentions to use AI* (5 items; $\alpha = 0.78$), and *facilities and resources for AI use* (7 items; $\alpha = 0.80$). Three educational technology specialists reviewed the questionnaire; their comments were considered, and the questionnaire was adapted to confirm its validity. The study instrument was then administered to a survey pilot sample of 25 faculty members.

BERA Ethical Guidelines (2018) were followed. The respondents were informed about the research purpose and their right to withdraw from the study for any reason and at any time. The respondents signed a consent form voluntarily. They were also informed about the rights of confidentiality and privacy and the secondary use of data. The Research Ethics Committee at KFU approved conducting of this study (see ethical approval certificate in Appendix 1). Several KFU colleges, such as the College of Medicine and Pharmacy, employ non-Arabic-speaking faculty members; thus, the survey was written in both Arabic and English and sent electronically in both languages via the university email to reach a significant number of faculty members. The sent email further explained to the respondents the ethical considerations that were taken into consideration during

the study. Reminder messages were sent via WhatsApp to encourage the faculty members to complete the questionnaire. A maximum of 30 days was allocated for the data gathering stage. Overall, 465 faculty members, representing 23.2% of the study population, participated. Their characteristics are presented in Table 1.

Table 1: Frequencies and percentages of the distribution of the study sample according to gender, years of experience, college type, age, and academic rank

Variable	Category	Number	Percentage (%)
Gender	Male	144	31.0
	Female	321	69.0
Years of experience	Less than 5 years	54	11.6
	5–10 years	63	13.5
	11–15 years	159	34.2
	More than 15 years	189	40.6
College type	Sciences	120	25.8
	Humanities	345	74.2
Age	20–30 years	32	6.9
	31–40 years	170	36.6
	41–50 years	178	38.3
	More than 50 years	85	18.3
Academic rank	Teaching assistant	36	7.7
	Lecturer	87	18.7
	Assistant professor	219	47.1
	Associate professor	75	16.1
	Professor	48	10.3
Total		**465**	**100**

3.3 Data Analysis

SPSS version 23 was employed to analyze the data that emerged from the study. Mean scores, standard deviations, and the median were utilized to answer the first three research questions; Pearson's correlation coefficient was used to answer the fourth research question and verify the internal consistency.

Regarding internal consistency, the Pearson correlation coefficient was calculated between the items and their corresponding category and between the categories and items with the total questionnaire score (N = 25). Data analysis shows that the questionnaire was statistically significant at significance levels 0.01* and 0.05**. Pearson's correlation coefficients between items and the overall score of the category ranged from 0.437* to 0.939**. Pearson's correlation coefficients between the categories and the total score of the instrument ranged between 0.745** and 0.952**. The reliability coefficient was calculated using Cronbach's alpha. The Cronbach α for the total score was 0.95 and those for the categories ranged from 0.78 to 0.93, meaning they were high-reliability coefficients suitable for the study. An agreement scale was adopted for the questionnaire items and categories to determine the degree of agreement based on the range equation (Table 2).

Table 2: Interpretation of mean scores according to the five-point Likert scale

Agreement scale	Low	Low	Moderate	High	Very high
Mean score	1–1.80	1.81–2.60	2.61–3.40	3.41–4.20	4.21–5.00

4. Results and Discussion

4.1 Faculty Members' Readiness, Attitudes, and Behavioral Intentions Regarding AI

As shown in Table 3, the respondents demonstrated a modest degree of readiness to integrate AI into their teaching practices, with an overall mean score of 3.40 ± 0.841 (range: 3.17–4.12). This score is in line with the findings of Hinojo-Lucena et al. (2019).

