Factors Affecting Students' Willingness to Use Artificial Intelligence in University Settings

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***Abstract*—This study aimed at investigating the factors affecting students' willingness to use AI. A quantitative study method was used, with the survey questionnaire technique. The sample of this study consisted of 330 university students in Jordan. The participants were from different colleges and majors. The results of the study revealed that perceived usefulness, ease of use, perceived enjoyment, time and psychological risks, social influence and task technology fit significantly influenced willingness of the students to use AI systems in their learning environment. However, the results of the study will help in introducing a new technology tool such as AI to be implemented in the learning environment by both students and instructors. The study will also help in determining the effectiveness of the AI used in university settings.**

***Keywords*—artificial intelligence, university, students, willingness, Jordan**

I. Introduction

Technology advancements and Internet use throughout the years have brought drastic transformation of the learning environment and the educational field [1]. Current digital technology advancements have brought about the development of alternative learning and teaching strategies and methodologies [2, 3]. Moreover, such advancements have been dynamic and swift that it has extensively reached various geographical areas in a short time [4]. It is therefore important for educational institutions to transform their environments to one that is traditional to a more current environment equipped with artificial intelligence-based educational learning (AI) [5]. Specifically, the potential of AI systems in higher education is endless [6]; for instance, [7] found educational platforms and applications to be consistent with the requirements and knowledge of the learner, which makes for efficient and enhanced teaching methodologies in the educational field [8, 9]. In addition, implementation of AI systems has the potential to transform the landscape of education as well as refining pedagogy and improving educational outcomes [10, 11].

Literature dedicated to the AI system has evidenced its role in improving engagement, communication, motivation and interest in learning [12, 13]. Technology related to AI adopted in the educational institutions can assist in educational problem-solution and promote high quality of education [14]. It is notable that prior to the development and implementation of AI-assisted learning environment, learners' willingness towards its adoption needs to be examined [15]. In other words, for the facilitation of learning process within AI-assisted environments, the attitudes of learners towards AI technology need to be explored [16], but the reality is, students' willingness towards its adoption classroom applications of AI have largely been placed aside in the field of education [17]. According to [18], education-applied AI technologies and applications should lay emphasis on the students' willingness for effective use and [19] revealed factors that influence the willingness towards its adoption among students from the student-oriented learning point of view.

AI influence has long permeated the educational field and setting, providing modern teaching and learning methodologies and addressing challenges in a way that makes for easier educational content and deals with lack of teachers and instructors [20]. The use of information technology IT technologies like innovative learning tools, tutoring systems and virtual facilitators have been evidenced to contribute to educational value [20], but even though some AI systems like chatbot technology appears to have a promising role in enhancing and facilitating learning, there are still uncertainties when it comes to learners' acceptance and adoption of it. Hence, prior to developing and implementing AI-assisted learning environment, the willingness of the learners to accept the willingness towards its adoption should be investigated and this is further compounded by the lack of studies on the topic stressing on the need for and importance of such studies to be carried out [16]. Such lack of investigation into learners' willingness towards its adoption was also mentioned by [17], particularly in the field of education, stressing on the need for more studies to examine it for in-depth understanding of the factor that drive learners' willingness towards its adoption and use of innovative technology, and an exploration of the way AI can be used to reap benefits for both learners and instructors [20, 21]. Past relevant studies [18, 19] also recommended the need to examine the factors that influence learners' willingness towards AI technology use from the perspective of students-oriented learning.

In fact, most of the current studies like [18–21] have examined the AI system effectiveness using analytical models

like [22] TAM, UTAUT, Task Technology Fit (TTF) model to shed light on the influence of factors on AI technology use. But as yet, no study has combined the three models to examine the willingness of students to use AI in higher education. The combination of the three models (TAM, UTAUT and TTF) to explore AI technology learning use can present an enriching contribution to literature and the findings will have several implications to managers and educators in light of the best ways to use AI systems in a way that can influence the willingness towards its adoption of students and pave their way to educational success in higher education – this is possible through the minimization of the gap between the acceptance and continuation research branch of using AI system and technologies. This study develops a research paradigm for the combination of TAM with UTAUT and TTF for AI system and to influence the willingness of the students to adopt and accept the system in their learning process for sustainable education. The paper mainly aims at addressing the question: What are the factors affecting the learners' willingness towards using AI technology in their higher learning process.

