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Mobile learning adoption: A systematic review

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Abstract

Mobile learning adoption is an active area of research. This paper aims to contribute to better understanding of mobile learning adoption by providing a body of knowledge to aid researchers working in this field. The applied method is systematic review of commonly used databases based on the guidelines proposed by Kitchenham (*Keele, UK, Keele University, 33*(2004), 1–26, 2004). In total 39 publications were retrieved out of which 27 were relevant to our research questions. The results highlighted publication trend, adoption models used and a set of factors that influence mobile learning adoption. Based on the findings recommendations were derived for further research in this field.

Keywords Mobile learning · Mobile learning adoption · Systematic review

1 Introduction

Mobile devices provide elearning opportunity using small and portable wireless devices. Availability of mobile devices among students has compelled the educational institutions around the world to use mobile technology to facilitate teaching and learning in new and innovative ways. It provides users with an opportunity for anywhere anytime learning. Integrating mobile technology in teaching and learning process is a challenging task, there are many factors that impede mobile learning adoption; technical, social, cultural, learner centered etc. (Bidin and Ziden 2013; Liu et al. 2010) hence adoption has been slow. Mobile learning is largely self-directed and these individual factors may act as a barrier in using mobile learning (Karimi 2016). There is also lack of successful examples that have fully utilized the capabilities of mobile learning. Research on mobile learning is in infant stage and its theoretical

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foundation has not yet matured. There are many issues that are unsolved and research in this regard is in short supply.

Understanding the various issues of mobile learning adoption is very important to fully utilize its potential. The main aim of this paper is to review the literature and establish a body of knowledge to provide a better understanding on mobile learning adoption. Systematic review is a method that identifies problem, critically evaluates and integrates the findings of individual studies addressing one or more research questions (Kitchenham 2004). Systematic reviews are rigorous and have well established guideline to conduct and report reviews. The objective of conducting this systematic review is to have a better understanding of mobile learning adoption in terms of publication trends, adoption models used and influential factors in order position research activities accordingly. Although there are two studies which reviewed mobile learning adoption (Liu et al. 2010; Bidin and Ziden 2013) this studies were not very comprehensive and also needs to be updated.

This study makes the following contributions to the field of mobile learning; i) assessing the mobile learning adoption studies with respect to publication trends, adoption models used and identification of influential factors, ii) consolidating the findings to provide future research direction. This article is organized as follows; the related literature section provides background on mobile learning, technology adoption and prior work done. The methodology section provides an overview of how the research was designed and executed. The results section provides an analysis of data obtained according to research questions. The findings are summarized in the discussion along with recommendation being provided for future research direction. Finally the limitations of the study and conclusion are presented.

2 Background

The concept of mobile learning and technology adoption are presented below.

2.1 Mobile learning

Mobile learning is an extension of elearning that allows users to accomplish learning using small and portable wireless devices. Mobile learning applications are being developed to provide electronic learning experience in mobile context. It provides an opportunity for anywhere, anytime learning according to the convenience of learners (Lee and Chan 2007). Teaching and learning doesn't require taking place in a specified location or specified time rather it is flexible and can occur at any location and at any time. Educational institutions around the world have started to use mobile technology in teaching and learning because it is both self-evident and unavoidable (Traxler 2009). Whilst mobile phones have broadened the availability of educational materials through decreased cost and increased flexibility it has both challenges and benefits.

Some of the benefits include; a) no barrier to geographical constraint as learning can occur at any place and at any time, b) helps students develop a self-centered learning pedagogy, c) facilitates an efficient communication mechanism for learning as well as to endorse and review the content among instructors and learners (Chandhok and Babbar 2011; Asabere 2013). Some of the challenges include; a) mobile learning draws

a gap between technically sound students in terms of system with non-technically efficient students, b) highly dependent on a platform of network resources, c) it can create a sense of isolation among students and instructors (Asabere 2013; Kukulska-Hulme et al. 2009). The general vision of mobile learning presented by the majority of authors currently writing in the field is that it seeks to enable anywhere and anytime learning that can facilitate communication, collaboration, and creativity among participants in authentic and appropriate contexts of use. In some respects, this is perceived as a revolution of just-in-time and just-for me information delivery.

