

# An Analysis of the Technology Acceptance Model in Understanding The University of Jordan's Students Behavioral Intention To Use m-Learning

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## Abstract

The recent advances in mobile technology, and the associated ability to access information instantly without the need to refer to a computer device, has led to increasing popularity of this type of technology in all areas of modern life. Is it not surprising therefore, that using mobile applications is growing increasingly appealing in the field of education. Learning Management Systems (LMSs) are moving towards including mobile application to enable on the go access to their users. This paper was designed to investigate The University of Jordan's (JU) students' intentions towards the usage of mobile technologies, and their willingness to adopt mobile application learning management system. Technology Acceptance Model (TAM) is a strong theoretical tool to understand users' acceptance of Mobile Learning (m-learning). The model which included m-learning self- efficacy, subjective norm, system accessibility, perceived usefulness, perceived ease of use, attitude toward usage, and behavioral intention to use m-learning, was developed based on the extended technology acceptance model. This study analyzed the relationships among factors predicting mobile learning management system (m-LMS); data from 1199 students in JU were collected to investigate integrated relationships among constructs in TAM. In line with previous studies original TAM hypotheses were supported. Furthermore, the external variables: self-efficacy, subjective norm, and system accessibility have a significant influence on perceived usefulness, perceived ease of use, attitude toward usage and intention to use.

**Keywords** m-Learning, Technology Acceptance Model, Learning Management Systems

## I. Introduction

Since institutes of higher education have started to utilize information technology in the educational process [1], there have been continuous efforts to improve the quality of this type of teaching and learning method. LMSs have evolved for this purpose, with continuously improving features to make them more appealing and user friendly. LMSs empower

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collaboration between students, allow students to access their marks and material, facilitate student-educator interaction, and enable student to upload assignments. On the other hand, teachers can easily manage courses, take online attendance, and form online discussion groups [2].

To improve access to these systems, there has been a trend towards implementing mobile learning applications, where the user can access the system from a mobile device, rather than a desktop or laptop. Using mobile devices as mediator in learning and teaching process is defined as m-learning [3]. This has been facilitated by the widespread availability of smartphones that allow the user to access such applications easily and efficiently [4].

There are several well-known LMSs that are used in universities all over the world. Out of these, Moodle is the most widely used [5]. It provides an open-source e-learning platform, and the latest version incorporates a mobile application for m-learning.

M-learning aims to overcome some of the restriction that limit desktop or laptop based learning systems, most significantly, the issue of portability and on demand access without time and space limitations. By accessing the learning system from a smartphone, the students carry the learning content with them wherever they are. The current generation of learners are highly attached to their phones and use them frequently for both educational and leisure purposes, and many find that the use of a phone is more practical and user friendly than the use of computers. Adapting the learning resources to fit in with the lifestyle of the learner is of great importance, to achieve maximum educational benefit [6].

Nevertheless, as for any available technology, the user has to be willing to use the available application, and to adopt it as part of the educational process. One way to investigate and predict user's behavior toward information technology adoption and usage is to use the TAM. This study utilizes the TAM to investigate attitude of students toward m-learning in the leading university in Jordan "The University of Jordan" [7].

## **II. Theoretical Background**

LMSs have become the backbone of educational interaction in higher education all over the globe, as educational institutes are increasingly moving towards online and distance learning due to the increasing numbers of students, and because of the flexibility it offers to its users) [4,8]. As the use of LMSs in universities has become a standard method of access to educational material for both the instructors and students, ways to access these systems using mobile devices have evolved. Mobile-learning gained popularity in the educational field for delivering material anytime, anywhere in a more flexible and convenient style [9,10].

Students nowadays are familiar and up to date with the use of Information Technology (IT), which make it easy to use IT applications in the educational process. Khwaileh & AlJarrah conducted a research on MA and PhD students of the Faculty of Educational Science in The University of Jordan [11]. Results showed that Jordanian graduate students are willing to use m-learning and have a positive attitude toward implementing m-learning, however, it was also noted that students and instructors must have appropriate training before exposing them to m-learning. Hung et al. studied the effect of using a mobile application for LMS on the pattern of use of that system. The study assessed students' usage of LMS before mobile application implementation and after [12]. The research revealed that the total number of times the users accessed the LMS increased after mobile application was introduced, whereas the number of web-interface accesses to the LMS decreased, which indicates that students were moving towards using the mobile application LMS.

Despite the vast adoption of mobile learning in higher education, only limited research has been conducted to examine factors influencing its implementation and its impact on students' academic achievements [9]. The acceptance of mobile LMS can be assessed by applying the Technology Acceptance Model (TAM) or the extended TAM [13]. This can provide us with factors affecting mobile LMS usage and acceptance.

