

The mobile blackboard system in higher education: Discovering benefits and challenges facing students



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ABSTRACT

Although m-blackboard has an extensive role in the educational context, the adoption of m-learning in higher education institutes is still in its infancy. However, m-blackboard faces various types of challenges that could affect its acceptance and usage. The previous studies on m-blackboard generated general findings, and studied frequently common factors, did not adopt a focused view of organizational and technology infrastructural factors. These studies investigated the adoption of m-learning in general and did not focus on M-LMS in particular, which is different to m-learning because m-learning is more personal, where learning content is personalized for the individual learner. These promising findings call for more focus from the perspective of the authors of this study. This study used a mixed research methods (i.e., qualitative and quantitative methods). For the qualitative method, researchers interviewed eight staff from the University of Ha'il. As for the quantitative method, a survey questionnaire was employed. This paper contributes to enrich the literature by reviewing, comparing, and analyzing previous works that have examined m-blackboard systems. The respondents using m-blackboard report significant benefits; e.g., it provides easier access to information, increases productivity, makes wise use of time and money, and is accessible anywhere and anytime. On the other hand, some challenges remain; these include the weakness of mobile network signals, the small size of mobile device screens, the costs of connecting mobile devices to the internet, and the time needed to download the m-blackboard application. Researchers recommended that the University of Ha'il should move forward with the m-blackboard platform; and to examine the challenges and benefits in different settings, technologies, and countries.

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1. Introduction

Most online activities take place within Learning Management Systems (LMSs) in educational contexts; one such system, Blackboard. Blackboard is a modern technology that enables sharing knowledge. Blackboard act as a communications channel between students and instructors, providing asynchronous and synchronous interactions, all can be via mobile devices (Almarashdeh et al., 2013). Today's students work, learn, and live in a technology-driven environment. LMS helps educational institutes (e.g., universities) engage with

students in the suitable medium (Momani and Abualkishik, 2014). However, LMS faces various types of challenges that could affect its acceptance and usage. For example, Contrado (2016) stated that the lack of students' readiness and awareness, infrastructure reliability, ease of access to the technology, and lack of support are the main obstacles inhibiting the adoption of LMS in universities. On the other hand, the modern technologies that can enable and facilitate the use of LMS need to be used and made more accessible for use to handle such challenges. Sung et al. (2016) asserted that the core motivation for the use of mobile devices in education are improved accessibility to information.

Although m-blackboard has an extensive role in the educational context, the adoption of m-learning in higher education institutes is still in its infancy in the LMS (Almasri, 2015), and Mobile Learning Management System (M-LMS) (Han and Shin, 2016; Shin and Kang, 2015). Nowadays, universities need

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to have a competitive and motivational environment that convoy technology growth; whilst, various factors could inhibit the adoption of m-learning in educational context. The existence of mobile devices does not guarantee that it will be used in an educational context. In addition, merely adopting a new learning technology does not promise its learning achievement and success. Yet, many educational institutions have attempted to aid online learning, while academics and researchers have also spend much effort on the adoption of M-LMS. Researches exploring situations, in which all components of learning occur via a mobile device, are limited (Shin and Kang, 2015). Limited studies have investigated predictive factors impacting the adoption of M-LMS (Han and Shin, 2016). Shin and Kang (2015) have called for further studies to discover why students use or reject M-LMS.

2. M-Learning in Saudi Arabia

Smartphones are increasing continuously worldwide. Also in the Middle East, smartphone diffusion is taking place as well. Alsenaidy and Ahmad (2012) stated that Saudi Arabia was leading 4G market in the Middle East. In the Saudi Arabia, there are a large number of young people who accept and use the modern technology with extreme enthusiasm. The developments in mobile internet technology and widespread use of smartphones are the country's core drivers of development. In Saudi Arabia, the government invests in the development of technological infrastructure, which supports internet-enabled services; also, the mobility networks are in the developed phase (CITC, 2017). Therefore, with the widespread diffusion of smartphones, mobile learning (m-learning) is expected to success and dominates the learning practices (Jawad and Hassan, 2015). M-learning refers to the delivery of learning to students at any time and from any place through the use of mobile devices. Higher educational institutions should exploit the advantages of mobile diffusion through offering M-LMS services (Mtebe, 2015).