2.2 Technology adoption

Adoption refers to user intention of using a new system it is a complicated process with number of factors determining adoption. The decision to adopt the technology is largely dependent on how the users feel the system will improve their work performance. Rogers (2010) states that successful adoption of a particular innovation must have the following characteristics; the technology must have advantage over older technology, it must be compatible with the users' needs and it should not be complex to use and difficult to learn. Technology adoption is an ongoing activity among individuals as well as in organizations. Decision makers need to know the issues that influence the use of a particular technology so they would be able to take them into account during the development phase (Taherdoost 2018). Technology adoption comes with challenges and some of the factors that affect acceptance are; lack of leadership and support for innovation, time to make changes, understanding and ability to implement, social implications, collaboration communication styles, current processes or procedures, budgetary priorities, training requirements, user resistance to learning new technology, work stress or overload, cost, reliability, user acceptance and performance (Atkin et al. 2017).

In recent years we have seen many new technologies particularly the development of miniature devices and its related enhancements. Every organization is investing in new technology as part of strategic planning, however the adoption of technology is slow. Number of models and frameworks have been developed to explain adoption of technology. Technology acceptance models have been applied in various fields such as education, finance, medical to name a few to study implementation of technology (Taherdoost 2018). These models investigate the factors or determinants influencing the acceptance of technology (Chong et al. 2011). The TAM model and its successors TAM2, UTAUT and TAM3 indicate that perceived ease of use is a significant influential factor for new technology adoption. Other significant factors include satisfaction, usefulness, attitude, motivation and fun to name a few has been part of various models. Tan et al. (2012) re-iterated that the success of new technology acceptance is highly dependable on the individuals' willingness to adopting a particular technology, hence different individual factors are tested with perceived usefulness, perceived ease of use and social influence. Using technology acceptance models in research to validate the outcome of has been generally accepted by scholars.

2.3 Prior work

Mobile learning adoptions is an active area of research. There are studies reported in literature that investigate mobile learning adoption, these studies are summarized in Appendix Table 4. Although there is considerable amount of published literature on mobile learning adoption but lacks comprehensive review papers published on mobile learning adoption. There are two papers which reviewed mobile learning adoption (Liu et al. 2010) reviewed a set of 22 papers and identified the factors that affect mobile learning adoption. (Bidin and Ziden 2013) studied the adoption and application mobile learning in the education industry and classified this into three categories features of the devices, user's expectations and pedagogical advantage. There are some review papers on general aspects of mobile learning, (Hwang and Wu 2014) conducted a survey by reviewing publications from 2008 to 2012 in seven well-recognized Social Science Citation Index (SSCI) journals of technology enhanced learning to investigate the applications and impacts of mobile technology enhanced learning. (Hwang and Tsai 2011) studied the research trends in mobile and ubiquitous learning by reviewing publication from 2010 to 2011. Our study will update the current literature on mobile learning adoption.

3 Research method

This research was carried out using the guideline proposed by (Kitchenham 2004). The systematic process included three stages planning the review, conducting the review and reporting the review. Planning the review identifies the research questions that need to be investigated, defines review protocol, data sources, search strategy and terms, study selection criteria, quality of studies, data extraction and synthesis. Conducting the review includes selecting and reviewing studies. Reporting includes writing up the results and communicating. Figure 1 provides an overview of the proposed research method.
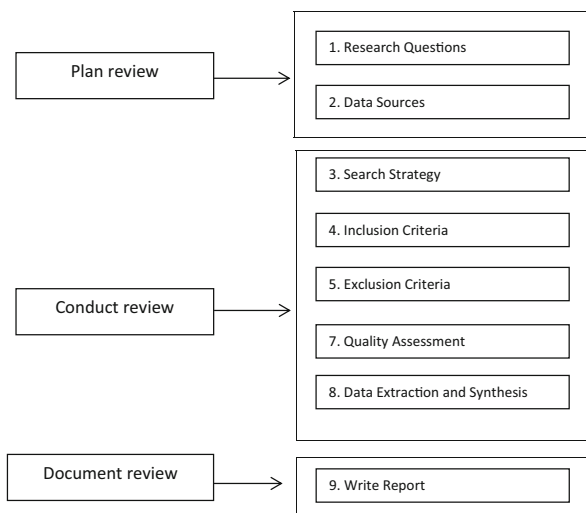

Fig. 1 Systematic review process overview

4 Research questions

The most important part of systematic review is to formulate research questions. Research questions were formulated that meets the objectives of the study (Table 1).