Table 3: Faculty members' readiness, attitudes, and behavioral intentions towards use of AI in their teaching practices

No.	Category / Item	Mean score	Standard deviation	Rank	Degree
Readiness to use AI in teaching		**3.40**	**0.841**		**Moderate**
1	I am willing to use AI technology in my teaching	4.12	0.731	1	High
2	I have the appropriate knowledge to use AI in my courses	3.30	1.093	3	Moderate
3	I have access to the right devices to apply AI technology in my class	3.17	1.113	6	Moderate
4	I have access to the right software to create content using AI	3.20	1.111	5	Moderate
5	I have access to AI scientific content	3.25	1.008	4	Moderate
6	Smart educational content can be created using AI technology	3.34	1.069	2	Moderate
Attitude towards AI		**3.70**	**0.586**		**High**
1	I think it is fun to use AI technology	4.35	0.742	1	Very high
2	I enjoy using AI technology	4.06	0.864	2	High
3	When I think about the capabilities of AI, I think about how difficult my future will be	3.41	1.224	7	High
4	I have a feeling of discomfort when I think of AI	3.32	1.202	6	Moderate
5	AI technology is not easy to learn	3.45	1.068	5	High
6.	I need to put much effort into learning AI technology	3.61	1.032	4	High
7	I think AI-powered educational content is not always right	3.70	0.875	3	High
Behavioral intentions to use AI		**4.07**	**0.636**		**High**

1	I can learn AI technology quickly	3.90	0.778	5	High
2	I will continue to try to know AI better	4.16	0.732	2	High
3	I will keep myself up to date with the latest emerging AI applications	4.10	0.789	3	High
4	I plan to spend some time studying AI technology in the future	3.97	0.839	4	High
5	I intend to use AI technology to help my teaching in the coming years	4.19	0.702	1	High

The respondents demonstrated a moderate response to the statements "I have the appropriate knowledge to use AI in my courses" (3.30 ± 1.093) and "Smart educational content can be created using AI technology" (3.34 ± 1.069). These results may reflect the respondents' modest or low knowledge and skill levels concerning AI. This was supported by their responses to the open-ended question, where several respondents mentioned their lack of AI knowledge and the need for workshops and training on AI in higher education. The respondents' moderate level of readiness could be attributed to the fact that most educators believe it is challenging to introduce students to the fundamentals of AI (Al-Subhi, 2020; Oyelere et al., 2022) or to adopt it in classroom pedagogy. Furthermore, although AI technology is currently being used in higher education (e.g., via intelligent virtual reality, intelligent support for collaborative learning, and personal tutors), many educators are unaware of it. Or, more importantly, they do not know what it involves (Hinojo-Lucena et al., 2019; Luckin et al., 2016) and how it can be applied productively and effectively in the educational process. Moreover, they do not seem to believe in the importance of using AI applications in education (Al-Habib, 2022; Al-Subhi, 2020), which may hinder their willingness to employ it in their teaching. These results may indicate a need to promote educators' knowledge and practical skills in AI education to enhance their readiness to employ it in their classrooms.

The results show that respondents' attitudes towards AI were rated highly (mean: 3.70 ± 0.586; range: 3.41–4.35). Similarly, their behavioral intentions to integrate AI into their teaching practices were rated highly (mean: 4.07 ± 0.636; range: 3.90−4.19). These results are supported by Chatterjee and Bhattacharjee's (2020) work, which claimed that behavioral intentions and attitudes have a considerable and favorable impact on the adoption of AI in higher education. Similarly, Islahi and Nasrin (2019) stated that educators' attitudes may significantly influence the success of technology adoption, integration, and utilization for productive outcomes in education. A future in which educators are replaced and technology dominates classroom education (EDUCAUSE, 2019) may not occur as long as most individuals are accustomed to working and interacting with technology in learning, work, and daily life (Nardi, 2017). This conclusion may explain the respondents' positive attitudes and behavioral intentions towards AI adoption.

4.2 Perceived Benefits of AI in Higher Education and Teaching

As shown in Table 4, the perceived advantages of AI use in higher education were rated highly, with a mean score of 4.29 ± 0.524 (range: 4.02–4.43). The perceived advantages of AI in teaching also received high scores, with a mean of 4.20 ± 0.515 (range: 3.96–4.40).