### *II.I Technology acceptance model (TAM) and Extended TAM*

Several theoretical models have been developed to investigate and predict user's behavior toward information technology adoption and usage, such as: Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), and Technology Acceptance Model (TAM). TAM was designed by Davis as an extension of TRA [14], this theory describes the procedure of how users accept a new technology system.

The components of TAM are Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude Toward Using (ATU), Behavioral Intention To Use (BI), and the Actual System Use (AU).

This model defines significant relationships as follows:

- PEOU has an impact on PU,
- PEOU and PU have direct effect on ATU,
- ATU has a direct effect on BI which subsequently determines AU.

Figure 1 is a graphical representation of the TAM. The TAM highlights that PU and PEOU are features that determine the behavioral intention of a new technology usage [18].

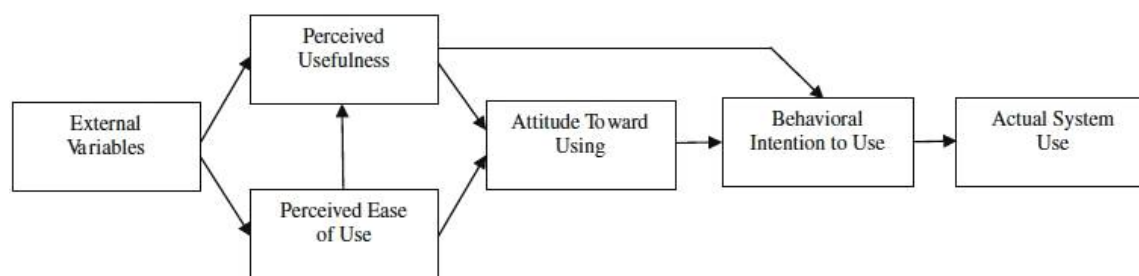


Figure 1: Technology Acceptance Model, Adapted from [18]

The original TAM theory was extended by Venkatesh and Davis to describe perceived usefulness and usage intention in terms of social influence processes (subjective norm, voluntarism, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and PEOU) [19]. On the other hand, the extended model excluded ATU because of its weak influence on the BI and on the AU. The extended model is referred to as TAM2. Davis also recognized that external variables improve TAM ability of predicting future technology acceptance [14].

### *II.II Factors Affecting Mobile LMS Usage and Acceptance*

Acceptance of m-learning is essential for its utilization [4], this leads to a need for investigating the factors affecting m-learning acceptance. Al-Emran et al. investigated learners' and educators' attitude toward m-learning and confirmed that the acceptance of this technology is essential in determining whether users are ready to use m-learning or not [4]. This research examined the impact of different factors such as age, gender, level of education, and ownership of smart phone on

the willingness of the user to use m-learning. Findings revealed that there is a considerable difference between students' attitudes towards m-learning according to their age, geographical area, and smartphone ownership. Moreover, results confirmed that incorporating m-learning in higher education in the Arab Gulf countries has promising potential.

Han & Shin, considered factors like demographics (age and status of employment), psychological characteristic (self-reported innovativeness and self-efficacy, mobile LMS ease of use and usefulness) and external factors (personal standers) [9]. They studied the relationship between mobile LMS educational effectiveness and those factors. Data of 1604 students of an online Korean university were collected, and results showed that mobile LMS adoption is affected by students' age and employment status, and there is a potential association between age, gender, psychological data and Mobile LMS use. Joo et al. examined the connection between factors forecasting the actual usage of mobile learning management system [15]. Data was collected from 222 Korean online university student to explore relationship between perceived ease of use, perceived usefulness, students' satisfaction, expectation-confirmation, continuous intention and the actual usage, and results showed that perceived ease of use affected perceived usefulness. Moreover, result revealed that perceived usefulness and expectation-confirmation predicted user satisfaction, perceived usefulness and user satisfaction affected the continuous intention factor, and continuous intention affected mobile LMS's actual usage. On the other hand, continuous intention was not affected by the perceived ease of use, and perceived usefulness was not affected by expectation-confirmation.

Hamidi & Chavoshi conducted a research to evaluate essential factors affecting mobile learning adoption in higher education [16]. They presented a case study on 300 students from K. N. Toosi University in Iran. This study classified factors into seven main categories: perceived usefulness, behavioral intention, ease of use, context, trust, personal character and feature factor. Results revealed that the application context affects positively both perceived ease of use and perceived usefulness, and ease of use positively affects perceived usefulness. The behavioral intention was significantly affected by the trust factor and the culture of using the application; moreover, result showed that personal features and character aspects positively affected the culture of using.

Although m-learning proved its positive effectiveness on e-learning in various universities, it has not been yet studied intensively in Jordanian universities. The motivation behind this study is to investigate willingness to adopt m-learning in the University of Jordan using TAM.