RQ1 is motivated by the need to understand research trend and publication venues of mobile learning adoption studies. RQ2 investigates the methods that are used to study mobile learning adoption. RQ3 was established to discover individual factors that are influential in mobile learning adoption.

5 Data sources

The electronic database sources used in this study included those that are relevant to our research questions. The search process for this study was based on the search of the following digital libraries.

• IEEE Digital Library	http://ieeexplore.ieee.org
• ACM Digital Library	http://dl.acm.org
• Springer Link	http://springerlink.com
• Science Direct	http://sciencedirect.com
• Taylor and Francis	http://www.tandfonline.com
• Wiley InterScience	http://onlinelibrary.wiley.com/
• Inderscience	http://www.inderscience.com
• IGI Global	http://www.igi-global.com

6 Search strategy

The automated search string was used to capture all results that are related to mobile learning adoption. The search string was determined using PICO criteria; population, intervention, comparison and outcome. The search string should provide maximum coverage but of manageable size (Schardt et al. 2007). The terms used are based on the research questions identified earlier and have been selected by using three different scopes as starting point. 1) Mobile phones as the target device including smart phones and tablets. 2) Mobile learning as the specified field of application studied. 3) Adoption as the topic under study along with other similar terms.

Table 1 Research questions

ID	Question
RQ1	What is the current trend of research in mobile learning adoption?
RQ2	What methods are used to investigate mobile learning adoption?
RQ3	What factors are influential in mobile learning adoption?

The different search strings derived in Table 2 above were executed on different electronic data bases, as the search progressed, the search terms were refined discarded and added. Any changes to the search string were rerun on the selected electronic data bases to ensure all relevant papers were retrieved.

7 Inclusion criteria

An inclusion criteria was designed to rigorously assess selected papers, result analysis only included those papers that have fulfilled the inclusion criteria listed below. The following inclusion criteria were developed in order to select the relevant publications to answer the research questions:

IC1. The paper is focused on mobile phones as target device including smart phones, tablet devices.
IC2. The paper reports on mobile learning adoption
IC3. The paper is scientifically sound.

8 Exclusion criteria

An exclusion criterion was developed to remove those papers from the list that were not related to our study. The papers that conformed to at least one of the following criteria were excluded:

EC1. The paper is not written entirely in English language.
EC2. The paper has already been listed in another database.

9 Quality assessment

All selected papers were assessed for their quality. Papers were evaluated using a checklist that was formulated to measure the research credibility and validity. The checklist was as follows:

QA1 Are the aims of the research clearly articulated?
QA2 Have other authors cited the study?
QA3 Does the study report credible findings with supporting data?

Table 2 Search string

Scope	Source title
Mobile learning	(mobile learning OR m-learning) AND
Adoption	(adoption OR adoptation OR acceptance)

10 Data extraction and synthesis

From each of the study selected, following information was extracted.

- The authors and the year of study.
- The source of publication.
- The method used to study mobile learning adoption.
- The factors that were identified to be affecting mobile learning adoption.

The search was executed on each of the databases and the references were saved in bibliography files. The research team read all titles and abstracts and checked the inclusion, exclusion criteria and quality assessment for each entry. The principal researcher classified the papers and articles according to type. The associate researcher reassessed the papers against inclusion, exclusion criteria and quality assessment. In general 39 papers were retrieved after assessing against inclusion and exclusion criteria 12 papers were removed. The papers were removed for the following reasons; they were not written in english language, the papers did not answer the research questions, or the papers were listed in multiple databases. The selected papers are listed in Appendix Table 4. Finally we extracted statistics and analyzed the included results in detail. The next section presents the analysis of the results.

11 Results

This section provides an in-depth analysis of the results obtained. Three research questions have been answered in detail and the results are summarized in discussion section.