Table 4: Mean scores and standard deviations of the perceived benefits of AI in higher education and teaching

No.	Usefulness of AI	Mean score	Standard deviation	Rank	Degree
Perceived benefits of AI in higher education		**4.29**	**0.524**		**Very high**
1	Using AI in higher education is beneficial to society	4.43	0.601	1	Very high
2	Using AI in higher education will make education more interactive	4.42	0.652	2	High
3	Using AI in higher education will be cost-effective	4.02	0.808	7	Very high
4	Using AI in higher education will make teaching and learning activities more interesting	4.31	0.759	4	Very high
5	Using AI is essential to meet the future needs of higher education	4.29	0.754	5	Very high
6	AI provides smart private tutoring platforms to be used in distance education	4.40	0.697	3	High
7	Using AI applications will help identify skills needed for the labor market	4.14	0.836	6	High
Perceived benefits of AI in teaching		**4.20**	**0.515**		**Very high**
1	I can use AI technology to get things done more quickly	4.30	0.667	4	Very high
2	Using AI technology increases my effectiveness and professional and research productivity	4.21	0.754	7	Very high
3	AI technology is useful for teaching and learning activities	4.33	0.683	3	High
4	AI technology can be used to meet students' differences	3.96	0.858	14	Very high
5	AI technology can be used to enhance student self-learning	4.34	0.704	2	Very high
6	AI technology can be used to answer students' queries	4.23	0.761	6	Very high
7	AI technology can be used to evaluate students and provide them with feedback	4.27	0.731	5	Very high
8	AI provides automatic correction of certain types of coursework that frees up the teacher's time for other tasks	4.40	0.619	1	High

9	I can present the most complex topics by employing AI in course teaching	4.12	0.838	11	High
10	AI technology benefits students and me because it relates to our lifestyle	4.08	0.824	12	High
11	AI technology introduces new ways to interact with information, such as using Google to adjust search results according to the learner's geographic location	4.17	0.699	10	High
13	AI technology increases interaction between students and course content, for example, adding a chatbot service for content that can recognize the learners' language and have a real conversation with them	4.19	0.693	8	High
14	AI technology achieves student inclusion and better classroom management through a virtual experience such as Classcraft	4.05	0.770	13	High
15	AI technology expands opportunities for learners to communicate and collaborate	4.18	0.755	9	Very high

Regarding the perceived advantages of AI in higher education, the statement "Using AI in higher education is beneficial to society" had the highest mean score (4.43 ± 0.601). This was followed by the statements "Using AI in higher education will make education more interactive" (4.42 ± 0.652) and "AI provides smart private tutoring platforms to be used in distance education" (4.40 ± 0.697).

Furthermore, the results show that most respondents thought that AI provided considerable benefits for higher education teaching. The following statements received the highest mean scores: "AI technology provides automatic correction of certain types of coursework that frees up the teacher's time for other tasks" (4.40 ± 0.619); "AI technology can be used to enhance student self-learning" (4.34 ± 0.704); "AI technology is useful for teaching and learning activities" (4.33 ± 0.683); and "I can use AI technology to get things done more quickly" (4.30 ± 0.667). These findings support those of various scholars (Baker et al., 2019; Owoc et al., 2021). According to these scholars, AI can aid educators in their learning activities and student assessments; support them and reduce their workload by automating tasks such as administration, assessment, feedback, and plagiarism detection; and support and guide students where needed.