### **III. Method**

#### *III.1 Participants*

The current used LMS in the University of Jordan is Moodle version 3.6, Moodle is an open source LMS, this version has been used since fall semester of 2018/2019, The Jordan University Lunched the Mobile version of Moodle November 2019, during the fall semester of 2019/2020. The questioner was conducted in February 2020 during the spring semester of 2019/2020, the results were collected for 3 weeks. The questionnaire was distributed online via Moodle.

Students of The University of Jordan were the study population for this study. Students were from different faculties: scientific, humanities, and medical faculties. A total of 1500 students participated voluntarily and students received no compensation for their participation. 301 of the participants' data were excluded from analysis, as the data was not complete. Hence, 1119 surveys were analyzed.

### III.II Research hypotheses, Measurement instruments

Item instruments were chosen from advanced research [20, 21] and modified to fit mobile learning management system. The completed instrument consisted of two parts. Part I was designed to identify demographic attributes of the students. It contained demographic items such as academic years, gender, faculty, the number of m-learning courses currently being taken, the number of m-learning courses previously taken, and the availability of the smartphone. The second part of the questions used a 5-points Likert scale to measure students' answers (strongly agree, agree, neutral, disagree, strongly disagree), this part contains 17 questions divided into: 3 questions for perceived ease of use (PEOU), 4 questions for perceived usefulness (PU), 2 question for attitude toward usage (AT), 3 questions for the intention to use (IU), 2 questions for m-learning self-efficacy (SE), 2 questions subjective norm (SN), and 1 question for system accessibility (SA). SE, SN, and SA questions were used as external factors in this research to test their impact on the perceived ease of use and on the perceived usefulness of using mobile learning management system.

In order to measure attitude, intention to use, perceived ease of use, perceived usefulness, self-efficacy and system accessibility, construct definitions were adopted from [20, 14, 15]. Based on TAM and extended TAM scales, the research model for this work examines 7 constructs as shown in Table 1.

Table 1. Construct variables and items

Construct	Definition	Item(s)
PEOU	Perceived ease of use defined as “the degree up to which a person believes that using a particular system would be free of effort” [14]. Therefore, perceived ease of use in this research refers to the degree to which a student believes that using M-LMS will be easy and free from effort [15]	3
PU	Davis defined perceived usefulness as “The degree up to which a person believes that using a particular system would enhance his or her job performance” [14]. Accordingly, in this study perceived usefulness refer to the degree to which student believes using M-LMS will improve his/her academic productivity.	4
AT	Attitude refers to individual’s positive or negative feeling regard using M-LMS [9]. Accordingly, it measures if using M-LMS is a good idea [17]	2
IU	Intention to use the M-LMS measure the intension toward using the new technology in the future [20], hence, in the study the intention to use the system refers to student intention to use the M-LMS in the coming future.	3
SE	Self-efficacy measures students’ capability to use M-LMS for accomplishing a learning task [9].	2
SN	“Perception that those most important to the respondent should use a mobile LMS” [21].	2
SA	System accessibility refers to the degree to which students are granted constant access to M-LMS [9].	1

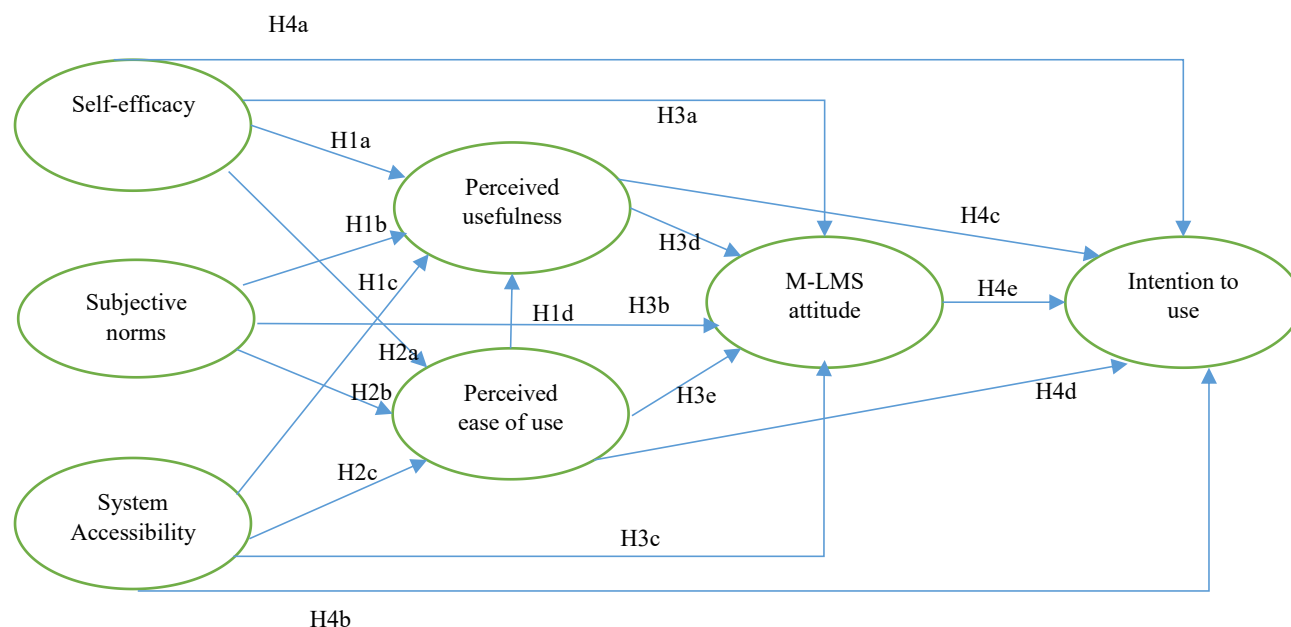
Higher education students were the main concern of this study, it investigates usage and usefulness of mobile technology in education in order to forecast mobile learning acceptance through Mobile Learning Management System (M-LMS). This research adopted three external variables: M-LMS self-efficacy, subjective norm, and system accessibility. It applied TAM2 model on the actual use of the new system as shown in Figure 2.