11.1 RQ1. What is the current trend of research in mobile learning adoption?

In the past decade a number of mobile learning applications were developed and likewise research papers started to emerge in the field of mobile learning. Amongst research in design, development and testing of mobile learning applications, adoption has been one of the widely researched areas. In total 39 papers published on mobile learning adoption were found on the selected databases and 27 of them were relevant to our research objectives. The overall trend shows increase in the number of papers published per year. This also confirms that research is still expanding in the area and more papers will emerge in near future. The number of journals papers outweighs the conference proceedings this may be due to the fact that this subject is complex and requires rigorous experiment and testing, hence researchers would want to add their findings to journals for more credibility rather than conferences. The publication channel varied since there are 23 different publication sources in 27 papers. The variety of publication sources demonstrates that there is no specialized source for reporting on mobile learning adoption. Figure 2 shows publication trend of papers on mobile learning adoption. Figure 3 shows papers distribution by journal and conferences.
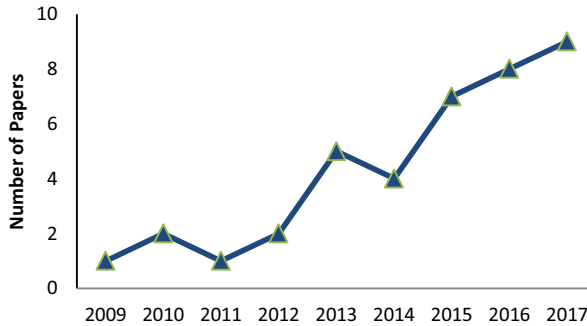
Fig. 2 Papers published per year

11.2 RQ2. What methods are used to investigate mobile learning adoption?

The results were divided into two components; formal methods (includes models used from literature (TAM, UTAUT, TPB and TTF etc) and informal methods (includes methods derived by the researchers). The analysis revealed that there is no specific model to study mobile learning adoption the generic models that were designed to study technology adoption are being used in majority of the cases. The models were extended, modified, integrated or used in conjunction with other models. In some papers no specific model was used rather users designed their own methods to study mobile learning adoption. One notable reason for this could be that existing models were not designed to study mobile adoption or specifically mobile learning adoption. From the results it was seen that 19 out of 27 (67%) papers used formal method to investigate adoption while 8 out 27 papers (31%) used informal methods to investigate adoption. Looking at the models that have been used it was noticed that TAM and UTAUT were widely used. TAM was used in 11 papers (42%) while UTAUT was used in 6 papers (23%). In very few cases TPB and TTF were also used. From the papers 8 out 26 (31%) of those who did not use any specific model mostly designed their own surveys and questionnaires and in very limited cases interviews. Figures 4 and 5 shows the distribution of methods and models used as per number of papers published.
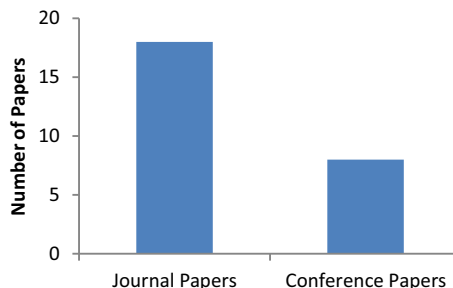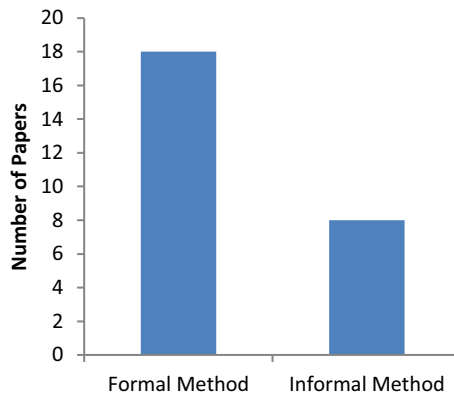

Fig. 3 Publication type

Fig. 4 Methods used

11.3 RQ3. What factors are influential in mobile learning adoption?

A total of 63 different factors were identified as a measure of mobile learning adoption. However, there were many similarities in these factors for e.g. usefulness and perceived usefulness, hence the authors grouped these factors by categorizing them into 15 major factors; attitude, intention, ease of use, enjoyment, learner interest, prior experience, usefulness, learnability, anxiety, personal, technological, social, financial, pedagogical, readiness. Appendix Table 5 provides the list of factors and how the factors using similar terms were grouped. For analysis we checked the factor listed and if any of the similar terms were used in the paper. Figure 6 provides statistics on factors influencing mobile learning adoption.

From the above statistics we identified nine influential factors as explained below (Table 3).

