ACCEPTANCE AND SUCCESS FACTORS FOR M-LEARNING OF ERP SYSTEMS CURRICULA

Brenda Scholtz and Mando Kapeso
Department of Computing Sciences,
Nelson Mandela Metropolitan University
South Africa

ABSTRACT

The effective training of users is a key factor of the success of Enterprise Resource Planning (ERP) system projects. This need for ERP system training is exacerbated by a demand for quality ERP consultants which is evident in Europe and in African countries, particularly in South Africa where science and technology education has been identified as a national priority. However, the high costs of traveling in developing countries within Africa can make it difficult to offer traditional face to face training by vendors. Mobile learning or m-learning has shown a significant rise in use by companies and researchers developing learning platforms. M-learning can be used to aid in the training of ERP users who are on the go as well as those who do not have direct access to desktop PCs in their work environment. Whilst several studies propose the use of m-learning systems, research related to the implementation and evaluations of m-learning systems which focus on ERP system education are limited. In this paper success factors for m-learning of ERP systems are identified. An understanding of these factors can improve the design of an ERP m-learning system, thereby facilitating an improvement in ERP and more broadly speaking, technology education. This paper reports on field studies where the Technology Acceptance Model (TAM) was used to evaluate the acceptance, usefulness and perceived ease of two systems, the OpenSAP e-learning application and the SAP Learn Now m-learning application. The study found that the m-learning system was accepted by the learners and was rated positively for perceived ease of use (PEOU) and perceived usefulness (PU). The study results also showed that the TAM model could be successfully used to evaluate e-learning and m-learning systems.

KEYWORDS

m-learning; ERP system education; e-learning.

1. INTRODUCTION

There has been a global increase in the number of small to medium size organisations making use of Enterprise Resource Planning (ERP) systems (Zhang, Gao, & Ge, 2013). ERP systems are a suite of business modules or applications that integrate the information and processes of the various business units within an organisation, such as finance, marketing and production. The integration of these units streamlines the flow of information which can bring benefits such as process improvements and reduction of inventory costs into the value chain (Beheshti, 2006). However these benefits cannot be achieved if the implementation of an ERP system is not successful. The total cost of ERP implementation failure is high and is rising rapidly (Momoh, Roy, & Shehab, 2010). Galy and Sauceda (2014) argue that the training of users of an ERP system is the corner-stone of the implementation. Several other studies have also cited ERP training as a key factor in ERP system implementation success (Bologa & Lupu, 2014; Dalveren, 2014; Dezdar, 2012). Other factors affecting ERP system implementation success are the demand for ERP skills and knowledge and access to graduates with industry-relevant ERP education (Bologa & Lupu, 2014; Scholtz, Calitz, & Cilliers, 2011). A demand for ERP skills has resulted in the introduction of ERP system courses in higher education degree programmes (Dalveren, 2014). It is therefore important to have well-structured education programmes at universities as well as industry training programmes for users and other stakeholders in ERP system implementations (Ram, Wu, & Tagg, 2014). In this paper we refer to ERP learners as those either in education programmes in universities or ERP users in industry training programmes.

It is evident that there is a need to address research regarding the design of ERP training and education programmes in order to find the most effective and efficient forms of delivery and reduce the time and cost involved whilst still maintaining the required quality. ERP training programmes can be presented through different forms varying from the traditional face to face courses to long distance learning platforms such as electronic learning (e-learning) and mobile learning (m-learning). Modern organisations have become more inclined to e-learning programmes due to the benefits of differing work schedules of employees and differences in geographical locations between vendors and the organisations implementing the ERP system (Pastor & Casanovas, 2002). E-learning is the use of technology to aid in learning at any place and anytime. M-learning, refers to the use of mobile technologies to support learning (Attewell & Savill-smith, 2003). The 2013 Africa E-Learning Report has identified mobile technologies as an important contributor to learning technologies in Africa in the last five years (Isaacs, Hollow, Akoh & Harper-Merrett, 2013).