II. Literature Review

A. Factors Affecting Students AI Willingness

The attitudes of learners towards AI in the learning environment are expected to be different in different contexts [23–25]. However, at present, it is unclear as to the way general attitudes towards AI affect the comfort of students with a distinct artificial intelligence in education (AIEd) implementation and exploring this issue will enrich literature on students' attitudes towards technologies and may provide the type of AIEd technology that is readily adoptable by the students and those that are not – the latter of which would need more care in implementing [26]. The majority of studies have generally adopted [22] TAM model for predicting individuals' acceptance of and behavioral intention towards IT use [27]. Based on the model, there are three major constructs that define the individual/organizational knowledge system, and they are perceived ease of use, perceived usefulness and perceived enjoyment. Perceived usefulness refers to the level of the individual's conviction that using a specific system is effortless from the physical and mental aspects [28]. In the field of education, it can be juxtaposed as the inclination of the students/learners to use or refrain from using an application or a certain technology on the basis of how easy it is to use it for optimum performance of learning [29–31]. Perceived ease of use refers to the level to which an individual is convinced that using a specific IS would improve his performance on the job [28].

In TAM, perceived ease of use is considered to be a direct determinant of the individual's intention towards adopting technology and Saleh *et al.* [32] and Mensah *et al.* [33] found perceived ease of use to be a top antecedent of intention towards technology. The concept of enjoyment is underpinned by intrinsic motivation [34, 35], and it is conceptualized under hedonic motivation [36]. Essentially, perceived enjoyment refers to the individual's level of fun and pleasure in using a specific technology [37, 38], and Al-Adwan *et al.* [34] described perceived enjoyment as the level to which the activity of using a certain system is viewed to be enjoyable in its right, independent from any performance outcome stemming from using the system. Despite its extensive adoption, TAM has been criticized as lacking and many recommendations have been made for its extension to other contexts and inclusion of additional variables [39].

When it comes to AI technology, studies have mostly stressed on the examination of specific variables from UTAUT like effort expectation and facilitating conditions [15]. Also, in acceptance of new technology, studies have mentioned the importance of the theory of perceived risks factors in the willingness to adopt technology [23]. Zhang *et al.* [40] and Wu *et al.* [15] confirmed that attention should be paid to the risks caused by the application of AI in education. However, few studies have focused on the theory of perceived risks, especially in higher education. However, few studies have focused on the theory of perceived risks especially in higher education [15]. For new technology, focus should be placed on the risks stemming from AI application in education [40] and [41] explained that for such exploration, the study needs to look into perceived risk theory to determine the risk factors that influence the willingness to use AI technology among students. Perceived risks, as a concept, refers to the risk of people predicting the outcome of behavior prior to the carrying out of the behavior [42].

More specifically, three major perceived risk factors, namely social influence, time risk and psychological risk, were selected, while the others were excluded to steer clear of overlap among the factors included in theories. Such risks have a negative influence on the willingness towards adoption face recognition technology [43] and in this study, perceived risks including time and psychological risks are deemed to influence the students' willingness towards adoption AI-assisted learning, where time risk refers to the time-related risk used in AI activities and psychological risk refers to the psychological state when learning through AI systems. Social influence has been proposed as one of the top predictors of behavioral intention [36], and in the education field, social influence is the opinion of the students, teachers, friends and family about using a specific technology [44] and thus, this study proposes that social influence has a significant influence on the students' willingness to learn using AI systems. The study selected the three risks factors due to the efficiency of AI technology in higher education, has less impacts on students' health, physical and financial risks [15]. Most of the theories have been used to explain acceptance of new technology [45] like Task Technology Fit (TTF). This theory is adopted in this study on the basis of the need to investigate the technology characteristics-task specifications correlation [46] as well as it can be applied in any situation of technology use for performing tasks [47]. Despite many theories and model have been used to explain acceptance of new technology such as TAM, UTAUT and others, several criticized and recommendations have been made for its extension to other contexts and inclusion of additional variables. For instance, Al-Adwan *et al.* [34] mentioned that TAM model only offers broad insights into user willingness to adopt technology, and other factors are necessary for context-based comprehension of the use of a particular technology [48]. Studies also recommended not to focus on the users' abilities only, but also on the perceived risks of the technology as well as the technology functionality and task

requirements [34, 39]. TAM and UTAUT are not explicitly concerned with the fit between the task and the technology, therefore, this study adopted several factors from three models (TAM, UTAUT and TTF),and therefore, this study examines seven major influencing factors to predict students' willingness to use AI in their learning environment – the factors are perceived usefulness, perceived ease of use, perceived enjoyment, social influence, time risk, psychological risk, task technology fit and students' willingness to use (see Fig. 1). Based on the proposed model, this study proposed the following hypotheses:

H1: Perceived usefulness has a positive effect on students' willingness.

H2: Perceived ease of use has a positive effect on student willingness.