12 Discussion

This section provides summary of our results and interpretation of findings. User acceptance of new technology is an important concern user's unwillingness to use
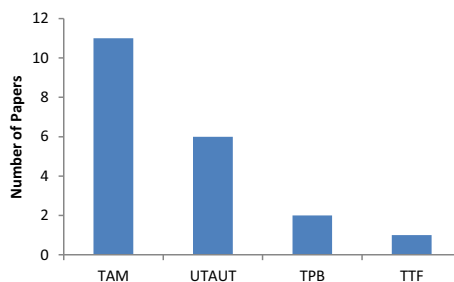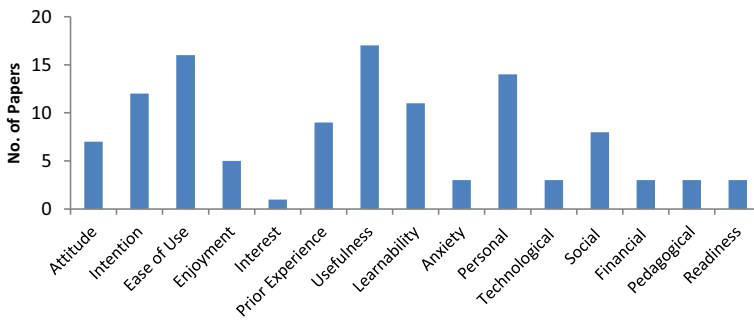

Fig. 5 Models used

Fig. 6 Factor statistics

an application and can end up being no benefit to the organization (Venkatesh and Davis 2000). Investigating factors influencing learner's acceptance of mobile learning is an essential step to ensure that time and money is invested wisely (Liu et al. 2010). From the results we can see that mobile learning adoption is one of the widely studied areas in the field of mobile learning and investigating the factors that affect mobile learning adoption forms majority of these studies. Increasing trend in number of papers published indicate that this is an active area of research and more papers will emerge in near future. This also emphasizes that better understanding of different factors involved in mobile learning adoption is very important. There were eighteen journal and nine conference papers. There is no specialized source for reporting on mobile learning adoption hence papers were retrieved from 25 different sources. A specialized source in terms of journal or conference would help researchers working in this field. The overall trend shows increase in the number of papers published per year thus it can be concluded that research is still expanding in the area and more papers will emerge in near future.

In general 69% of papers studied utilized formal methods to study mobile learning adoption while 31% of the studies did not use any formal methods rather used observation, self administered questionnaires and interviews to collect data. Those which used models (TAM, UTAUT, TPB and TTF) from

Table 3 Explanation on factors

Factor	Explanation
Attitude	feeling about an application
Intention	willingness to use an application
Ease of use	how easily the application can be used
Enjoyment	pleasure in using the application
Prior experience	if the users have previously used the similar application
Usefulness	how valuable the users feel the application is
Learnability	ease with which a mobile application can be understood by users
Personal	individual factors that affect the use of mobile learning application
Social	result of social influence

literature had to either extend, modify or integrate this with other available models this strongly indicates that none of this models are best suited to study mobile learning adoption. TAM was widely used amongst all the formal methods that were used. This strongly indicates need for an adoption model that is suitable to study mobile learning. An extensive body of literature exists that supports TAM in predicting the acceptance of innovations. It is a challenge to apply traditional adoption models in mobile learning context since mobile learning is more personalised on services made available by the technology (Liu et al. 2010).

From this analysis we can conclude that attitude, intention, ease of use, enjoyment, experience, usefulness, learnability, personal and social are major factors influencing mobile learning adoption while other factors that have minimal impact are interest, anxiety, technological, financial and pedagogical factors. Attitude affects an individual's behaviour by filtering information and shaping the individual's perception of the technology (Kim et al. 2009). Most technology acceptance models are based on a simple concept from psychology: beliefs and attitudes about a certain technology largely determined by the intention to use it, which in turn influences actual usage behavior (Ajzen 1993; Fishbein and Ajzen 1977). Information systems that users perceive easier to use and less complex will increase the likelihood of its adoption and usage (Lee et al. 2001). Enjoyment is a strong predictor of ease of use. If the technology is found to be easy to use, the perceived enjoyment will increase. Human knowledge increases with experience thus the skill biasedness of technological change would tend to favour more experienced users (Weinberg 2004). Mazhar et al. (2014) found out that rate of adoption is directly and positively related to the usefulness of a new technology. The more a person believes that technology offers many uses, the more he is inclined towards its adoption. Leung et al. (2008) studied how learnability of mobile interfaces affects adoption, the authors concluded that mobile computer technologies have much potential to support older adults in their daily lives, many existing mobile applications are difficult for older adults to learn to use, which may negatively affect the adoption of these technologies by this population. Personal and social factors are important determinant of technology adoption since the users may be influenced by others with in their network which may influence their intention towards technology adoption (Talukder 2012). There is a need for proper mobile learning adoption framework that takes into consideration these factors during implementation of mobile learning applications.