These results could be related to the fact that AI is changing daily life and will continue to do so (Carvalho et al., 2022; Laupichler et al., 2022). Chatbots, for instance, can gather responses using a dialogue interface akin to a human interviewer with a modest bit of user effort; dialogue can be customized based on a student's preferences and responses (Owoc et al., 2021). AI also has the potential

to engender positive social effects by supporting healthy living, influencing voting behavior, and providing health support (Følstad et al., 2018). The global realization of the capacity of AI to solve problems related to sustainable development goals, such as human rights, gender, and inequality issues (Tomašev et al., 2020), may emphasize its significant benefits. Moreover, the respondents' appreciation of AI could have been largely linked to the Covid-19 pandemic, which pushed the globe to switch to remote learning, revealed some benefits and issues with AI, and made people more receptive to adopting AI technologies (Srinivasan, 2022). However, realizing the potential of AI to bring about social benefits is only one aspect of preparing educators for teaching with AI. Thus, it is essential to take further steps to promote educator training for AI learning to ensure that AI is effectively applied in schools and higher education institutions (Ayanwale et al., 2022).

4.3 Available Facilities and Resources

The data analysis shows that from the respondents' viewpoints, there was modest availability of facilities and resources for integrating AI into teaching practices, with a mean score of 3.31 ± 0.763 (range: 2.59–3.86; Table 5).

Table 5: Mean scores and standard deviations of available facilities and resources for integrating AI into teaching practices

No.	Facilities and resources	Mean score	Standard deviation	Rank	Degree
Available facilities and resources		**3.31**	**0.763**		**Moderate**
1	My university has all the resources to use AI technology to create smart content	3.57	1.011	3	High
2	I can get all the resources required to develop AI-based smart content	3.42	0.997	4	High
3	My university sponsors any educational opportunity related to AI	3.62	0.868	2	High
4	All the classrooms in the college building where I work are equipped with the necessary devices to use AI technology for teaching purposes	2.59	1.071	7	Low
5	My university has AI specialists to help me employ it in course topics	2.82	1.057	6	Moderate
6	The university administration supports the use of AI in teaching courses	3.31	1.002	5	Moderate
7	The university encourages faculty members to use modern technology	3.86	1.073	1	High

The responses to statements related to this research inquiry indicate a moderate degree of agreement from the respondents; for example: "The university administration supports the use of AI in teaching courses" (3.31 ± 1.002) and "AI experts at my university can assist me in incorporating it into my academic themes" (2.82 ± 1.057). The statement "All the classrooms in the college building where I work are equipped with the necessary devices to use AI technology for

teaching purposes" received a low mean score (2.59 ± 1.071). This finding is similar to that of Al-Subhi (2020), who found that a lack of necessary technical support is a challenge that hinders AI application in Saudi higher education.

The data from the open-ended question serve to further underline these results. Here, numerous respondents reported that the classrooms lacked essential primary and supporting devices to apply AI in education and that the institution encouraged modern technology. It could therefore be suggested that the respondents' moderate level of readiness to integrate AI into their teaching approaches was related to the technical services and environment at the university.

4.4 Correlation between Faculty Members' Readiness to Integrate AI into Teaching and Various Factors

A statistically significant correlation was found at the 0.01 significance level between respondents' readiness to integrate AI into teaching and the perceived benefit of AI in higher education, the perceived benefit of AI in teaching, attitudes towards AI, behavioral intentions to use AI, and availability of facilities and resources for AI use. The correlation coefficients ranged between 0.264** and 0.467** and had a significance level of 0.00 (Table 6).

Table 6: Pearson's correlation coefficient to determine the correlation between faculty members' readiness to integrate AI into teaching and certain variables

Pearson correlation coefficient		**Perceived benefits of AI in higher education**	**Perceived benefits of AI in teaching**	**Attitudes towards AI**	**Behavioral intentions to use AI**	**Available facilities and resources**
Readiness to use AI in teaching	Correlation coefficient	.365**	.419**	.264**	.467**	.354**
	Statistical significance	.000	.000	.000	.000	.000
	Number	465	465	465	465	465

Note: ** Correlation is significant at the 0.01 level (2-tailed)