H3: Perceived enjoyment of use has a positive effect on student willingness.

H4: Time and psychological risks have a positive effect on student willingness.

H5: Social Influence has a positive effect on student willingness.

H6: Task technology fit has a positive effect on student willingness.

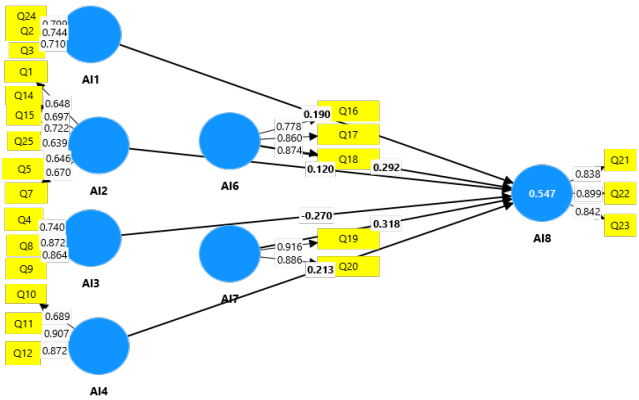

Fig. 1. Study model.

Note: AI1, Perceived Usefulness; AI2, Time and Psychological Risks; AI3, Perceived Enjoyment; AI4, Social Influence; AI6, Ease of Use; AI7, Task Technology Fits; AI8, Willingness

III. Method

A. Design of the Study

This study examined the factors that influence the students' willingness to use innovative educational methods (AI) to their learning activities, and this is particularly examined in the context of Jordanian students in universities. This study is a quantitative research design, with the survey used as the primary data collection instrument to determine the characteristics, attitudes, views, abilities, beliefs, thoughts and expectations of the university students as suggested by [36].

B. The Study Sample

The population sample comprises the university students attending a university in Jordan, chosen from various colleges and departments based on their familiarity with the technology and willingness to participate in this study. The participants were also chosen based on their university's geographical location – one that caters to many students enrolled in AI system courses. Three hundred and thirty students were selected as the study sample, all varying in age from 18 to 22 years of age. The sample size was determined according to Hair *et al.* [49] and Loehlin [50] who suggested for appropriate sample follow the recommendation of at least a sample size of 200-250 as being adequate for analysis in PLS-SEM. Before the study commenced, the authors obtained the approval of the Ethics Committee and the Dean of Scientific Research at Irbid National University to distribute the survey questionnaire copies. Following obtaining the said approval, the authors proceeded to contact the faculties of various departments for questionnaire copies distribution using a hyperlink. Also, the students' participation was based on a voluntary basis, where their verbal agreement was obtained under the presence of university students, and they have been informed that the data gathered would be kept confidential.

C. Study Measurements

Data collection was carried out using a questionnaire survey distributed to the study participants, wherein which several variable scales were used from related past literature to measure perceived usefulness, perceived ease of use, and perceived enjoyment from [22], time risk and psychological risk from [15] and [51], social influence from [52], task technology fit from [53], and students' willingness to use AI systems in their learning from [54]. The above seven factors in the research model were measured using 23 items gauged along a five-point Likert scale ranged from five strongly agree, and one strongly disagree. More specifically, 9 measurement items of perceived usefulness, perceived ease of use and perceived enjoyment from TAM gauged the perceptions of the students towards using AI systems in learning, 6 items were used to measure time risk and psychological risk to determine the risk-related use of AI, 3 items were used to measure social influence, gauging the influence of people on students in their AI systems willingness to use, 2 items were used to measure task technology fit to gauge the suitable AI systems that are aligned with learning tasks, and 3 items were used to measure the willingness of the students to use AI systems in their learning environment. The measurement items were adopted from past relevant studies but were tweaked to make it suitable to the context of the study objectives. In the first section of the questionnaire, a demographic information was requested, namely age, gender and computer experience and in the second section, the scaled response items were listed to obtain the perception of the respondents regarding the influence of the factors on their willingness to learn using AI system.

