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Model of intention and actual use mobile learning in higher education institutions in Iraq

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ABSTRACT

Mobile learning (ML) is now involved in the creation of teaching and learning methods for higher education. However, this involvement is varied among countries. The objective of this research was to examine the factors that impact students' intentions to use ML in Iraqi higher education institutions (HEIs). Building on unified theory of acceptance and use of technology (UTAUT) and information system success model (ISSM), a conceptual model was developed. The population of this study are users in Iraqi univeristies. Using a stratified random sampling, a total of 323 responses were collected to examine the proposed hypotheses. The findings showed that variables of UTAUT such as effort expectancy (EE), social influence (SI), performance expectancy (PE), facilitating conditions (FC) as well as variables of ISSM such as satisfaction along with perceived enjoyment and self efficacy affected positively the intention to use ML (ITUML) which in turn affected actual use (AU). Gender and experience moderated the effect of PE, EE, and SI on ITUML. A model of ITUML among users in Iraqi HEI was developed. Decision makers are advised to focus on certain variables to enhance the usage of ML in HEI.

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1. INTRODUCTION

Mobile learning (ML) is a new technology that is being widely used by universities to access learning materials and for teaching. The technology allows teachers and learners to access and engage in classes from anywhere at anytime [1]–[3]. Prior to COVID-19, ML was an option for teaching and learning [1]–[3]. However, with the post-COVID-19, technology has become a must for all higher learning institutions (HLIs). ML has become a solution to enable learning in remote areas and for convenient access to education. However, there is a variation among countries in terms of using ML [4]–[7]. The rate of adopting technology is affected by the desire of individuals to use and benefit from the technology [8]–[11]. Against this background, most of the studies focused on ML in developed and emerging economies while the use of this technology in developing countries is still under-researched [12]–[15].

Prior literature on ML is dominated by the technical approach which examines the usage of ML from the network, programs, software, and hardware perspectives, while the behavioral approach is examined less frequently [16]. Among the behavioral approach, the use of targeted analysis model (TAM) which is the technology acceptance model by [17] dominates the literature. However, when it comes to using models such as UTAUT, the percentage dropped to between 1%-4% of the previous studies [3], [4]. However, unified theory of acceptance and use of technology (UTAUT) was limited to four main variables that include performance

expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) along with four moderators [5]. The aspect of ML such as innovativeness, self-efficacy, service quality, enjoyment of using ML, and satisfaction with ML was neglected in prior literature. In addition, prior literature on Iraqi users' usage of ML as well as developing countries is still underresearched [18]. In post-COVID-19, it is important to assess the usage of ML by users and to understand the factors that affect this usage [1], [4]–[6], [19]. This study aims to examine the factors that affect the usage of ML and to develop a framework that can be used by Health Effects Institute (HEI) in Iraq to enhance the usage of ML by users. The remaining sections of this paper discuss the literature review, methods, findings, discussion, and conclusion.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

This section elaborates on the prior literature. The section discusses the theoretical framework as well as the hypotheses development. The section refers to UTAUT model as the theoretical underpinning theory on which the direct and moderating effect hypotheses are developed. The study includes direct hypotheses as well as the moderating role of gender and experience. The following section disucsses the literature of this study.

2.1. Theoritical framework

Several theories in the literature attempted to explain the adoption of a technology. one widely used theory is UTAUT. UTAUT is known for its high explanatory power [20]. The model includes four main variables as well as moderators. Since this study is examining the student, the study focuses on explaining the role of factors that include gender and experience as a moderating variables while other moderators such as age and education were not included due to the similarities among users in terms of age and education [9]. Along with the variables of UTAUT, additional variables were included to account for the context of this study, and these include the self-efficacy, enjoyment, and innovativeness [21]-[23]. In addition, from information system success model (ISSM), the variables satisfaction and quality of service were added. These variables are expected to further explain ML usage.

2.2. Hypotheses development

Based on UTATU and the review of prior literature, this study proposed a set of hypotheses to be examined in this study. The hypotheses are related to the variables of UTAUT. In addition, other contextual factors are added. These include self-efficacy, innovativeness, service quality, and satisfaction. The study also include the moderating role of gender and experience.

2.2.1. Performance expectancy (PE)

Performance expectancy (PE) is refers to a person recognizes that their own use of a system will allow them to profit from the execution of a job was defined by Venkatesh *et al*. [24]. Several studies Morris and Venkatesh [25] and Venkatesh *et al*. [26] have shown a favorable link between PE and ML use intention. As a result, it is hypothesized that the PE will have a beneficial influence on Iraqi users' desire to use ML in this research. It is hypothesized that:

- H1: PE has a positive effect on the intention to use ML (ITUML).