The results in Table 6 imply that the perceived value of AI in higher education and teaching, attitude, behavioral intentions, and facility and resource availability are crucial in determining whether educators are ready to integrate AI into their teaching. Furthermore, these factors are related, as demonstrated by previous studies. For instance, research has predicted that the perceived usefulness of AI has a positive impact on individuals' readiness (Chai et al., 2021), attitudes (Chatterjee & Bhattacharjee, 2020), and behavioral intentions (Ayanwale et al., 2022). If educators believe that AI can be a valuable tool for enhancing student learning, they are more likely to be ready to integrate it into their teaching. Kim and Karpova (2010) noted that attitude directly and considerably impacts consumers' behavioral intentions. Perceived usefulness and behavioral intentions are thought to be mediated by attitude (Chatterjee & Bhattacharjee, 2020). If

educators have a positive attitude towards AI, they are more likely to be open to using it in their teaching.

Moreover, research has found a direct relationship between behavioral intentions and facilitating conditions (Chatterjee & Bhattacharjee, 2020; Rahman et al., 2020) for adopting new technologies such as AI. If AI resources are available and educators have strong behavioral intentions, they are more likely to be ready to integrate AI into their teaching and to overcome any related challenges they face. Therefore, it is important to consider these factors when developing interventions to promote faculty members' readiness to integrate AI into their teaching. By understanding how these factors interact, more effective interventions can be designed to help educators overcome the challenges of integrating AI into their teaching. One such intervention could, for example, focus on increasing educators' awareness of the value of AI in higher education and teaching. Another intervention could focus on helping educators develop a positive attitude towards AI. Yet another intervention could focus on providing educators with the resources they need to use AI in their teaching.

4.5 Readiness of Faculty Members to Integrate AI into Teaching According to Gender, Age, Academic Rank, College Type, and Teaching Experience

The mean scores and standard deviations were calculated to measure the respondents' readiness to integrate AI into their teaching according to different variables (Table 7).

Table 7: Mean scores and standard deviations of faculty members' readiness to integrate AI into their teaching according to gender, age, academic rank, college type, and years of teaching experience

Variable	Variable category	Mean	N	Std. deviation
Gender	Male	3.65	144	0.791
	Female	3.29	321	0.840
Age	20–30 years	2.95	32	0.850
	31–40 years	3.41	170	0.823
	41–50 years	3.49	178	0.877
	More than 50 years	3.35	85	0.746
Academic rank	Teaching assistant	3.43	36	0.779
	Lecturer	3.40	87	0.869
	Assistant professor	3.28	219	0.834
	Associate professor	3.55	75	0.850
	Professor	3.70	48	0.765
College type	Sciences	3.32	120	0.819
	Humanities	3.42	345	0.847
Teaching experience	1–5 years	3.48	54	0.895
	6–10 years	2.98	63	0.704
	11–15 year	3.38	159	0.884
	More than 15 years	3.53	189	0.787

Multiple variance analysis was used to demonstrate the significance of the differences between the mean scores of the respondents' willingness to integrate AI into their teaching according to gender, age, academic rank, college type

(i.e., humanities or sciences), and years of teaching experience (Table 8). The variables are discussed below individually.

Table 8: Multiple variance analysis demonstrating the effect of gender, age, academic rank, college type, and years of teaching experience on faculty members' readiness to integrate AI into their teaching

Source	Type I sum of squares	df	Mean square	F	Sig.
Gender	12.828	1	12.828	20.586	.000
Age	8.861	3	2.954	4.740	.003
Academic rank	5.670	4	1.418	2.275	.060
College type	0.899	1	0.899	1.442	.230
Teaching experience	17.977	3	5.992	9.616	.000
Error	281.664	452	0.623		
Total	5696.500	465			

4.5.1 Gender

As illustrated in Table 8, regarding respondents' readiness to integrate AI into their teaching according to the gender variable, there were statistically significant differences in favor of the male educators at the 0.05 significance level. These findings are consistent with those of Mahdi and Al-Dera (2013), who found that female teachers at Najran University in the KSA used less technology in their lessons than male teachers. This result might be related to concerns about technology, as research has shown that female educators exhibit higher anxiety levels regarding this topic than male educators (Bain & Rice, 2006; Todman, 2000).