Unfortunately, although the telecommunications infrastructure is in developed level, m-learning is still in the implementation phase, especially in developing countries (Jawad and Hassan, 2015). As stated by Mtebe, (2015), the LMS has been successfully adopted in developed countries; however, in developing countries it has mostly failed, and its utilization is incomplete and limited (Abdel-Jaber, 2017). For example, in Saudi Arabia, numerous universities have adopted and implemented LMS, but students' engagement and satisfaction level is low among students. A recent study by Alshammari et al. (2016) argued that the organizational and technological factors are the core challenges in such countries. Indeed, different country, contexts, and institutions face different challenges (Mtebe, 2015). Attaining the success implementation of the m-blackboard by students is a critical challenge.

LMS usage is important, as it could increase students' performance in courses offered via the LMS (Mtebe, 2015). Unfortunately, according to the records of universities in the Saudi Arabia, the number of students who actively interact using m-blackboard systems is limited. Therefore, the m-learning acceptance must be examined from the perspective of students in universities for a successful m-learning adoption in Saudi Arabia (Al-Hujran et al., 2014). To this end, we conducted a case study of university of Ha'il in the Saudi Arabia. Our aim was to answer the following two research questions. What are the benefits and challenges that affect students' intention to adopt m-blackboard in Saudi Arabia? How do users perceive such benefits and challenges? To fill this gap, this study examined the potential benefits and challenges that might change the students' intention to adopt m-blackboard in Saudi Arabia.

3. Literature review

There are assured predictive factors that have a significant influence in student perception and should be measured to provide better understanding of students' perceptions regarding the M-LMS. The previous studies on M-LMS generated general findings, and studied frequently common factors (e.g., self-factors), did not adopt a focus view of organizational and technology infrastructural factors. For example, Han and Shin (2016) reported latent associations between M-LMS acceptance and students' psychological characteristics (i.e., self-efficacy, innovativeness, perceived usefulness, and perceived ease of M-LMS use). This was supported by Alshammari et al. (2016), who reviewed the literature on LMS acceptance and found that the factors of self-efficacy and enjoyment were commonly measured and their effects were proved. However, they added that the organizational and technological factors are the essential challenges in M-LMS implementation rather than self-factors and self-efficacy in the Saudi Arabia.

Other studies have discovered the effect of technological infrastructure issues on the adoption of M-LMS. For example, Asiimwe and Gronlund (2015) found that university students had positive attitudes regarding the use of M-LMS in general. Meanwhile, Asiimwe and Gronlund (2015) reported that the majority of the students were prominent that it was annoying for them to use the M-LMS via mobile phones. This was reasonable as students perceive it required much effort, difficult to use, and they are not aware how to use the system especially via mobile phones. These were because they found that using mobile devices was costly for the high internet fees, aside from the low speed, specifically in loading pages for small memory, inconsistency of university LMS with mobile phones, and lacking accessibility to learning materials and sources (Mayisela, 2013). Similar conclusion was reported by Kaliisa and Picard (2017), who reviewed studies on m-learning in universities and found reasonable

challenges associated with m-learning. The main limitations stated by the studies were related with technological infrastructure issues, such as slow internet access and lack of access to new mobile devices. That is, though some students reported having positive attitudes, sufficient technological resources (e.g., Smartphones) and awareness to use mobile devices for learning purposes (Mtebe and Raisamo, 2014), yet, they are willing to adopt and use M-LMS system, only if, M-LMS are made easy to use and access particularly through providing high processing power, larger and clear screens (Mtebe and Raisamo, 2014; Macharia and Pelser, 2014). Park et al. (2012) found that system accessibility can increase users' behavioral intentions to adopt m-learning. These studies evidenced that students' perceptions of M-LMS might change depending on the technological infrastructure that probably differs from a context to another.