2.2.2 Effort expectancy (EE)

Effort expectancy (EE) refers to the effort exerted by a user to use a new system [27]. EE is an essential variable of UTATU and has been found to have a mixed findings with positive or negative effect [28]-[31]. However, this study believed that when a student perceived ML as ease to use, he or she will tend to use the technology. Accordingly, the following is proposed:

- H2: EE has a positive effect on the ITUML.

2.2.3. Social influence (SI)

Simply, SI is the influence of others on the decision of an individual [32]. Using ML has become a need for all users and these users might be affected by their colleages, teachers, management of the university, families and friend [33]. Prior literature found that SI is weak in the first stage of introducing a technology while its effect increases over time. SI has been found to have a significant effect on ITUML [34], [35]. In this study, it is expected that SI will have a positive effect on ITUML by Iraqi users. Accordingly, the following is hypothesized:

- H3: SI has a positive effect on the ITUML.

2.2.4. Facilitating conditions (FC)

Facilitating conditions (FC) is the extent to which a person acknowledges that an organizational and technological infrastructure would improve the advantage of using modern innovation [36]. Several prior studies have found that FC has a beneficial influence on behavioral intent towards ML usage [37], [38]. Hence, the following is hypothesized:

- H4: FC have a positive effect on the ITUML.

2.2.5. Personal innovativeness (PN)

Personal innovativeness (PN) is varied among individual based on their age, education, and knowledge. Young individual are more enthusiastic to try new technology and they are the majority of the users of new applications such as ML [39]. Prior literature found that PN has a positive impact on the ITUML [16] established a significant association between PN and behavioral intent to employ ML. PN also found to have an essential variable for ML usage [40], [41]. Therefore, in this study, the PN is expected to have a significant effect on ITUML among Iraqi users. Hence, the following is hypothesized:

- H5: PN has a positive effect on the ITUML.

2.2.6. Quality of Service (QoS)

Quality of service (QoS) is one of the variable of information system success model (ISSM). It is predicted by most of prior literature to affect the perception of users regarding the usage of ML. Many prior studies in computer-human interaction [42], [43] and usability studies [44], [45] were highlighted by Islam [46] who described QoS in terms of response and reliability, security, and content quality. The findings of prior literature indicated the existance of a positive effect between QoS and ITUML and other technologies [47], [48]. Therefore, the following is hypothesized:

- H6: QoS has a positive effect on the ITUML.

2.2.7. Perceived enjoyment (PEN)

Perceived enjoyment (PEN) is similar to playfulness and it refers to the perception of users of enjoyment while using a new technology [49], [50]. Prior literature found that technology that provides users with playfulness are more used by the users [51]. PEN is important factor that should be considered when exploring the users' intention for ML usage [52]. The findings of researchers indicated that there is a positive impact of PEN on ITUML [53], [54]. Accordingly, PEN is expected to affect the intention of Iraqi users to use ML. Therefore, the following is hypothesized:

- H7: PEN has a positive effect on the ITUML.

2.2.8. Satisfaction

Satisfaction may be defined as the users' impression of how well their wishes, goals, and requirements have been satisfied, as well as their general perception of the information system [31]. ISSM includes satisfaction as a variable since it was suggested and proven to have a substantial influence on technology adoption and use [32]. The goal of this research is to influence Iraqi users' desire to use ML in a constructive way. Thus, the following is postulated:

- H8: Satisfaction has a positive effect on the ITUML.

2.2.9. Self-efficacy (SE)

Self-efficacy (SE) refers to a person's confidence in his or her ability to utilize a computer to complete a given job [55]. SE is critical factor for using any technology [34]. Several studies found that SE can contribute to the ease of use and the usage of ML [35]-[37]. In this study, SE is expected to have a significant effect on ITUML by users in Iraq. Thus, the study proposes the following:

- H9: Self-efficacy has a positive effect on the ITUML.

2.2.10. Intention to use and actual use

In line with TAM and UTAUT, prior researches on ML has demonstrated the existence of a favorable association between the ITU and the actual use (AU) [29], [39], [40]. Following the approach of these studies, this study proposes that the effect of ITUML on AU of ML is positive. Accordingly, the following is hypothesized:

- H10: ITU has a positive effect on the AU of ML.