The research field of m-learning has attracted interest from researchers as well as from companies developing and implementing learning systems (Uzunboylu, Cavus, & Ercag, 2009). While m-learning has attracted the interest of many researchers and organisations looking to implement a more flexible long distance learning environment, very little research has been done in using m-learning systems within the ERP industry. For this reason this paper proposes an m-learning model of success factors for ERP e-learning and m-learning education and training programmes. This paper is structured as follows: The related literature in the areas of e-learning and m-learning are discussed in Section 2. The research methodology used is discussed in Section 3 and the results are analysed and discussed in section 4. Finally the recommendations and conclusions are addressed in Section 5.

2. E-LEARNING AND M-LEARNING SUCCESS FACTORS AND ERP EDUCATION

2.1 E-Learning in the ERP Industry

Several definitions of e-learning have been proposed. According to Sharma and Kitchens (2005) e-learning includes learning with web-based training facilities such as virtual universities and classrooms which allow for digital collaboration and technology assisted distance learning. Siqueira, Braz and Melo (2007) define e-learning as the use of Internet related technology in education or training. E-learning has an advantage over traditional learning in that apart from it having the ability to break geographical barriers it also offers the potential of a more flexible, tailor-made learning environment which can adjust according to both to the learners' knowledge and skills and also to their preferred learning style (Sambrook, 2003).

Although e-learning has gained popularity it is important to be aware of factors affecting the success of e-learning projects (Table 1). One of these factors is the quality of content material, which can impact the success of an e-learning project (Siqueira et al., 2007). Nedungadi and Raman (2012) further suggest that the appropriate management of the content is important to ensure that e-learning is efficient. This management involves the development and maintenance (updates) of relevant information and content, which is time consuming and expensive. In order to address this issue the learning process must be as quick and as cost effective as possible whilst still achieving the learning goals. This is attained through "rapid e-learning" which reduces the duration of e-learning projects (Unneberg, 2007). By enabling those producing the e-learning content, establishing a well organised assessment and approval process and ensuring the training is consistent across the organisation this can be achieved. Hawking and Mccarthy (2006) propose an e-learning model that integrates synchronous and asynchronous learning approaches in order to assist the delivery of offshore ERP education. Asynchronous e-learning does not involve the presence of a teacher; rather learning content is located on a remote server which learners can access over the Internet. However, synchronous e-learning requires e-learning to be conducted with the learner and the teacher being present at the learning event at the same time. This model has been adopted by most ERP vendors in that they have learning community sites where various learners can access information as well as interact with instructors or experts in particular knowledge areas who provide assistance as well as virtual classes (Hawking & Mccarthy, 2006). E-learning offerings should include training, delivery of information almost immediately and consultancy from experts (McGill, Klobas, & Renzi, 2014) .

Table 1. Factors for improving the success of e-learning projects.

Factor	System	Author
Fast access to course material	Higher Education System	McGill, Klobas, and Renzi (2014)
Combination of synchronous and asynchronous e-learning applied	ERP system	Hawking and Mccarthy (2006)
Quality of content	Data Warehousing System	Siqueira et al. (2007)
Content modelling	Data Warehousing System	Siqueira et al.(2007) Nedungadi and Raman (2012)
Enabling of those producing e-learning content	Marketing System	Unneberg (2007)
Consultancy from experts	Higher Education System	McGill, Klobasand Renzi (2014) Hawking and Mccarthy (2006)
Online certifications	ERP system	Dalveren (2014)
Provision of instructor videos		Hawking and Mccarthy (2006)
Interactive learning assignments		
Assessments (theory and practical)		

Several ERP vendors such as SAP, SYPRO, SAGE and Microsoft have introduced e-learning platforms to meet the modern demands of the customers for an e-learning platform (Dalveren, 2014; Mishra & Mishra, 2011). These solutions offer learners access to an ERP e-learning platform whereby they have unlimited access to online training materials, online certification as well as training and learning plans. SAP's innovative e-learning platform, openSAP, enables learners, SAP professionals, developers, entrepreneurs and consultants the opportunity to learn about SAP and its innovations (SAP, 2013). It also gives the learners an opportunity to interact with other learners and SAP experts on subject matters. The openSAP e-learning system consists of various courses taught on ERP and SAP and consists of a number of units offered at different times throughout the year. However e-learning may not be ideal for all situations even though it is well implemented. The 2013 e-learning Africa Review reported finances and hardware costs amongst the constraints of e-learning. Additional bandwidth and electricity costs of maintaining desktop computers were also cited (Isaacs, et al., 2013).