This study argues that the use of M-LMS is intensely affected by technological infrastructure. Therefore, this study focused on the users' perception of infrastructure issues comprehensively. Substantial investments were made in developing and enhancing mobile applications for learning, and most of these applications were not entirely successful because of the lack of meeting support and/or not considering user requirements (Shroff and Keyes, 2017). This shed the light on the importance of examining the perspective of students in higher education for a successful m-learning (e.g., m-blackboard) implementation in Saudi Arabia (Al-Hujran et al., 2014).

In the literature of m-learning, many factors have been reported as salient predictors of users' intention to adopt m-learning. As such, facilitating conditions factor was ensured as a salient factor in determining the students' intention to adopt m-learning by several studies (Iqbal and Qureshi, 2012; Mtebe and Raisamo, 2014; Masrek, 2015; Masrek and Samadi, 2017; Shorfuzzaman and Alhusein, 2016; Al Tabib et al., 2016; Ugur et al., 2016; Ahmed, 2016; Jawad and Hassan, 2015). Facilitating conditions defined by Venkatesh and Davis (2000) as "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system". However, a handful of studies have examined the facilitating conditions factor in the user's perceptions of M-LMS. These studies investigated the adoption of m-learning in general, and did not focus on M-LMS in particular, which is different to m-learning because m-learning is more personal, where learning content is personalized for the individual learner as stated by (Sarrab et al., 2013). These promising findings calls for more focus from the perspective of the authors of this study.

In technology adoption, facilitating conditions factor is a vital factor. Acceptance of any technology (especially latest technology) is extremely dependent on the infrastructure conditions and supporting environment. In the m-learning adoption, these facilitating conditions include internet speed,

resources, and personnel support (Iqbal and Qureshi, 2012). This study debates that facilitating conditions normally differ from an educational context to another. This study explores the non-surveyed scope of universities in Saudi Arabia.

4. Methodology

4.1. Data collection and samples

This study used mixed research methods (i.e., qualitative and quantitative methods). The qualitative method is the inductive step utilized to draw theories or hypotheses (Davis, 2016). This method is usually text-based and it can be employed in focus groups or in-depth interviews with staff who are having substantial experience in M-LMS research area and using it before. A semi-structured interview is a flexible form of a structured interview, as it allows deeper inquiry by providing the opportunity for the interviewer to enquire and elaborate the interviewee's responses. In such interviews, researchers endorse using a simple checklist that covers all related research questions. The advantage of such a checklist is that it supports the interviewer in keeping the interview within the bounds set by the purpose of the study (Alshenqeeti, 2014). The researchers interviewed eight staff from the University. This study examines the impact of main challenges and benefits in M-LMS utilization by students using a single case design. As the use of a single case design is more appropriate for research that purposes to test a theory, or special case (Yin, 2009). This study uses a single case design to examine more deeply into the phenomena to insure that a well understanding is provided.

A quantitative method using a survey questionnaire technique with closed questions was used for data collection. Questionnaire deemed necessary to facilitate the respondents' understanding in answering the questionnaire questions (Sekaran and Bougie, 2016), in order to test the hypotheses formulated in the research model of the study. The survey questionnaire was employed to collect data from students at university of Ha'il in Saudi Arabia, who are accessible to the m-blackboard system. This study conducted a cross-sectional survey for data collection, as user perceptions need long period of time to change. A random stratified sample was targeted certain respondents (i.e., students at university of Ha'il in Saudi Arabia). Paper-based questionnaire was distributed, and managed personally by the authors. In addition, online-based questionnaire was conducted via WhatsApp to reach a greater number of students. As a result, 212 usable responses were received, and the overall response rate was 26.8%.