Based on the literature, a hypothetical model was developed to test the following hypotheses:

- Hypothesis 1: Self-efficacy, subjective norm, system accessibility, and perceived ease of use influence University of Jordan's students' perceived usefulness.
- Hypothesis 2: Self-efficacy, subjective norm, system accessibility influence University of Jordan's students' perceived ease of use.
- Hypothesis 3: Self-efficacy, subjective norm, system accessibility, perceived usefulness, and perceived ease of use predict University of Jordan's students' attitude towards using M-LMS.
- Hypothesis 4: Self-efficacy and system accessibility, perceived usefulness, perceived ease of use, and attitude toward using the system predict University of Jordan's students' intention to use M-LMS.

The extended model that adopts TAM relationships between constructs hypothesizes the following (illustrated in Figure 2):

- H1a: A user's self-efficacy of a M-LMS system positively affects his/her perceived usefulness of use the system.
- H1b: A user's subjective norm of a M-LMS system positively affects his/her perceived usefulness of use the system.
- H1c: A user's system accessibility of a M-LMS system positively affects his/her perceived usefulness of use the system.
- H1d: A user's perceived ease of use of a M-LMS system positively affects his/her perceived usefulness of use the system.
- H2a: A user's self-efficacy of a M-LMS system positively affects his/her perceived ease of use of use the system.
- H2b: A user's subjective norm of a M-LMS system positively affects his/her perceived ease of use of use the system.
- H2c: A user's system accessibility of a M-LMS system positively affects his/her perceived ease of use of use the system.
- H3a: A user's self-efficacy of a M-LMS system positively affects his/her attitude toward using the system.
- H3b: A user's subjective norm of a M-LMS system positively affects his/her attitude toward using the system.
- H3c: A user's system accessibility of a M-LMS system positively affects his/her attitude toward using the system.
- H3d: The perceived usefulness of a M-LMS system positively affects his/her attitude toward using the system.
- H3e: The perceived ease of use of a M-LMS system positively affects his/her attitude toward using the system.
- H4a: The user's self-efficacy positively affects the user's intention to use the system.
- H4b: The system accessibility positively affects the user's intention to use the system.
- H4c: The perceived usefulness positively affects the user's intention to use the system.
- H4d: The perceived ease of use positively affects the user's intention to use the system.



- H4e: User’s attitude toward the use of M-LMS affects the user’s intention to use the system.

Figure2. Hypothetical model represents the developed theoretical model and the hypotheses between the constructs

#### IV. Results

Data collected by the questionnaire were analyzed using Statistical Package for Social Sciences (SPSS).

##### IV.1 Descriptive statistics and reliability

As aforementioned the questionnaire consisted of 24 questions that were divided into two parts:

- The first part of the questionnaire which is the demographic data has 7 questions as illustrated in Table 2, including student’s faculty, academic level, academic year, gender, number of courses that the student is studying during the spring semester 2019/2020 using m-MLS, number of courses studied previously using m-LMS and the availability of the smartphone. The gender of the participants was 71.5% females and 28.5% males, this is normal percentage as for the academic year 2019/2020 the percentage of the females in the university was 67.89% while the males were only 32.11%. The results of the academic level were also consistent with the percentages in the university, as 95.1% of the participants were undergraduate students and the percentage of the undergraduate students in the JU is 82.76%. For the number of courses studied using M-LMS previously, 36.7% have never taken courses using M-LMS before and 20.6% did not take any course using M-LMS during the current semester (Spring 2019/2020). It was expected that a significant number of students did not take any course using M-LMS, due to the fact that JU launched the Mobile version of Moodle November 2019, during the fall semester of 2019/2020. As for the availability of smartphones, 100% of the participants have smartphones, which will facilitate the accessibility of the M-LMS.