4.5.2 Age

The results in Table 8 also demonstrate statistically significant differences at the 0.05 significance level regarding respondents' readiness to integrate AI into their teaching according to the age variable. Table 9 shows the results of Scheffe's dimensional comparisons to determine which age category significantly affects the study sample's responses.

Table 9: Scheffe's dimensional comparisons of statistically significant differences in faculty members' readiness to use AI by age variable

Category	Age (I)	Age (I)	Mean difference (I–J)	Sig.	Difference trend
Readiness to use AI in teaching	20–30	31-40	-.46-*	.029	In favor (31–40) years
		41-50	-.53-*	.006	In favor (41–50) years

Note: * Correlation is significant at the 0.05 level (2-tailed)

In contrast to Mahdi and Al-Dera's (2013) research findings, which outlined that educators' age has no effect on the implementation of technology in teaching, the results of the current study reveal statistically significant differences in the respondents' readiness to utilize AI according to the age variable. These differences were between the age groups of 20–30 and 31–40, with the latter being favored. Additionally, there were differences between the age groups of 20–30

and 41–50, in favor of the latter. According to these findings, academics between the ages of 31 and 50 are more likely to be open to incorporating AI into their classes. This might be because of the characteristics of this age group, which include maturity and a propensity to explore new things. Moreover, there is an increased demand for distinguished faculty members in all stages of Saudi education, raising Saudi educators' interest in technology. The standards for defining qualified educators have advanced beyond the teacher's mastery of the subject matter and pedagogy and towards technological expertise (Alhawiti, 2013).

4.5.3 *Academic rank*

Table 8 shows no statistically significant differences at the 0.05 significance level for respondents' willingness to integrate AI into their teaching according to academic rank. These results coincide with those of Al-Subhi (2020), who found that the academic rank of educators at Najran University did not impact their actual use of AI applications in their teaching. An individual's capacity to deal with a matter or to adapt to new situations (e.g., using technology) may depend on their psychological state and certain outside variables, such as available resources and facilities. Thus, aspects such as academic rank might not alter faculty members' readiness when internal (e.g., motivation, personal characteristics) and external (e.g., promotion, institutional support, availability of facilities) factors are present.

4.5.4 *College type*

There were no statistically significant differences at the 0.05 significance level regarding respondents' readiness to integrate AI into their teaching according to the college type variable (see Table 8). This could be related to the long-held belief that educators with scientific backgrounds are more open to and enthusiastic about using technology. Moreover, during the Covid-19 pandemic, most educators shifted to online instruction (O'Keefe et al., 2020). Several teachers continue to use particular technologies, programs, and platforms for teaching. Moreover, the annual KFU competition for distinguished faculty members encourages them to be creative and innovative in their teaching techniques. In this context, scholars such as Ayanwale et al. (2022) have suggested that educators of various disciplines should be trained as alternatives to specialized educators to ensure that AI application is democratized in the future.

4.5.5 *Years of teaching experience*

As seen in Table 8, there were statistically significant differences at the 0.05 significance level regarding respondents' readiness to integrate AI into their teaching according to the teaching experience variable. Table 10 shows the results of Scheffe's dimensional comparisons to show any significant differences attributed to experience.

These results suggest that years of teaching experience should be considered a crucial factor influencing faculty members' willingness to integrate AI in a higher education context. However, Mahdi and Al-Dera (2013) found no significant difference in the use of technology among educators at Najran University in the KSA based on their teaching experience.