2.2 M- Learning and ERP Education

The 2013 e-learning Africa Review identifies mobile technologies as the leading driving technologies in education in Africa (*eLearning Africa 2013 : In Review*, 2013) The report identifies the low cost of mobile devices as compared to desktop PCs and bandwidth amongst the reasons for mobile devices being the preferred technologies. Connectivity on mobile devices is significantly cheaper than on PCs and this may be more appealing to users in developing countries and those who may not have PCs at their homes (Nordin, Embi, & Yunus, 2010; Uzunboylu et al., 2009). M-learning has therefore been deemed as the new paradigm in education. According to Nedungadi and Raman (2012) the progression of distance learning and training can be characterised as the move from distance learning to e-learning to m-learning. M-learning involves the use of handheld mobile devices to facilitate and enhance the learning process (Nedungadi & Raman, 2012). M-learning can also be defined as the use of wireless phones or personal digital assistants to deliver digitised content (Sharma & Kitchens, 2005). Furthermore, m-learning refers to learning conducted in multiple locations, across multiple times with content accessible from various devices, for example smartphones and tablets (Oberer & Erkollar, 2013). M-learning provides collaborative interaction and learning opportunities for persons and groups that are geographically dispersed (Uzunboylu et al., 2009).

Several factors for m-learning project success have been identified (Table 2). The m-learning framework assumes that the users are on the move most of the time, with the learning taking place outside of a learning facility such as a classroom (Nordin et al., 2010). It allows professionals on-the-go to connect to training material anytime and anywhere (Sharma & Kitchens, 2005). Nedungadi and Raman (2012) suggest that m-learning should provide a flexible learning environment which can adapt content presentation format to suit the device that is being used. The delivery of information on a mobile platform needs to be conscious of the context of use of its users.

Table 2. Factors for improving the success of m-learning projects.

Factor	System	Author
Content is instantly accessible with various devices	Higher Education i.e. Marketing Course	Oberer and Erkollar (2013) Sharma and Kitchens (2005)
Information delivery must consider mobile environment and context of use	Environmental Awareness	Uzunboylu et al. (2009)
Adaptive approaches to m-learning	Research tool	Nedungadi and Raman (2012)
Learning should be learner-centered and allow for knowledge assessment	-	Nordin et al. (2010)
Adoption of a community-centered approach (well established social learning networks)	- ERP system	Nordin et al. (2010) Suki and Suki (2007) Bologa and Lupu (2014)
Ability to download and view material and content offline	- ERP system	Sharma and Kitchens (2005) Dalveren (2014)
Hands-on simulation of activities provided to users as they would on actual system	Environmental Awareness ERP system	Uzunboylu et al. (2009) SAP (2013)

For learning to be effective Nordin et al. (2010) suggest that the learning process should be learner, knowledge, assessment and community centred. A community-centred approach can also be enhanced by social media communities (Suki & Suki, 2007). This approach is also supported by Bologa & Lupu (2014) who propose that well-established social learning networks can reduce the learning time of ERP systems.

ERP m-learning applications are offered by most the larger ERP vendors. For example, SAP Education has developed an m-learning application, SAP Learn Now, which enables SAP users on the go, the ability to access the training information they need in order to maintain a competitive edge (SAP, 2013). The application runs on the Android and iOS operating systems and has the following features:

- Online access to content and course material which can be downloaded and viewed offline;
- Learners can interact with the hands-on SAP Learn Now simulation.
- Users can receive class tests, instructor videos and have interactive learning assignments; and
- The application enables users to highlight relevant sections, take notes and post questions on the SAP learning community which can be answered by subject matter experts.