Table 2. Demographic information of the sample

Question	Variables	Number (N)	Percent (%)
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1. Gender	Male	342	28.5
	Female	857	71.5
2. Academic level	Bachelor	1140	95.1
	Higher Diploma	5	0.4
	Master	39	3.3
	PHD	15	1.3
3. School	Humanity school	595	49.6
	Scientific school	303	25.3
	Medical school	301	25.1
4. Academic year	First year	405	33.8
	Second year	378	31.5
	Third year	209	17.4
	Forth year	161	13.4
	Fifth year	29	2.4
	Sixth year or more	17	1.4
5. Number of courses studied using M-LMS previously	Never	440	36.7
	One course	216	18.0
	Two courses	157	13.1
	Three courses	85	7.1
	Four courses	87	7.3
	More than that	214	17.8
6. Number of courses studied using M-LMS currently	Never	247	20.6
	One course	240	20.0
	Two courses	189	15.8
	Three courses	181	15.1
	Four courses	342	28.5
	More than that		
7. Availability of smartphone	Yes	1199	100
	No	0	0



- Cronbach's Alpha

The constructs were assessed for reliability using Cronbach's alpha [22]. All the values for  $\alpha$  were greater than the 0.70 minimum value required for constructs to be deemed reliable [23]. Moreover, all values for  $\alpha$  were above 0.80, exceeding the common threshold value recommended by Nunnally [24]. All of the measures used in this work showed excellent internal consistency, ranging from 0.958 to 0.964 (see Table 3).

- The means for all constructs and items of the second part of the questionnaire were determined (see Table 3). The system accessibility has the highest mean (3.69) indicating that most of the students have no difficulty accessing and using M-LMS in the university, and the least was for perceived usefulness with (2.94) which is also considered in the agreement area. The means for all other constructs were all greater than 3 (answers were between agree and strongly agree), which indicate that users agreed on all items within the constructs.

Table 3. Descriptive statistics of variables

Constructs and items	Mean	Cronbach's alpha
<b>Perceived Ease of Use (PEOU)</b>	<b>3.59</b>	<b>.962</b>
8. I find M-LMS easy to use	3.45	
9. It is easy for me to learn how to use M-LMS	3.49	
10. Becoming skillful at using M-LMS is easy for me	3.84	
<b>Perceived Usefulness (PU)</b>	<b>2.94</b>	<b>.961</b>
11. M-LMS would enhance my learning performance	3.00	
12. M-LMS would improve academic productivity	2.96	
13. M-LMS make studying course content easier	3.05	
14. M-LMS improves student/student interaction and student/lecturer interaction	2.75	
<b>Attitude (AT)</b>	<b>3.19</b>	<b>.961</b>
15. It is a good idea to study using M-LMS	3.24	
16. I am positive towards M-LMS	3.14	
<b>Intention to Use (IU)</b>	<b>3.62</b>	<b>.963</b>
17. I intend to use M-LMS for checking new announcements frequently	3.56	
18. I intend to use M-LMS to obtain presentations, studies, educational videos and materials.	3.52	
19. I intend to use M-LMS to submit assignments and to get feedback.	3.80	
<b>Subjective Norm (SN)</b>	<b>3.48</b>	<b>.961</b>
20. M-LMS is a necessary tool for me as a university student	3.39	
21. In order to prepare for future job, its necessary for me to use M-LMS	3.58	
<b>Self-Efficacy (SE)</b>	<b>3.35</b>	<b>.958</b>
22. I feel confident finding information on M-LMS	3.54	
23. I have the necessary skills for using M-MLS	3.16	
<b>System Accessibility (SA)</b>	<b>3.69</b>	<b>.964</b>

24. I have no difficulty accessing and using M-LMS in the university

3.69

Most of the students' answers were between strongly agree and moderately agree which indicates that users agreed on all items within constructs. Figure 3 illustrates the answer distribution for each construct in the extended TAM questionnaire based on a five point Likert scale. The percentage of the participants that have selected the option Agree or Strongly Agree for the items in the constructs were as follows: the results indicated that most part of the students 61% have no difficulty accessing and using the M-LMS (SA), 60% intend to use the system (IU), 57% of the students perceived the system easy to use (PEOU), for the SE 53% of the students have the necessary skills and feel confident finding the information on M-LMS, for the SN construct the percentage was 47, 45% for the AT and 37% for the PU.