Table 10: Scheffe's dimensional comparisons for faculty members' readiness to integrate AI into their teaching according to the experience variable

Category	Experience (I)	Experience (I)	Mean difference (I–J)	Sig.	Difference trend
Readiness to use AI in teaching	1–5 years	6–10 years	.51*	.008	In favor of experience from 1 to 5 years
	6–10 years	More than 15 years	-.55-*	.000	In favor of 15 years and more experience

Note: * Correlation is significant at the 0.05 level (2-tailed)

As seen in Table 10, in the current study, there were statistically significant differences concerning the respondents' readiness to use AI between those with 1 to 5 and those with 6 to 10 years of experience, in favor of the former. Additionally, there were statistically significant differences between those with 6 to 10 and those with 15+ years of experience, in favor of the latter. These findings indicate that educators with lower and higher levels of teaching experience are most receptive to integrating AI into their lessons. This could be explained, in part, by the fact that educators with less teaching experience may be more willing to implement AI in their classes due to a desire to appear more creative and productive and to demonstrate a high level of professional performance. They are also more likely to study fundamental technologies in their undergraduate programs.

Meanwhile, more experienced faculty members might become more comfortable using technology due to both their own interest in it and the Covid-19 pandemic experience. University workshops could help faculty members to become more technologically proficient. In this context, different conclusions have been made. For example, Yaghi (2001) claimed that older instructors are less comfortable utilizing computers, while Egbert et al. (2002) found that teachers with more experience use technology in the classroom more than those with less experience.

5. Conclusion

The future of higher education is inextricably connected to future breakthroughs in new technologies and the processing power of emerging intelligent machines. These advancements in AI will raise new questions for teaching and learning in higher education. They will have the power to significantly alter such institutions' internal dynamics and governance (Nasrallah, 2014; Popenici & Kerr, 2017; Silander & Stigmar, 2019). To ensure widespread acceptance and application of AI in higher education, it is essential to consider faculty members' readiness to include AI in their teaching and the elements and supportive environments that could facilitate such integration. These factors represent the primary reasons for conducting this study.

Despite their positive attitudes and behavioral intentions towards AI use, the faculty members surveyed were only moderately ready to integrate AI into their teaching. This is due to issues such as their low knowledge level of AI and how to

use it in teaching, the modest level of facilities and resources provided by the educational institution, or their lack of knowledge on how to benefit from AI. For educators to incorporate AI in their classrooms, it is crucial that they receive practical AI training.

The perceived value of AI in higher education and teaching, attitudes towards AI, behavioral intentions concerning AI use, and supportive conditions were significantly correlated with the respondents' willingness to incorporate AI in their classes. Respondents' gender, age, and years of teaching experience also impacted their willingness. Accordingly, it can be concluded that there is a need to enhance faculty members' readiness, awareness, and practical skills regarding AI to ensure that upcoming generations are prepared to keep up with the world's current rate of technological advancement (Bates et al., 2020; Zawacki-Richter et al., 2019).

6. Limitations, Strengths, and Future Research

This research had several limitations. First, it was conducted at one Saudi public university, limiting the application of the findings to other public and private Saudi universities. To overcome this issue, the study could be reproduced and the significance of the findings reinforced by comparison to other Saudi higher education institutions. Second, while the study drew attention to the issue of faculty members' readiness to integrate AI into their instruction, it offered no real-world models or methods for doing so. An empirical study is thus advised to overcome this issue. Third, although the faculty members surveyed claimed that the university promotes technology use, several acknowledged the necessity for a practical workshop on AI. More analytical studies of such workshops in higher education are necessary to assess the extent to which new technologies, such as AI, have been presented to educators, both conceptually and practically. Fourth, a respondent noted that AI can be utilized for assessment and evaluation but not teaching. Thus, an interpretive study is recommended to comprehend this claim fully. Finally, the study used only one research instrument, which could lead to several limitations, including providing incomplete data and being biased in favor of certain types of respondents or results.

This study also had several strengths. First, it covered a crucial subject necessary for advancing education in the twenty-first century. Although only approximately 23.2% of the target sample responded, several respondents highlighted the value of the study topic in their comments to the open-ended question. Indeed, without educators' willingness to assist in achieving this goal, the actual acceptance and implementation of AI in higher education may never come to pass.