4.2. Measurement

The survey questionnaire consisted of three main sections. The first section asks for respondent

demographic information. The respondents were asked if they had previously used m-blackboard on their personal computers, smartphones, or both. This was intended to target adopter respondents. The second section was associated with the facilitating conditions variable. The third section focused on the benefits and challenges of m-blackboard adoption. The variables in the last two sections were measured using a five-point Likert-type scale (1 = strongly disagree and 5 = strongly agree).

The questionnaire questions were adapted from several studies. The adapted questions were modified to be compatible with the current study. The questionnaire questions were formulated in English; however, it was required to translate them into Arabic, as the targeted respondents of the study were the students at university of Ha'il in Saudi Arabia, who are almost all Arabs and the Arabic is the official language in such country. The questionnaire is shown in [Appendix A](#).

5. Empirical results

The qualitative data collection was based on semi-structured interviews, developed based on the literature review. The procedure used for selecting interview respondents was purposive sampling: the list of the university returning students. Interviews with those selected respondents were conducted face-to-face. In order to ensure consistency between interviews, and thereby increase the reliability of the findings, researchers developed interview instruments to guide the administration and implementation of the interviews. These instruments include: what to say to interviewees when setting up the interview, beginning, and concluding the interview, what to do following the interview, develop an interview guide that lists the questions or issues to be explored during the interview, and start with a question that is important but not too specific ([Boyce and Neale, 2006](#)). Interviews lasted from 30 to 40 min, and were recorded and transcribed. The qualitative interview data were analyzed manually by the researchers through analytical comparison of the written interview text.

The results of the semi-structured interviews indicated that all the interviewed staff declared that they have a well user experience of M-LMS. The interviewed staff members declared that to adopt mobile technology to serve LMS, factors affecting this adoption must be analyzed: facilitating conditions (users should be equipped with the minimum requirements: smartphone, knowledge, and reliable internet service). All interviewed staff mentioned that many challenges may impede this progress, including weak internet signals, mobile screen size, and internet cost. All factors, challenges and benefits of M-LMS were explored more by distributing a survey questionnaire to students at the University.

The quantitative data were analyzed using (Statistical Package for the Social Science) SPSS 17.0 software. A descriptive analysis was employed to

present the description included the frequency and the percentage of each variable. Also the chi-square value was calculated, and its level of significance. The chi-squared test was used to determine whether there is a significant difference between the expected and the observed frequencies in certain categorical values of each factor. The last deemed necessary to find the degree to which the benefits and challenges items can play role in m-blackboard adoption.

5.1. Demographic profile of the sample

As shown in [Table 1](#), in the study, the majority (83%) of the respondents were young (less than 24 years old), and most students were still in undergraduate degree of studies. Male respondents were dominate (69%) the sample. Approximately half (56%) of students who answered the questionnaire were from the scientific sciences colleges, followed by social sciences (35%); the rest (9%) were from medical sciences colleges. It's notable that the majority of the sample is newly blackboard adopters, 91% of respondents had fewer than two years of experience using web blackboard platforms. The data analysis showed that, possessions of Smartphones respondents were dominating the sample (95%). However, only 19% were using mobile devices to access blackboard platforms using a web browser instead of a mobile application. Indeed, a student accessing LMS does not mean they are fully connecting with the content because of a technological barrier. He highlighted that "content needs to be easy to read, with simple navigation; otherwise there is a risk that a student will become disengaged from their course material". In addition, accessing LMS by using web browser has many challenges that could causes users to discontinue using it. M-LMS should have a clear content, should be easy to navigate, fast to respond, and have the same look and functionality on any device.

5.2. Significant difference in frequencies and descriptive statistics of the variables

Descriptive statistics of the variables were formulated for three factors by using direct questions distributed in five scales: strongly disagree, disagree, neutral agree, agree, and strongly agree. [Tables 2, 3, and 4](#) show the significant difference in frequencies using chi-square. The residuals frequency (i.e., represents the difference between the expected and the observed frequencies), Means, Chi-Squares and standard deviations for the variables. In our test of significant difference in frequencies using Chi-Square, we expected values for each group were equal because we have no prior information about the sample. The expected values for the groups ("strongly disagree", disagree, "neutral", "agree" and "strongly agree" groups is 42.