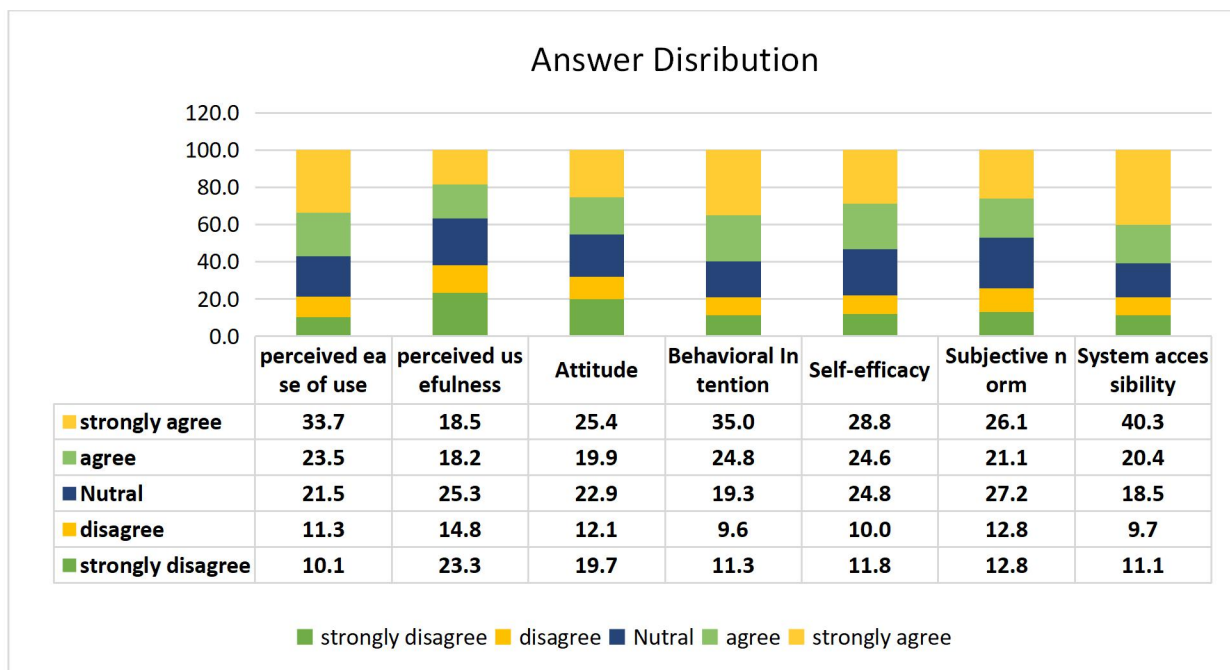


Figure 3. Answers distribution for each construct

#### IV.II Hypotheses testing

Based on the aforementioned analysis, results confirm the existence of statistically significant relationships in the directions of the proposed research model. The results of the hypotheses tests are shown in Table 4. Using regression analysis, 17 out of 17 hypotheses were supported by the data. Original TAM hypotheses (H3d, H3e, H4e, and H1d) were supported. Perceived usefulness had a significant effect on attitude toward usage [17, 25], as did perceived ease of use on attitude toward usage [23, 26]. Moreover perceived ease of use had a significant influence on perceived usefulness and attitude toward usage had a significant effect on behavioral intention to use.

Perceived usefulness had a significant effect on attitude toward usage, as well perceived ease of use on attitude toward usage, moreover, perceived ease of use had a significant influence on perceived usefulness, with  $p < 0.05$ .

Table 4. Correlation between the constructs

Hypothesis	Hypothesized path	P-Value (P)	Correlation coefficient (r)	Result of hypotheses
H1a	SE→PU	0.007	0.704**	Supported
H1b	SN→PU	0.008	0.672**	Supported
H1c	SA→PU	0.020	0.548*	Supported
H1d	PE→PU	0.031	.613*	Supported
H2a	SE→PE	0.008	0.783**	Supported
H2b	SN→PE	0.015	0.549**	Supported
H2c	SA→PE	0.020	0.662*	Supported
H3a	SE→AT	0.007	0.724**	Supported
H3b	SN→AT	0.008	0.685**	Supported
H3c	SA→AT	0.018	0.601**	Supported
H3d	PU→AT	0.014	0.846**	Supported
H3e	PE→AT	0.003	0.628**	Supported
H4a	SE→IU	0.009	0.719**	Supported
H4b	SA→IU	0.026	0.548*	Supported
H4c	PU→IU	0.031	0.623*	Supported
H4d	PE→IU	0.005	0.554**	Supported
H4e	AT→IU	0.038	0.656*	Supported

\*\* Correlation is significant at the 0.01 level ( $p < 0.01$ ), \* Correlation is significant at the 0.05 level ( $p < 0.05$ )