Second, the analysis found that educators require hands-on training in implementing AI in educational institutions. Additionally, they require enabling infrastructure, materials, and facilities to use AI in their instruction effectively. Based on this context, Bucea-Manea-Tonis et al. (2020) claimed that to fulfil the demands of millennials and the technological revolution, universities must adopt these technologies and create new training and teaching techniques. Therefore,

this study could draw the attention of university stakeholders to the need to provide conditions and enabling factors for the effective use of AI in educational institutions. Third, the study topic aligned with the KSA's Vision 2030 and the digital transformation of education. This research highlighted the significance of improving Saudi higher education standards and the quality of its faculty members to better equip graduates to handle the technology surrounding them.

Finally, no research has been conducted specifically examining the readiness of faculty members to integrate AI into Saudi higher education. This study thus contributes to the body of research on the elements affecting preparation for AI integration and teaching in higher education. It provides researchers with a solid foundation for how AI could be successfully implemented in Saudi universities or higher education in general, either by including it in curricula or teaching it as a separate academic subject. In general, this study provides a new contribution to knowledge about university educators' readiness to integrate AI into the educational environment and the factors influencing that readiness in higher education and the KSA overall.

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Appendix 1
Ethical Approval Certificate

موافقة أخلاقية
Ethical Clearance

Deanship of Scientific Research

Ref. No.	KFU-REC-2023-FEB-ETHICS533	الرقم المرجعي
Project Title	العوامل المؤثرة على استعداد أعضاء هيئة التدريس لدمج الذكاء الاصطناعي في ممارساتهم التعليمية: دراسة من سياق التعليم العالي السعودي	اسم المشروع البحثي
Contact Point	بديعه ناصر النصيب	ضابط الاتصال
Phone	0508017001	الهاتف
Email	balnasib@kfu.edu.sa	البريد الإلكتروني
Co-Researcher 1	بديعه ناصر النصيب	باحث 1
Granting Institution	جامعة الملك فيصل King Faisal University	المؤسسة الممنحة
Approval Date	01/02/2023	تاريخ الموافقة
Approval Validity	24 Months	صلاحية الموافقة

تفيد لجنة أخلاقيات البحث العلمي بجامعة الملك فيصل بأنه تم منح المشروع البحثي الموضح عاليه موافقة أخلاقيات البحث العلمي. وذلك بناء على فحص للجانب الأخلاقي من المشروع وفقاً للبيانات المزودة من قبل صاحب الطلب. قد تخضع المشاريع البحثية للمتابعة الميدانية أو أي شكل آخر من أشكال المتابعة الدقيقة من قبل اللجنة في أي وقت. قد تطلب اللجنة تقريرا منتظما عن تقدم المشروع لضمان التزام الباحثين بأعلى المعايير الأخلاقية. الباحثون مسؤولون عن تخزين وحفظ وتأمين البيانات الناجمة عن المشاريع. يجب على الباحثين إبلاغ اللجنة على الفور بأي تعديلات جوهرية على المشروع أو قضايا أخلاقية مستجدة وذلك من خلال البريد الإلكتروني (ialjreeshi@kfu.edu.sa) أو الهاتف [00966158997773].

Having reviewed the details submitted by the applicant regarding the abovenamed research project, the Research Ethics Committee at King Faisal University grants its ethical approval to the protocol. Projects may be subject to an audit or any other form of monitoring by the committee at any time. The committee may request a regular report on the progress of the project to ensure that researchers are committed to the highest ethical standards. Researchers are held accountable for the storage, retention and security of original data obtained from projects. Any substantial alterations to the project or emerging events or matters that may affect the ethical acceptability of the project must be reported immediately to the committee via email (ialjreeshi@kfu.edu.sa) or phone (0096615899773).

The Chair of the Research Ethics Committee	أ.د. عبدالرحمن اللبلي Prof. Abdulrahman Al Lily	رئيس لجنة أخلاقيات البحث العلمي
Date	2/5/2023	التاريخ