D. Validity and Reliability

The reliability of the items in the questionnaire was established –and the reliability was tested using Cronbach's alpha coefficient test, composite reliability and factor loading coefficient analysis. Specifically, the factor loading coefficient of items had to exceed 0.40 for excellent reliability. As for the CR values they needed to exceed 0.60 and Cronbach's alpha coefficient values had to exceed 0.60 to be consistent. Convergent validity test was also applied through the average variance extracted (AVE) where the value needed to exceed 0.50. Data gathered through the questionnaire survey was entered into SPSS and PLS-SEM and was then

exposed to descriptive analysis to analyze and provide their mean and standard deviation values. The study then utilized regression analysis to test the developed hypotheses. The results in Table 1 have indicated that Cronbach's alpha of all the constructs exceeded the recommended value as willingness to adopt was 0.824, perceived usefulness was 0.662, ease of use was 0.800, perceived enjoyment was 0.768, time and psychological risks was 0.774, task technology fit was 0.770, and social influence was 0.764. In terms of convergent validity, table 1 results showed that items loadings were higher than 0.60 value, and composite reliability CR demonstrate good internal consistency in the construct suggested that CR above .60 (willingness to adopt was 0.824, perceived usefulness was 0.700, ease of use was 0.875, perceived enjoyment was .780, time and psychological risks was 0.771, task technology fit was 0.780, and social influence was 0.783); and finally, AVE and constructs validity are considered converging.

Table 1. Construct Validity and reliability

	α	CR	AVE
Willingness	0.824	0.824	0.740
Perceived Usefulness	0.662	0.700	0.565
Ease of Use	0.800	0.875	0.703
Perceived Enjoyment	0.768	0.780	0.686
Time and Psychological Risks	0.774	0.771	0.450
Task Technology Fit	0.770	0.780	0.812
Social Influence	0.764	0.783	0.685

IV. Results

The correlations of the study variables to use AI were analyzed using Pearson Product-Moment Correlation Analysis. Based on the results, a significant correlation was found between willingness to use AI in learning and six study variables (see Table 2).

Table 2. Pearson correlation analysis

	PU	EOU	PE	TPR	TTF	SI	WIL
Perceived Usefulness	--						
Ease of Use	0.70	--					
Perceived Enjoyment	0.58	0.64	--				
Time and Psychological Risks	0.48	0.49	0.64	--			
Task Technology Fit	0.61	0.63	0.60	0.64	--		
Social Influence	0.47	0.51	0.50	0.39	0.71	--	
Willingness	0.54	0.53	0.39	0.45	0.64	0.62	--

The interpretation strength of the model was established using PLS-AMOS and the evaluation standard coefficient was compared in order to determine whether the four fitting model indices fell within the acceptable range as shown in Fig. 1. The structure of the modified model was revealed to be reasonable, and the results tabulated in Table 3 showed significant paths of the variables, which supported the research hypotheses. Table 3 and Fig. 1 show that the variables (Perceived Usefulness, Ease of Use, Time and Psychological Risks, Perceived Enjoyment, Task Technology Fit and Social Influence) were all significant (p = <0.05) with weights of o.19, 0.292, 0.12, -0.270, 0.318, and 0.21 respectively.

Table 3. Results of the model

Hypotheses	Path coefficient	p-value	Results
PU-WILL	0.190	0.000	Supported
EOU-WILL	0.292	0.000	Supported
PE-WILL	-0.270	0.000	Supported
TPR-WILL	0.120	0.000	Supported
TTF-WILL	0.318	0.000	Supported
SI-WILL	0.213	0.000	Supported

V. Discussion

The results obtained in this study, revealed that the independent variables had significant correlations with the willingness of the students to use AI technology in their learning – findings that are consistent with the past relevant studies [55, 56], and stressing on the status of the factors as determinants of willingness to use AI technology. The results may be related to the recent use of AI system as a learning tool by the participants to study several university courses – suffice it to say that they may have had a good experience and perception of its usefulness and as such, supporting their inclination towards its use. Moreover, the students may have felt satisfaction with their use of the AI systems in tasks completion – in this regard, Hanus and Fox [57] found that student's excitement and motivation often increases in using new learning ways like AI system. In [58] study, the authors evidenced the role of perceived usefulness in determining technology adoption as users will have the tendency towards technology use to bring about the completion of their tasks. This study's result on perceived usefulness is aligned with those reported by [55] and [56] who revealed a positive significant influence from perceived usefulness to willingness towards AI adoption. Therefore, the first hypothesis is supported.

In the second hypothesis, perceived ease of use was proposed to influence willingness to adopt, and positive influenced was achieved. This study finding mirrors reported past findings by [59] and [60] who found ease of use to be among the top determinants of willingness to make use of AI technology. This result may be related to the implementation of the University of the AI system, and its integration into activities, while providing several staff training courses to assist in successful integration of the system in learning and teaching processes. Prior results were also consistent with the present one in that [59] found perceived ease of use to have a positive and significant influence on the willingness of the students towards AI technology adoption [60] supported its positive influence on the same. This result supports the second hypothesis concerning the significant influence of perceived ease of use on the willingness of the students to adopt AI in their learning. Aside from the above supported hypothesis, the findings also do support the positive influence of perceived enjoyment on the students' willingness to use AI technology in their learning environment. This result may be attributed to the students' experience of enjoyment while learning using AI technology. The third hypothesis of

perceived enjoyment and its influence on the willingness to use AI technology in learning is thus supported.