Furthermore, for the constructs added to test users' acceptance for the M-LMS system, results show a strong direct influence of self-efficacy on attitude toward usage ( $r = 0.724$ ,  $p < 0.01$ ), self-efficacy on perceived usefulness ( $r = 0.704$ ,  $p < 0.01$ ) as well as a strong direct effect on intention to use ( $r = 0.719$ ,  $p < 0.01$ ), self-efficacy has also a strong direct influence on perceived ease of use ( $r = 0.783$ ,  $p < 0.01$ ). Subjective norms have a moderately strong effect on perceived usefulness ( $r = 0.672$ ,  $p < 0.01$ ), system accessibility has an effect on perceived usefulness ( $r = 0.548$ ,  $p < 0.05$ ). A moderately strong effect of subjective norms on perceived ease of use ( $r = 0.549$ ,  $p < 0.01$ ), and for system accessibility on perceived usefulness ( $r = 0.548$ ,  $p < 0.05$ ), system accessibility has also moderately strong direct effect on intention to use ( $r = 0.548$ ,  $p < 0.05$ ).

The model and hypotheses were tested by examining correlation and significance, as shown in Figure 4. Each arrow represents a statistically significant relationship between variables.

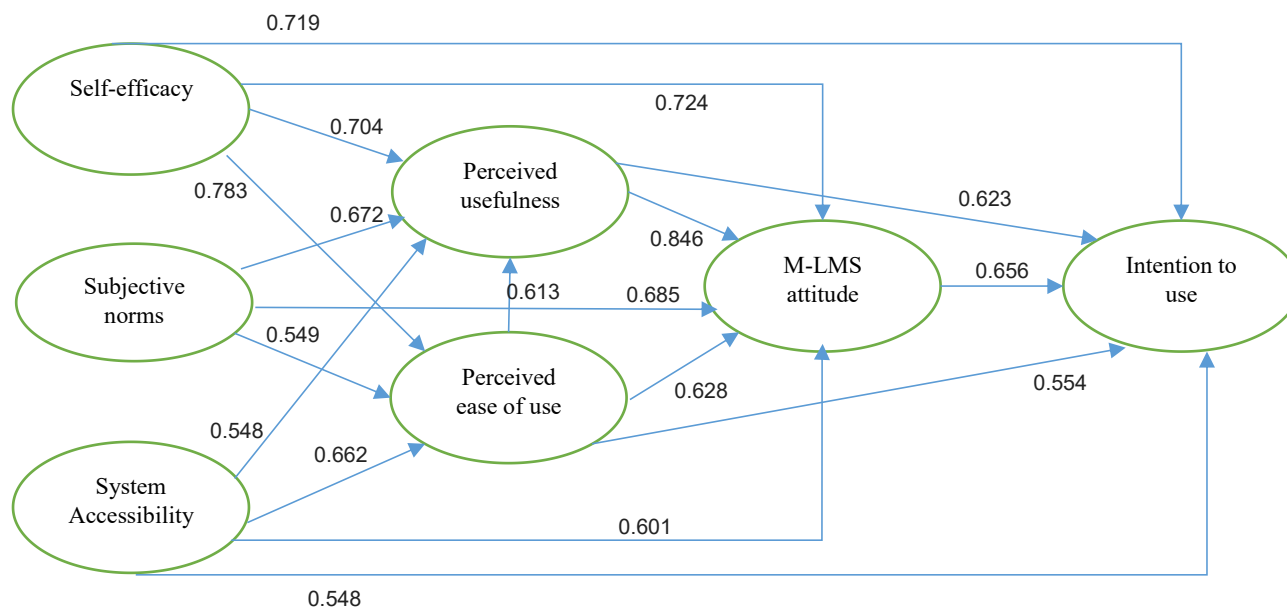


Figure 4. Hypothetical model with coefficient

Several important findings emerge from this evaluation; *self-efficacy* of the system appeared to be a significant determinant of *perceived usefulness*, *perceived ease of use*, *attitude toward usage* and on *behavioural intention to use* the system. *Subjective norm* has a significant effect on *perceived usefulness* and *attitude toward usage*, and a moderate influence on *perceived ease of use*. *System accessibility* has a moderately strong effect on *perceived usefulness* and *Intention to use* and a significant effect on *perceived ease of use*. This indicates that easy accessibility for the application positively affects the *perceived ease of use*.

Consistent with prior research [17, 26], there was a positive correlation between *perceived ease of use* and *usefulness* of the M-LMS system. This indicated that participants found the system *easy to use*, and no effort was required for getting used to the system. They *perceived the easy to use* system as useful, and found that it can add value to the educational process. The study's findings also indicated that *perceived usefulness* has a strongly and positive impact on *attitude toward usage* and *behavioural intention toward using the system*. As students perceived the system to be useful they acquired stronger *behavioral intentions to use the M-LMS*. And *Attitude toward usage* has a significant direct effect on intentions to use the M-LMS, and therefore this lead to the actual use of the system.