2.2.11. Gender as moderator

Characteristics, such as computer SE, computer anxiety, and SI, yield mixed results [56], [57]. The effect of PE on ITUML was found to be varied based on gender [58]. The impact of EE on intention is also influenced by gender, with female being more significant in terms of impact [59]. The impact of SI on the ITU is conditional on the gender [60]. Based on UTAUT, which proposed gender as a moderator, this study expects that there is differences among respondents in terms of PE, EE, and SI based on their gender. Accordingly, this study proposes the following:

- H11: Gender moderates the impact of PE on the ITUML.
- H12: Gender moderates the impact of EE on the ITUML.
- H13: Gender moderates the impact of SI on the ITUML.

2.2.12. Mobile experience moderator

Prior research has found that a user's experience is critical for a user's comprehension, perceived viewpoint, behavior, and dispositions in online settings. As a result, it is expected that the more a person uses the mobile web, the more the person realizes that the mixed-use network conforms to his/her lifestyle, and the more likely a person will embrace ML [61]. The study of [62] indicated that because the ML strategy is still in its early stages, relatively few activities were done in the classroom afterward, and the low participation in learning exercises was not recorded. UTAUT proposed experience as a moderator. Therefore, this study expects that high experience with ML will improve the relationship between PE, EE, and SI with the ITUML by Iraqi users. Accordingly, the following is hypothesized:

- H14: Experience moderates the impact of PE on the ITUML.
- H15: Experience moderates the impact of EE on the ITUML.
- H16: Experience moderates the impact of SI on the ITUML.

3. METHOD

This study is using a survey design to examine the factors that affect the ITUML and to develop a model of ITUML by Iraqi users in HEI. Therefore, the population of this study is the users which refer to students, academic staff, and non-academic staff. A stratified random sampling is deployed to collect the data from three universities in Iraq. The population size accounted for 103,091 respondents in the three universities. The sample size is 384 respondents based on [41]. The data was collected using a questionnaire. The measurement of variables such as PE, EE, SI, FC, ITUML, and AU were adopted from [8]-[10]. Measurement of PEN was adopted from [17], measurement of SE was adopted from [23], measurement of enjoyment was adopted from [29], measurement of QoS and satisfaction was adopted from [31]. Prior to data collection, the measurement was validated, and a pilot study was carried out. 341 replies in all were gathered. Outliers and the missing value were both determined. 18 responses have been deleted as a consequence of this. According to Table 1, the data are normally distributed, and no significant correlation between the variables was discovered.

Table 1. Result of multicollinearity analysis

Variable	Tolerance	VIF
PE	.546	1.830
EE	.503	1.989
SI	.630	1.588
FC	.452	2.213
PI	.595	1.681
QoS	.635	1.574
PEN	.505	1.980
SA	.696	1.437
SE	.685	1.460
AU	.617	1.620

Dependent Variable: ITUML

4. RESULTS AND DISCUSSION

Both statistical package for the social sciences (SPSS) and analysis of moment structures (AMOS) were used to examine the data. 323 individuals in all have taken part in this research. Among the responders, 54% were males. Most of the respondents are students (73%) and have experience of using ML (43%) of more than three years.

4.1. Measurement model

The validity and reliabilities as well as the factor loading (FL) were checked to ensure that the measurement model is valid. The evaluation of the measurement model was based on the suggestions of previous researchers [63], [65]. As shown in Figure 1, the indices were achieved expect for GFI. However, Awang [66] suggested researchers to proceed with the model as well as three indices are achieved. The FL for all variables were achieved except for some items which were removed to improve the indices and due to the high correlation among items.

They were accomplished for cronbach's alpha and compsite reliability since their values were higher than 0.70. Because the average variance extracted (AVE) was more than 0.50, convergent validity was attained. Additionally, since the root square of AVE is larger than the cross loading, the discriminant validity is attained.