Additionally, in the fourth hypothesis, the perceived risks (time and psychological risk) were proposed to influence the willingness of the students to use AI in their learning environment, and based on the result, the hypothesis is supported. This result is not like that reported by [61] and [15, 22] who found psychological risk to have a significant influence on the willingness of the students to adopt AI technology. The students did agree that using AI brings about their learning and assists them in their task completion in a timely manner. In comparison to the traditional learning methods, students' use of AI in tasks completion affects their psychological state through less pressure and thus, less nervousness to complete their tasks.

Moving on to hypothesized effect of social influence on the willingness of the students towards using AI technology, the result supported the hypothesis. This may be related to the influence of the instructors on the students when using AI technology – the majority of the instructors used AI systems in teaching and thus, they were able to assist the students in their queries during activities completion. This result is consistent with that of previous studies that showed social influence to have a direct significant effect on the behavior and willingness of the students to use technology in learning [15, 62].

As for the TTF factor, a positive influence of the variable was found on the students' willingness to use AI technology in their learning environment, which reflects the sufficient level of experience of students when using AI technology in learning and in completing their tasks. The study managed to make use of the combined version of TAM, UTAUT and TTF model to examine and interpret the factors that influence the willingness of the students to learn using AI technology. This is one of the major contributions of the study to literature. The study also promotes the use of AI technology in the long-term and hence, the research achieved the research objectives, with all the hypotheses supported. It is however recommended that owing to the under-examination of the task-technology-factor in literature, future studies may be conducted to validate the study results and provide support for the conclusion for broader generalization.

The study adds enrichment to AI literature in the field of education, but it is not without its limitations that future studies can avail from. First, this study used the quantitative method of gathering data and thus, future studies may employ a longitudinal study with a mix quantitative and qualitative method instead for more insights into the students' perceptions and views on AI use in learning tasks completion Second, the study's sample size is limited to university students in the Jordanian university and to this end, future studies can should use bigger-sized samples and collect data from multiple region or countries to diversify the study's respondents and validate the findings of the study and to make them for more generalizability. This study also was conducted and limited to university educational contexts, and to ensure broader applicability, future studies should be conducted in different educational contexts. Lastly, another limitation concerns the study variables as there may be other variables that contribute to influencing AI willingness to use among students aside from the examined ones, which future studies can include in their investigation, for instance, students' characteristics such as age and gender, university types, environment, technology factors and experience which should be considered in future studies.

VI. Conclusion and Implications

This study supported the significant influence of the examined factors on the willingness of the university students to use AI technology in their learning. The results of this study may assist the AI technology developers to focus on the factors driving system adoption for sustainable and effective learning. On the whole, the study can be used to set the direction for developing willingness of students to use AI technology and tools as a sustainable and effective strategy of learning. This study presented insights into that are invaluable to the theory and practical education practices in Jordan and other developing nations. It is worth noting that to achieve the full potential of and reap the full benefits from AI, it is incumbent upon educational institutions to consider a review of curriculum to include AI tools and to ensure that the students are assisted in their quest to learn new knowledge and skills to navigate in the dynamic education landscape. The study has implications to literature by extending it through the determined factors and their role in the willingness of students to use AI tools and the status of the factor's strengths in the perceptions of students. Regardless of the potential of AI to enhance practical learning for learners and its assistance in promoting continuous development, very few studies have been carried out on AI in this field [15, 63]. The majority of the studies on AI have recommended for authors to conduct additional studies to examine willingness of students to use AI in achieving their learning curriculum [15, 27]. This study also contributes to literature by providing insights into AI use among university students. The study provides practical suggestions for the educators and policymakers concerned with successful implementation of AI in the education field. For educators, it is imperative that educators should attend training sessions to develop their technology skills and knowledge to effectively implement AI technology in the teaching/learning activities to enhance the learning experiences and outcomes. Finally, policymakers should support financing and assist in developing and implementing appropriate AI tools and resources in the learning/teaching process.

Conflict of Interest

The authors declare no conflict of interest.

Conflict of Interest

Introduction and Literature: Ashraf Kan'an, Burhan Hamadneh, Malek Jdaitawi and Reda Al-Mawadieh conducted review literature; Marwa Kholif, Nahed Nasr and Noha Hamouda conducted the research methodology. All researchers contributed to the results and discussion sections as well as to the paper.

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