Overall, it is concluded that for the added constructs, students' intentions to use the M-LMS, were strongly affected by added constructs, and users had a positive attitude toward the M-LMS system; therefore, they intend to use it and are satisfied with the tools provided.

## **V. Discussion**

The purpose of this study was to examine factors predicting students' actual usage of the M-LMS through the extended TAM model. Similar to earlier studies [16, 12, 15, 27, 21, 28] this study confirmed that TAM could be considered as one of the theoretical models that are useful in understanding the behavioral intention to use M-LMS. Findings are as follows: all original TAM hypotheses were supported, PEOU has an impact on PU, PEOU and PU have direct effect on ATU, ATU has direct effect on BI which subsequently determines actual system [18].

**Hypothesis 1: Self-efficacy, subjective norm, system accessibility, and perceived ease of use influence University of Jordan students' perceived usefulness.**

Consistent with previous research [16, 15] PEOU predicted PU, this indicates that students who could use M-LMS easily tended to show high PU for mobile learning activities, such as submitting assignments and contacting lecturers [15]. SN proved that it influences students' perceived usefulness; this is in agreement with Huang et al.; Legris et al; Park; and Shin & Kang [12, 27, 21, 28]. In contrast to Shin & Kang [28], SE exhibit a positive influence on PU [21], therefore, confidence toward M-LMS implies a belief in its usefulness. Moreover, SA has positive effect on PU in contrast to Shin & Kang and Park, [28, 21], where the results showed that SA did not exhibit a positive or direct influence on PU. This was referred to the developed infrastructure and Internet access in 95% of the study sample in Korea [21].

**Hypothesis 2: Self-efficacy, subjective norm, system accessibility influence university of Jordan students' perceived ease of use.**

SE and SA have a significant influence on PEOU [21, 28]. This implies that essential personal factors such as SE have a positive influence on the usage of M-LMS [28]. Furthermore, this coincides with previous studies as SA has a positive effect on PEOU [21, 28] this illustrates the importance of providing access to M-LMS (i.e. user-friendly design, Wireless Internet access, and compatibility with M-LMS [28]. Moreover, SN also has a positive effect on PEOU. This is contrary to previous studies [21, 28]. This implies the importance of M-LMS usage for the students. Thus, individual factors such as SA, SE, and SN should be considered to improve PEOU. This can be accomplished by providing students with orientation and manuals for M-LMS [28].

**Hypothesis 3: Self-efficacy, subjective norm, system accessibility, perceived usefulness, and perceived ease of use predict university of Jordan students' attitude towards using M-LMS.**

Coinciding with prior studies [17, 21], PU is one main indicator of user's attitudes and PEOU has a positive impact on the user's attitude. Students in Jordan believe that M-LMS is a necessary tool as a student and for future job preparation; therefore, SN has a positive influence on AT which is also in agreement with Park, study [21]. SA and SE were also dominant constructs that positively affected all other constructs. This illustrates the importance of providing easy access to M-LMS by the university, as well as students' preparation to use the M-LMS.

**Hypothesis 4: Self-efficacy and system accessibility, perceived usefulness, perceived ease of use, and attitude toward using the system predict university of Jordan students' intention to use M-LMS.**

According to original TAM, PU and AT is hypothesized to directly affect IU [17], this study was consistent with prior research where PU and AT have positively affected IU [15, 28]. However, this study adapted the extended TAM, therefore,

there were more constructs that are hypothesized to directly affect IU. According to previous studies PEOU of m-learning has a positive effect on IU [29-32] in this study PEOU has a positive direct influence on IU. SE also has a direct influence on IU [21] and so SA [9].

The results of this study illustrated that extended TAM constructs had a positive effect on the students' behavioral intention to use M-LMS in JU. Accordingly, an effort should be made by e-learning center to boost the students' SE (such as providing manuals, descriptive videos, etc.). SN, which also had a positive effect on PU, PEOU, and AT is an important construct. Therefore, it is important to work on increasing the awareness of the M-LMS benefits and offer variety of m-learning courses. Furthermore, SA has a positive direct effect on the IU the M-LMS. Thus, the university should provide easy access for the students to the M-LMS. Since the PEOU had a positive effect on PU and IU this encourages the university to develop user-friendly M-LMS, which will increase the students' satisfaction and in turn make further use of the M-LMS.

## **VI. Limitations and future work**

A limitation of this research is that only one university was considered in Jordan, for future work we are interested in conducting the same study on different universities in Jordan in order to generalize the results of the study.

## **Acknowledgment**

The authors would like to convey their special thanks to Dr. Sahel Eneizat for his collaboration with this project.

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