[Table 2](#) shows that the expected values are different from the observed values, since resulted in

residuals, ranged from -21.4 to 18.6 for the five groups. The Chi-square is statistically significant for the variables numbered 1 and 2 only. Therefore, differences found between group frequencies in variables 1 and 2 are not due to chance alone, not the variables 3 and 4. There are difference between the observed frequencies found within our sample and the frequencies expected in the general population, with 4 degree of freedom. This indicates that there is less than a 4 in 100 chance that students have

resources, as well as, knowledge necessary to use m-blackboard of our sample is actually representative of the population from which they were drawn. However, the significant frequencies that were higher than the expected (i.e., 42) were focused in “agree” and “strongly agree” groups. These indicating that the higher frequencies in more agreement among students for having the resources and knowledge necessary to use m-blackboard were significantly exist, not due to chance.

Table 1: Demographic information of the sample demographic factor

	Categories	Frequency	Percent
Age	less than 18 years	6	2 %
	18-23 years	171	81 %
	24-29 years	35	17 %
	30-35 years	0	0%
	36-41 years	0	0%
Gender	Equal or more than 42 years	0	0%
	Male	147	69 %
College	Female	65	31 %
	Medical sciences	20	9 %
	Social sciences	75	35 %
	Scientific sciences	117	56 %
Length of Using Blackboard	less than 1 year	126	60 %
	1-2 years	66	31 %
	3-4 years	9	4 %
Possession of Smartphone	more than 4 years	11	5 %
	Yes	202	95 %
Means of Accessing Blackboard	No	6	5 %
	Mobile	40	19 %
	Computer	69	32 %
	Both	103	49 %

Table 2: Analysis of m-blackboard system facilitating conditions from student’s perspective

Variable/Items	Strongly disagree		Disagree		Neutral		Agree		Strongly Agree		X ²	M	SD
	F	R	F	R	F	R	F	R	F	R			
Facilitating Conditions													
I have the resources necessary to use blackboard mobile	21	-21.4	33	-9.4	41	-1.4	61	18.6	56	13.6	25.45	3.46	1.30
I had the knowledge necessary to use blackboard mobile	23	-19.4	32	10.4	50	7.6	54	11.6	53	10.6	18.61	3.38	1.30
Internet speed is appropriate for blackboard mobile	41	-1.4	31	11.4	52	9.6	46	3.6	42	-0.4	5.59	3.08	1.38
A specific person was available for assistance with blackboard difficulties or quires	45	2.6	34	-8.4	53	10.6	44	1.6	36	-6.4	5.50	2.96	1.37

Table 3 shows that the expected values are largely different from the observed values, since resulted in large residuals, ranged from -28.4 to 36.6 for the five groups. The Chi-square is significant for all benefits variables. Therefore, differences found between group frequencies in all benefits variables are not due to chance alone. The difference between the observed frequencies found within our sample and the frequencies expected in the general population, with 4 degree of freedom. This indicates that there is less than a 4 in 100 chance that student’s perceive m-blackboard an easier access to information, more productivity, wise use of time, as well as, money and accessible anywhere and anytime of our sample is actually representative of the population from which they were drawn. However, the significant frequencies those higher than the expected (i.e., 42), were focused in “neutral”, “agree” and “strongly agree” groups. These indicating that the higher frequencies in more agreement among

students for benefits of using m-blackboard were significantly exist, not due to chance.