2.3 The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) has been accepted by a number of researchers in an attempt to explain why individuals choose to adopt or not adopt a particular technology when performing a task. TAM is built on the theory of reasoned action (TRA) which proposes that a person's behavioural intention initiates his or her performance to carry out a specified activity (Joo & Sang, 2013). TAM is based on two variables that influence the adoption: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Several studies (Ngai, Poon, & Chan, 2007;Liu, Liao, & Pratt, 2009) on e-learning have used TAM to predict the acceptance of e-learning systems. These two variables can therefore be used to evaluate e-learning and m-learning systems (Figure 1). According to Joo and Sang (2013) PEOU refers to the degree to which an individual believes that using a particular system would be effortless. There are three common items which can be used as metrics for PEOU, namely: 1) I found the system easy to use; 2) Learning to use the system was easy for me; and 3) It was easy to become skilful at the system. PU is defined as the degree to which a person believes that using the particular technology would improve his or her job performance. Five items can be used to describe PU, namely:

- The system will be of use and benefit to me;
- The system can improve my performance (with ERP);
- The system can help me accomplish my tasks more efficiently;
- The system is useful for my ERP studies; and
- The system can help me be more productive.

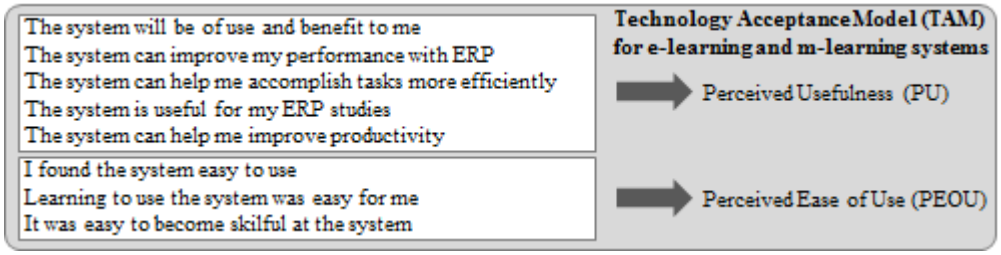

Figure 1. TAM metrics for e-learning and m-learning systems for ERP training and education programmes.

3. RESEARCH METHODOLOGY

The primary aim of this paper is to investigate the acceptance of e-learning and m-learning technologies specifically designed for ERP training and education programmes. The scope of the study will be limited to learners in higher education institutions in a developing country like South Africa. The research problem to be investigated is that whilst several ERP vendors are offering these new paradigms in learning, the acceptance of these technologies in developing countries is not known. Africa has been shown to have slightly different challenges as compared with other first world countries, since issues such as bandwidth can impact the success of e-learning and m-learning programmes. An improved understanding of the challenges involved with e-learning and m-learning for ERP systems is required in order to address the lack of quality ERP training programmes in both education and industry in Africa. In this way the demand for ERP skills and knowledge can also be met. The main research question of this paper is *"What are the success factors and acceptance of e-learning and m-learning technologies for ERP courses in higher education in developing countries?".* The main purpose of this study is therefore to establish the level of acceptance of e-learning and m-learning for teaching an introduction to ERP systems to novice ERP learners. In order to address the main research question, two secondary research objectives need to be realised, namely:

- RO1: Determine the PEOU and PU of the openSAP e-learning system; and
- RO2: Determine the PEOU and PU of the SAP Learn Now m-learning system.

The research strategies used were a literature review and two field studies in order to further investigate the research problem and determine the acceptance of SAP's e-learning and m-learning systems. The two field studies were undertaken in and ERP systems course at the Nelson Mandela Metropolitan University (NMMU) in South Africa. In the first field study learners evaluated the PEOU of SAP's openSAP e-learning system and the second field study the SAP Learn Now m-learning system was evaluated. The field studies were conducted in two practical sessions of the ERP course module. The practicals are aimed at supporting the weekly face to face lectures conducted by the lecturer. In these practical sessions learners get hands-on experience of the ERP systems. Prior to this study all learning content for this course related to the practical sessions was delivered in a traditional format where learners are provided with a document specifying a step-by-step tasks list to follow in the ERP system and then answer some questions at the end. In the first field study the learners were required to view the benefits offered by SAP HANA Business Suite for Sales, Service and Marketing. The learners were then required to complete an online assessment of the course material in order to evaluate their understanding of the course material. In the second field study learners made use of the information on the Management Accounting module using a mobile application (Table 3).

Table 3. Summary of Field Studies.