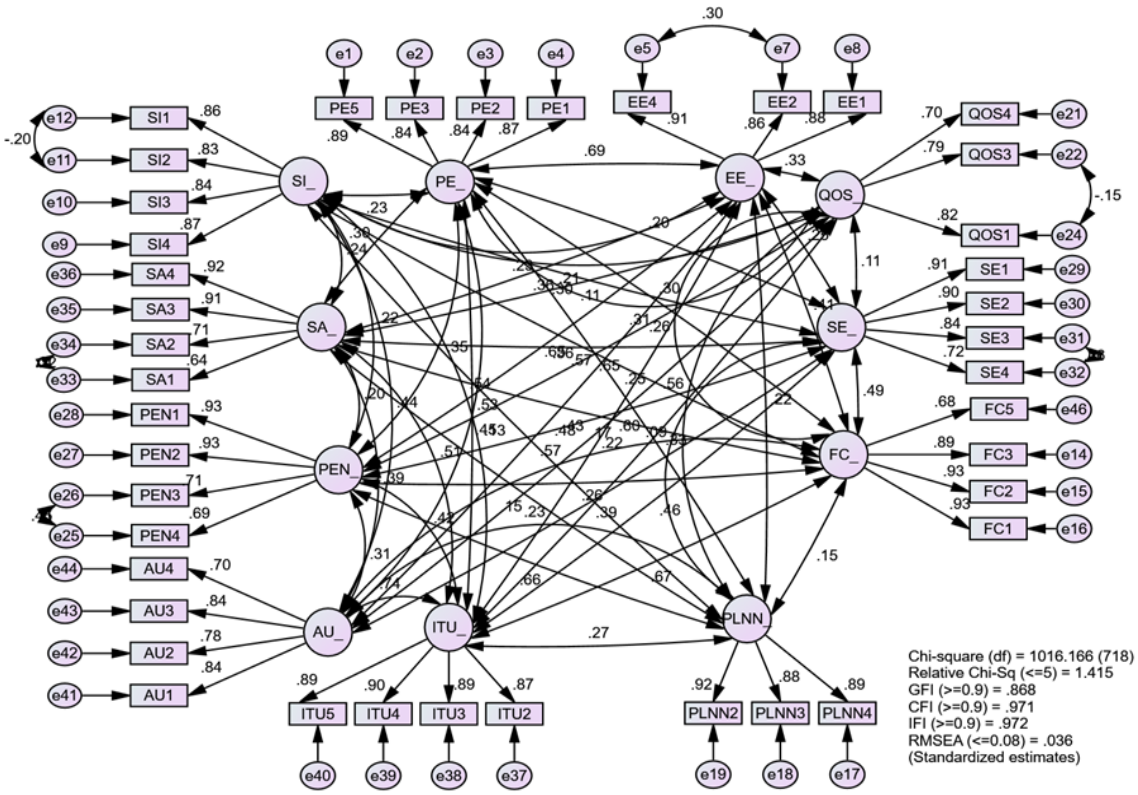

Figure 1. Measurement model

4.2. Structural model

The R-square and the path coefficient are checked to evaluate the structural model. This is in line with the suggestions of [66]. The R-square was 0.67, meaning that the factors could account for 67% of the ITUML. Table 2 displays the outcomes of the hypothesis testing. It demonstrates that all hypotheses were supported with the exception of H5 and H6.

Table 2. Results of testing the hypotheses

H	DV	Path	IV	Estimate (B)	S.E.	C.R.	P	Label
H1	ITU	<---	PE	.151	.049	3.097	.002	Supported
H2	ITU	<---	EE	.205	.049	4.217	***	Supported
H3	ITU	<---	SI	.195	.051	3.807	***	Supported
H4	ITU	<---	FC	.332	.058	5.728	***	Supported
H5	ITU	<---	PLNN	-.014	.044	-.311	.756	Rejected
H6	ITU	<---	QOS	-.012	.046	-.256	.798	Rejected
H7	ITU	<---	PEN	.118	.051	2.316	.021	Supported
H8	ITU	<---	SA	.134	.048	2.771	.006	Supported
H9	ITU	<---	SE	.090	.042	2.165	.030	Supported
H10	AU	<---	ITU	.660	.042	15.812	***	Supported

Note: ***significance at the level of 0.001.
Note: ITU: intention to use

For the moderating effect of gender, analysis of Chi-square differences (<3.84) showed that there is differences greater than 3.84 between the constrained and unconstrained models indicating that there are statistical differences among males and females in term of PE, EE, and SI. Thus, H11, H12, and H13 are supported. In terms of experience, high experience enhanced the effect of PE, EE, and SI on the ITUML. thus, H14, H15, and H16 are supported. Based on the findings of hypotheses testing, Figure 2 shows the finalized model for the ITUML and the AU of ML by users in Iraqi HEI. QoS and enjoyment were dropped from the initial model because they have an insignificant effect.