As shown in Table 4, the expected values are largely different from the observed values, since resulted in large residuals, ranged from -17.4 to 25.6 for the five groups. The Chi-square is significant for all challenges variables, except the number 2. Therefore, differences found between group frequencies in challenges variables (i.e., 1, 3, 4, and 5) are not due to chance alone. The difference between the observed frequencies found within our sample and the frequencies expected in the general population, with 4 degree of freedom. This indicates that there is less than a 4 in 100 chance that student’s perceive the challenges of m-blackboard application takes long time to download, weak and costly internet connection through smart phone, and the weak signal of smart phone network especially inside the Campus of our sample. These were actually representative of the population from which they were drawn. However, the significant

frequencies those higher than the expected (i.e., 42), were focused in “neutral”, “agree” and “strongly agree” groups. These indicating that the higher

frequencies in more agreement among students for benefits of using m-blackboard were significantly exist, not due to chance.

Table 3: Analysis of m-blackboard system benefits from student’s perspective

Variable/Items	Strongly disagree		Disagree		Neutral		Agree		Strongly Agree		X ²	M	SD
	F	R	F	R	F	R	F	R	F	R			
M-Blackboard Benefits													
Easier access to information	15	-27.4	23	-19.4	51	8.6	57	14.6	66	23.6	46.49	3.64	1.22
More productivity	14	-28.4	28	-14.4	50	7.6	52	9.6	68	25.6	42.90	3.62	1.24
Wise use of time	16	-26.4	22	-20.4	63	20.6	54	11.6	57	14.6	44.46	3.53	1.20
Wise use of money	16	-26.4	32	-10.4	63	20.6	38	-4.4	63	20.6	39.46	3.47	1.26
Accessible anywhere and anytime	16	-26.4	25	-17.4	40	-2.4	52	9.6	79	36.6	57.48	3.72	1.28

Table 4: Analysis of m-blackboard system challenges from student’s perspective

Variable/Items	Strongly disagree		Disagree		Neutral		Agree		Strongly Agree		X ²	M	SD
	F	R	F	R	F	R	F	R	F	R			
M-Blackboard Challenges													
Application takes long time to download	26	-16.4	45	2.6	65	22.6	35	-7.4	41	-1.4	19.88	3.09	1.28
Small screen of smart phone	26	-16.4	42	0.4	50	7.6	45	2.6	49	6.6	8.89	3.23	1.33
Weak internet connection through smart phone	25	-17.4	40	2.4	65	22.6	38	-4.4	44	1.6	19.84	3.16	1.28
Costly connecting to internet smart phone	27	-15.4	41	1.4	68	25.6	14.6	11.4	21.2	2.6	24.32	3.12	1.30
Weak signal of smart phone network inside the Campus	27	-15.4	35	7.4	52	9.6	34	-8.4	64	21.6	21.72	3.34	1.39

6. Discussion

6.1. Benefits of m-blackboard adoption

The survey results indicate that only 2% responded that they strongly disagree that the presence of the Blackboard system has helped them to learn much, while 7.2% disagree on the same, and 17% remained neutral. This study provided evidence that the majority (73%) of the students believe that the presence of the Blackboard system has helped them to learn much, whereas 9.2% say that the presence of the Blackboard system has not helped them to learn much, and 17% remain neutral on the subject. As evidenced from the data analysis, only 9.1% of the students perceive that the Blackboard system has not enhanced their awareness and recall of relative information, while the majority (73%) agree that the Blackboard system has enhanced their awareness and recall of relative information. However, 16 % are neutral on the same question. With regard to item number 3, a low percentage (12%) of the respondents indicate that the Blackboard system has not enhanced their effectiveness in the educational process, while a high percentage (66%) of the students either agree or strongly agree that the Blackboard system has enhanced their effectiveness in their educational process, and 20% of the respondents remain neutral on this matter. Only 15% of the students disagree that the Blackboard system has increased their productivity, while 28% of the students neither agree nor disagree, and a high percentage (56%) of the students believe that the Blackboard system has increased their productivity. All this can be generalized to the whole population of the students, since the standard deviations are very small and the chi-square statistic on all the answers given by the respondents are significant. As a summary, the descriptive statistics of the variables show that the

respondents agreed on almost all the items in the statements.