Field Study	Learning System	Outcomes/Tasks
1	OpenSAP e-learning	• Review Sales, Services and Marketing Material • Complete assessment
2	SAP Learn Now m-learning	• Review Performing Posting to Management Accounting • Complete tasks on the hands-on simulation of the posting activity • Complete assessment based on material reviewed

A paper-based questionnaire was compiled based on other studies (Ngai, Poon, & Chan, 2007;Liu, Liao, & Pratt, 2009) done on TAM for e-learning. The questionnaire was distributed to learners for completion after they had successfully completed all the tasks in the practical session. Since the questionnaire items have been used in previous studies, both the content and face validity of this study was established. Furthermore the questionnaire was statistically checked by an expert for reliability and validity. The questionnaire consisted of closed-ended questions with a 5-point Likert scale where learners had to rate the PEOU and PU items from 1 to 5, where 1 represents *Strongly disagree* and 5 represents *Strongly agree*. The following statistical ranges were applied: negative [1 to 2.6), neutral [2.6 to 3.4] and positive (3.4 to 5]. In addition to the Likert scale questions, open ended questions were used in order for learners to express their opinions on the two systems being evaluated. The qualitative data was thematically analysed where themes were determined (Thomas, 2006).

4. RESULTS AND DISCUSSION

In the sections to follow the results captured from the questionnaires will be discussed in greater detail.

4.1 Participant Profile

The number of learners that were registered for the ERP module was 25 with the majority (64%) being male and the remainder were female. All of the learners are Information Systems (IS) majors and are therefore expert computer users but are novice ERP users since none of them had any prior experience with any ERP system, the SAP system or with either learning platform. Most of the learners were between the ages of 18 and 25, with only two learners being over the age of 25. The sample size for the field studies was 23 as opposed to the 25 learners registered for the module. This is due to the fact that two learners did not attend the practical session for the openSAP practical when the questionnaires were administered. An additional participant was removed since it was an outlier, resulting in a final sample size (n) of 22.

4.2 TAM Results

The PEOU was analysed for the two systems (Table 4). After analysis of the results it can be noticed that the overall mean rating for PEOU for the SAP Learn Now m-learning system (μ = 3.9) was only slightly higher than that of the openSAP rating (μ = 3.6) and both of the scores were ***positive***. From this result it can be deduced that the learners found the m-learning system easier to use than that of the e-learning system. From this information it can be deduced that the learners perceived the usefulness of the m-learning system (μ = 4.0) to be the same as that of the e-learning system (μ = 4.0). Further the low standard deviation values of both systems reveal that the difference in opinions of the system was around the mean and therefore opinions did not vary that much.

Table 4. Technology Acceptance (PEOU and PU) Results.

	PEOU		PU	
System	**OpenSAP**	**SAP Learn Now**	**OpenSAP**	**SAP LearnNow**
n	22	22	22	22
Mean	3.6	3.9	4	4
StdDev	0.7	1	0.7	1
Min	2	2.3	2.6	2.4
Max	5	5	5	5

Further analysis was conducted in order to gain more insight on the specific items which consists of the PEOU and the variation to the mean values which were recorded for the two systems (Figure 2). The SAP Learn Now m-learning system was rated higher than the openSAP e-learning system for all three metrics of PEOU. The highest rated item (μ = 4.1) was *"Learning to use the e-learning/m-learning system was easy for me"* and was for the SAP Learn Now m-learning system. Five of the six scores were in the positive range.

The only metric not in the positive range was, *"It was easy to become skilful at the system"* (μ = 3.3), which was for the openSAP e-learning system. One aspect which needs to be investigated in further studies is the impact of the content on the ratings for the m-learning system. In order to get a more detailed perspective on the five individual items relating to PU further analysis was done (Figure 3). All items for both systems were in the positive range for PU. The ratings were very similar for all five items for both systems. The highest rated item was "*Can improve my performance with ERP"* (μ = 4.1). The lowest rated item was for "*Helps me to accomplish tasks more efficiently*" (μ = 3.8).