13 Recommendations

This section describes how findings of this research are important for policy, practice and subsequent research. This research is very important and can provide directions for future research in the area of mobile learning adoption.

- There is no specialized source for reporting on mobile learning adoption. Research is expanding rapidly in the field of mobile learning and adoption is one of the active areas of research. Specialized source of reporting in a

form of journal or an organized conference will allow researchers to collaborate and develop solutions that are specific to mobile learning adoption.

- In order to examine mobile learning adoption models have been utilized, these are the models (TAM, TAM2, TPB etc.) that have been previously developed to examine user's intention to adopt a new technology thus they were used to study mobile learning adoption. These models are very generic therefore there is a need to come up with an adoption model that is designed specifically to study mobile learning adoption.

- This review has revealed a number of factors that are influential in mobile learning adoption. This research can serve as an important direction for developing mobile learning adoption framework. Using a systematic process for mobile learning adoption will provide high level of accuracy.

14 Threat to validity

This research may have some limitations despite the fact that the process was planned with the aim of attaining the utmost achievable accuracy. Firstly we may have missed some relevant studies published at venues that we did not include in our search. The search was limited based on selected venues which are recognized as leading publishers in the field of computer science and information systems. In particular, we have missed articles published in standalone journals or conferences, or workshops. This research omitted search of technical reports and theses as good quality grey literature but these would eventually appear in journal or conference papers. The results must be qualified as applying to studies published in major journals and conferences. The search string may have filtered out some publications that would have been relevant. To mitigate these threat PICO criteria was applied resulting in effective search string that contained a rich collection of terms.

15 Conclusion

This study presents the results of systematic review of mobile learning adoption. Three research questions were identified for the purpose of this study to assess the mobile learner adoption for publication trends, models used and the factors affecting adoption. A search strategy was designed and executed, and analysis was done in accordance with the research questions identified. In total 27 out of 39 papers were analyzed based on the research questions. Results indicated increasing research activity, lack of adoption models and insight into individual factors that are influential in mobile learning adoption. The findings of the study provided gaps in literature which can serve as a basis for future research direction. Future research can be carried out to establish a specialized source of reporting, develop models to specifically study mobile learning adoption and to design an adoption framework.

Appendix 1

Table 4 Selected primary studies

	Author	Title
1	Dyson et al. (2009)	Addressing the cost barriers to mobile learning in higher education, International Journal of Mobile Learning and Organisation, **Inderscience**
2	Bidin and Ziden (2013)	Adoption and application of mobile learning in the education industry, 6th International Conference on University Learning and Teaching (InCULT 2012), **Elsevier**
3	Bakhsh et al. (2015)	An Assessment of Students' Readiness Towards Mobile Learning at AIOU, Pakistan, In Information and Communication Technologies (ICICT), 2015 International Conference, **IEEE**
4	Chong et al. (2011)	An empirical analysis of the adoption of m-learning in Malaysia, International Journal of Mobile Communications, **Inderscience**
5	Bere and Rambe (2016)	An empirical analysis of the determinants of mobile instant messaging appropriation in university learning, Journal of Computing in Higher Education, **Springer**
6	Tan et al. (2012)	Determinants of Mobile Learning Adoption: An Empirical Analysis, Journal of Computer Information Systems, **Taylor & Francis**
7	Karimi (2016)	Do learners' characteristics matter? An exploration of mobile-learning adoption in self-directed learning, Computers in Human Behavior, **Elsevier**
8	Hyman et al. (2014)	Electronic reading and digital library technologies: understanding learner expectation and usage intent for mobile learning, Educational Technology Research and Development, **Springer**
9	Cruz (2013)	Examining the Effect of Learning Styles on Mobile Learning Adoption, In Advanced Learning Technologies (ICALT), 2013 IEEE 13th International Conference, **IEEE**
10	Bere (2014)	Exploring Determinants for Mobile Learning User Acceptance and Use: An Application of UTAUT, In Information Technology: New Generations (ITNG), 2014 11th International Conference, **IEEE**
11	Sabah (2016)	Exploring students' awareness and perceptions: Influencing factors and individual differences driving m-learning adoption, Computers in Human Behavior, **Elsevier**
12	Isa et al. (2015)	Exploring the Adoption of Blended Learning, In Artificial Intelligence, Modeling and Simulation (AIMS), 2015 3rd International Conference, **IEEE**
13	Joo et al. (2016)	Factors predicting online university students' use of a mobile learning management system (m-LMS), Educational Technology Research and Development, **Springer**
14	Yeap et al. (2016)	Factors propelling the adoption of m-learning among students in higher education, Electronic Markets, **Springer**
15	Hao et al. (2017)	Influential factors for mobile learning acceptance among Chinese users, Educational Technology Research and Development, **Springer**
16	Prieto et al. (2015)	Mobile Acceptance among Pre-Service Teachers: A Descriptive Study Using a TAM-Based Model, Third International Conference on Technological Eco-systems for Enhancing Multiculturality - TEEM'15, **ACM**
17	Khan et al. (2015)	