In the third part of the questionnaire on m-blackboard benefits, student perceptions indicated that easier access to information provided the highest benefit, with a mean value of 3.83. Accessibility provided the second-highest benefits, with a mean value of 3.72. M-blackboard also enables students to complete their academic work in a more productive and interactive manner. Mobile technology allows students and staff members to reach the blackboard system at any time. These results are consistent with previous studies. [Han and Shin \(2016\)](#) found relationships between M-LMS use and students' perceptions of usefulness as well as ease of M-LMS use. In addition, approximately 61% of students increase their productivity when they can access the material they need at any time. Also [Heirdsfield et al. \(2011\)](#), who found that the ability to access materials 24 hours a day is the most prominent feature of blackboard systems.

6.2. Challenges of m-blackboard adoption

Via a mean of 3.34, the respondents agreed that the greatest challenge to adopting m-blackboard is the weakness of mobile network signals inside the universities campuses. Small screen size is one of the dominant challenges of using mobile devices for educational purposes; it received a mean score value of 3.23 from the respondents, indicating their agreement. Moreover, this result is in agreement with findings reported in the literature ([Mtebe and Raisamo, 2014](#); [Macharia and Pelsler, 2014](#); [Asiimwe and Gronlund, 2015](#)), who found that some of the main challenges were small screen size, low storage capacity, and short battery life. Other challenges include slow downloading, with a mean value of 3.09, and the cost of connecting mobile devices to the internet, with a mean value of 3.12. According to

these results, the respondents agree that weak mobile network signals and small mobile device screens are among the main challenges encountered when accessing the internet for educational purposes.

7. Conclusion and recommendations

This study presents infrastructural benefits and challenges that reflect factors affecting adoption of m-blackboard in the Saudi Arabia, and integrates a case study performed at university of Ha'il in Saudi Arabia. Different factors involving behavior, maturity, and technology acceptance were reviewed and investigated using various scales.

Based on the responses, as expected, students are facing challenges and gaining benefits using m-blackboard system. However, there are frequency differences among groups of students regarding the facilitating conditions, benefits and challenges of using m-blackboard system. This might refer to other factors associated with the context. Therefore, further investigation needed to discover a reasonable relation. That is, next researchers are advised to discover what factors might reverse the expected effect of such factor. In terms of the benefits of m-blackboard adoption, the responses indicate significant positive benefits such as easier access to information, greater productivity, time and cost savings, and the fact that it is accessible anywhere and anytime. The last section of the survey addresses the challenges of m-blackboard adoption. The respondents indicated that the greatest challenge is the weakness of mobile network signals, followed by the small screens of mobile devices, cost of connecting mobile devices to the internet, and the time needed to download the m-blackboard application. Researchers recommended that the universities in Saudi Arabia should move forward toward adopting the m-blackboard platform. Previous studies, interviews with experts, and questionnaire responses all make clear that the m-blackboard platform allows better interactions between students and staff, provides easier access to class material, saves time and effort, and contributes to the use of current technologies to support education in colleges and universities. In line with this study; Iqbal and Qureshi (2012), Talukder and Quazi (2011), Almasri (2015), Sung et al. (2015), and Alshammari et al. (2016) showed that using of mobile learning systems increases the productivity of the students and consider m-blackboard useful technology. Also consistent with findings from other studies Liu et al. (2010), Heirdsfield et al. (2011), and Jawad and Hassan (2015); this study also point out that the rising of accessibility and obtainability of resources are a valuable feature of online environments admired by students. Future research on this topic will be conducted by building an m-blackboard platform for the universities in Saudi Arabia; this platform should be developed, tested, evaluated, and then made available for all students and staff to use. Future researchers are advised to

investigate other aspects rather than the users' perception of adoption (e.g., learning environment, teachers' scaffolding, etc.). In addition, all challenges faced during m-blackboard adoption must be investigated, and the reason behind it must be dug deeper. Recommendations to handle all of these challenges must also be provided along with considering what was stated by Abdel-Jaber (2017) that students' assessment of course aside from the instructors' interactivity are the best factors affecting perceived satisfaction with LMS among students in Saudi Arabia. Future researchers are advised to study m-learning from institutional readiness as asserted by Alsmadi et al. (2017).