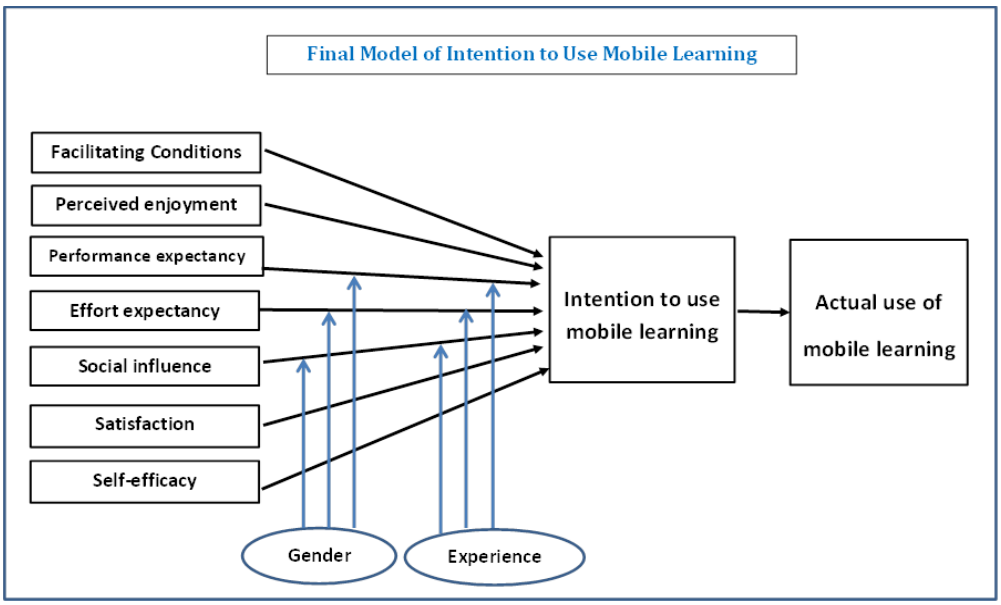

Figure 2. Final model of intention and actual use ML in HEI in Iraq

4.3. Discussion

This study examined the factors that affect the ITUML by users in Iraq. The variables of UTAUT were found critical for such usage. This indicates that if the HEI in Iraq aims to enhance the usage of ML, they have to pay attention to PE, EE, SI, and FC. These findings are consistent with prior literature such as [21]-[23] which referred to the importance of PE, EE, SI, and FC in the usage of technology. The findings also showed that satisfaction which is part of the ISSM is also an important factor. This finding indicates that satisfied users will tend to use ML. thus, HLI has to assess the satisfaction of users and take corrective action to improve their satisfaction which will lead to an improvement in their ITUML.

Perceived enjoyment was found to be a determinant of the ITUML. addition playfulness or gamified learning system to the ML will contribute to the increased usage of the ML. Therefore, HLI is expected to enhance playfulness to improve the use of ML. Self-efficacy (SE) is a critical determinant of the ML. this is because using the ML requires adequate knowledge of the ML and its application. This finding is supported by prior literature such as [15], [31]. The moderating role of gender which showed that males are more involved in the complicated system than female and are affected by PE more than female while the female is more affected by SI indicated that there are differences in term of the users based on their gender. Experience also was found as a moderating variable supported by the original model of UTAUT [8], [9]. [27].

These findings can help HLI in Iraq to improve the acceptance of ML and improve the quality of learning and teaching. HLI in Iraq is recommended to utilize these findings to support the development of ML in the country and improve the accessibility and comfortability of students and academic staff as well as the non-academic staff.

5. CONCLUSION

Following data analysis, the conclusive model comprises seven components that have a favorable impact on the ITUML that constitute FC, PEN, EE, SI, EE, SE, and satisfaction. Furthermore, ML utilization intent has a favorable influence on the actual utilization of ML. However, "quality of service" and "personal innovativeness" had little influence on the intent to use ML. As a result, the two components were excluded

and eliminated from the conclusive model. The findings established gender and experience as moderating variables influencing the effect of PE, EE, and SI on the ITUML in HEIs. Most institutions in Iraq have minimal impediments to education and learning, and technical innovation is needed to meet the challenges. Based on the literature, ML might be employed as an innovative tool to supplement traditional learning and education. Some aspects influence impactful ML implementation in universities, which encompass learner acceptability of ML. ML research in Iraq is in its early stages, with relatively few studies undertaken in the domain of ML. this study presents a roadmap of the variables that might affect ML acceptability in HEI in Iraq. The study contributed to the literature by combining UTAUT and ISSM and explaining a large percentage of the variation in ML usage. The study also contributes to the literature in developing countries. Decision makers are advised to focus on the important variables that have been identified in this study to achieve a high rate of using ML. Further studies are needed to examine the ITUML in different countries.

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