Table 4 (continued)

	Author	Title
		Mobile Learning (M-Learning) adoption in the Middle East: Lessons learned from the educationally advanced countries, Telematics and Informatics, **Elsevier**
18	Prieto et al. (2014)	Mobile Learning Adoption from Informal into Formal: An Extended TAM Model to Measure Mobile Acceptance among Teachers, Second International Conference on Technological Ecosystems for Enhancing Multiculturality – TEEM'14, **ACM**
19	Pappas et al. (2017)	Mobile Learning Adoption through the lens of complexity theory and fsQCA, Global Engineering Education Conference (EDUCON), 2017, **IEEE**
20	Yadegaridehkordi et al. (2013)	Success factors influencing the adoption of M-learning, International Journal of Continuing Engineering Education and Life Long Learning, **Inderscience**
21	Ho et al. (2010)	Technology adoption of mobile learning: a study of podcasting, International Journal of Mobile Communications, **Inderscience**
22	Reychav and McHaney (2017)	The relationship between gender and collaborative learning assessment in a mobile technology-based setting: An empirical investigation, Computers & Education, **Elsevier**
23	Gan et al. (2017)	Understanding mobile learning adoption in higher education: An empirical investigation in the context of the mobile library, The Electronic Library, **Emerald**
24	Kim et al. (2017)	Understanding the role of user resistance on mobile learning usage among university students, Computers & Education, **Elsevier**
25	So et al. (2015)	Understanding users' perceived needs and concerns toward mobile application integration in primary science education in Korea, International Journal of Mobile Learning and Organisation, **Inderscience**
26	Osakwe et al. (2017)	Where learners' and teachers' perceptions on mobile learning meet: A case of Namibian secondary schools in the Khomas region, Technology in Society, **Elsevier**
27	Seol et al. (2012)	Use of a mobile application to promote scientific discovery learning: students' perceptions towards and practical adoption of a mobile application. 13th annual conference on information technology education. **ACM**.

Appendix 2

Table 5 Grouping of factors

Attitude	attitude towards learning, attitude towards use, willingness to adapt m-learning, attitude towards technology use
Intention	continuance intention, intention to adopt, intention to use, perceived behavioral control, behavioral intention
Ease of use	perceived ease of use, ease of use, effort expectancy, learner control
Enjoyment	enjoyment, fun, perceived enjoyment, perceived playfulness
Interest	student interest
Prior experience	previous experience, prior e-learning knowledge and exposure
Usefulness	perceived long term usefulness, perceived near term usefulness, perceived usefulness, usefulness, performance expectancy, content knowledge, task characteristics, satisfaction
Learnability	facilitating conditions, learnability, flexible learning, learning autonomy learning style, perceived understanding, collaboration, content knowledge
Anxiety	inertia, influence of user resistance, mobile anxiety
Personal	gender, individual differences, cultural, norms, marital status, age, ownership, personal innovativeness, privacy, subject norm, voluntariness, motivation, self-efficacy,
Technological	technical feasibility, quality of service, system use, technological knowledge, technology characteristics
Social	cultural aspects, social influence
Financial	cost
Pedagogical	instructor readiness, m-learning awareness, pedagogical knowledge
Readiness	student readiness, instructor readiness

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