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Compliance with ethical standards

Conflict of interest

The authors declare that they have no conflict of interest.

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Appendix A: Instructor questionnaire

We are conducting a research study to find predictive factors that affect the adoption of a mobile blackboard (m-blackboard) system at the universities in Saudi Arabia in the Kingdom of Saudi Arabia.

This questionnaire is used purely for research purposes and your personal information will be kept

private. There are no right or wrong answers, just tell us your honest personal opinion.

Please complete all of the questions, tick only one box for each question by putting symbol (√). The survey contains the following three sections:

Section A: Demographic information

Section B: Facilitating Conditions Factor

Section C: Benefits and challenges of m-blackboard adoption

Section A (Questions 1-6): Demographic information

<p>1. Age</p> <p><input type="checkbox"/> Less than 1 year</p> <p><input type="checkbox"/> 1 – 2 years</p> <p><input type="checkbox"/> 3 – 4 years</p> <p><input type="checkbox"/> More than 4 years</p> <p>2. Gender</p> <p><input type="checkbox"/> Male</p> <p><input type="checkbox"/> Female</p> <p>3. Major</p> <p><input type="checkbox"/> Medical sciences</p> <p><input type="checkbox"/> Social sciences</p> <p><input type="checkbox"/> Scientific sciences</p>	<p>4. Experience in using m-blackboard</p> <p><input type="checkbox"/> Less than 1 year</p> <p><input type="checkbox"/> 1 – 2 years</p> <p><input type="checkbox"/> 3 – 4 years</p> <p><input type="checkbox"/> More than 4 years</p> <p>5. Do you have Smartphone</p> <p><input type="checkbox"/> Yes</p> <p><input type="checkbox"/> No</p> <p>6. Using blackboard system via:</p> <p><input type="checkbox"/> Mobile system</p> <p><input type="checkbox"/> Computer system</p> <p><input type="checkbox"/> Both</p>
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Section B (Questions: 7-10): Facilitating conditions factor

Answers (1= strongly disagree, 2= disagree, 3= Neutral, 4= agree, 5= strongly agree)

Facilitating Conditions

7. I have the resources necessary to use blackboard mobile	1 , 2 ,3 ,4 , 5
8. I had the knowledge necessary to use blackboard mobile	1 , 2 ,3 ,4 , 5
9. Internet speed is appropriate for blackboard mobile	1 , 2 ,3 ,4 , 5
10. A specific person was available for assistance with blackboard difficulties or quires	1 , 2 ,3 ,4 , 5

Section C (Questions: 11-20): Benefits and challenges of m-blackboard adoption

Answers (1= strongly disagree, 2= disagree, 3= Neutral, 4= agree, 5= strongly agree)

Benefits of M-Blackboard Adoption

11. Easier access to information	1 , 2 ,3 ,4 , 5
12. More productivity	1 , 2 ,3 ,4 , 5
13. Wise use of time	1 , 2 ,3 ,4 , 5
14. Wise use of money	1 , 2 ,3 ,4 , 5
15. Accessible anywhere and anytime	1 , 2 ,3 ,4 , 5

Challenges of m-blackboard adoption

16. Application takes long time to download	1 , 2 ,3 ,4 , 5
17. Small screen of smart phone	1 , 2 ,3 ,4 , 5
18. Weak internet connection through smart phone	1 , 2 ,3 ,4 , 5
19. Costly connecting to internet smart phone	1 , 2 ,3 ,4 , 5
20. Weak signal of smart phone network inside the Campus	1 , 2 ,3 ,4 , 5