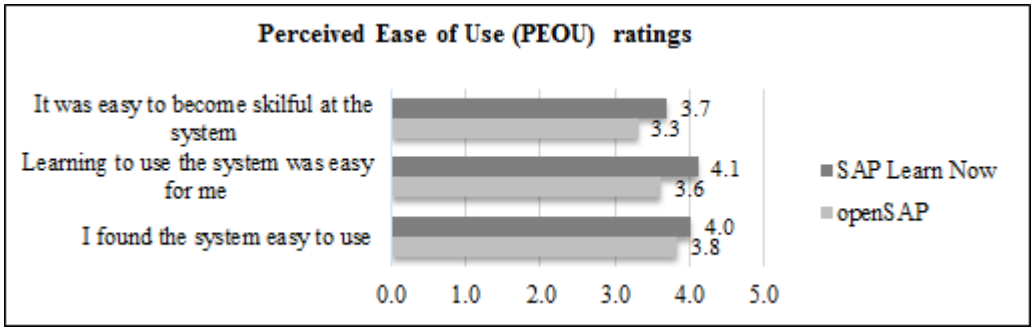

Figure 2. Perceived Ease of Use (PEOU) ratings (n = 22).

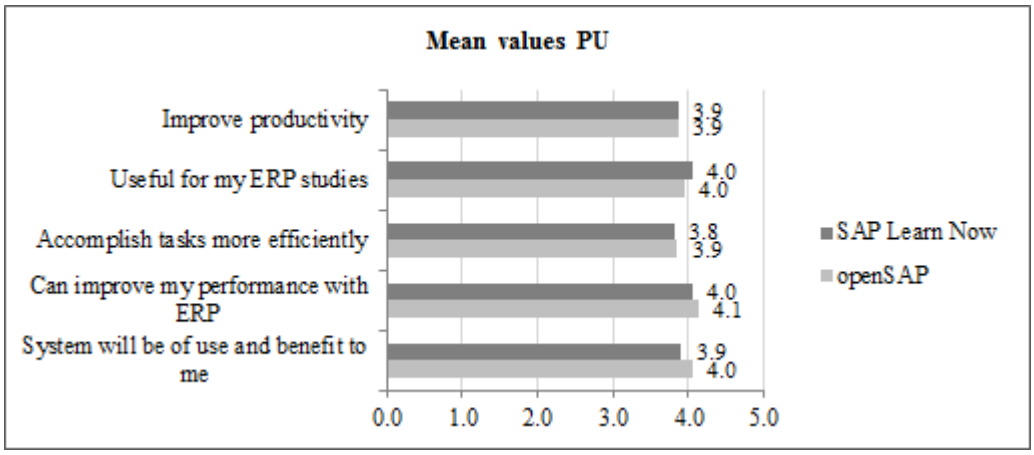

Figure 3. Mean values PU.

4.3 Qualitative Results

Through the use of open-ended questions qualitative feedback was obtained from the learners by asking them to comment on features of the learning systems which they liked or didn't like. A frequency count (*f*) was calculated for each theme identified in the thematic analysis and categorised into positive (Table 5) and negative (Table 6) features. Only the themes with the top two frequency counts for each system are listed in the table. The most two frequently identified features for OpenSAP were the use of videos (*f* = 9) and the quality and breadth of content (*f* = 9). One learner stated that *"It is easier to learn from videos than from text".* Another learner highlighted the real life examples used during the video lectures as a positive feature. This supports the results of studies (Nedungadi & Raman, 2012; Siqueira et al., 2007) citing content quality and learning flexibility and adaptability as critical success factors of m-learning projects. During the SAP Learn Now session the use of videos was also identified frequently (*f* = 12) as a positive feature. The theme with the second highest frequency count was the hands on simulation (*f* = 9).

Table 5. Top positive features.

Themes (openSAP e-learning)	**Frequency Count *(f)***	**Sample comments**
Video lectures	9	*I found it easier to learn from a video than having to read through text and slides*
Flexibility and content	9	*Practical examples*
Themes (SAP Learn Now m-learning)	**Frequency Count *(f)***	**Sample comments**
Video tutorials	12	*Explanation of the content via the videos*
Hands on simulations	9	*Guided simulations; The touchscreen interface made learning easier*

The analysis of open-ended comments revealed that the most frequent negative feature of the openSAP e-learning system was the long duration of the video lectures (f = 8). This was followed by the amount of information that had to be consumed, that is information overload (f = 6). After the second session, which involved the SAP Learn Now m-learning system the fat finger problem and the size of the icons was the most frequently (f = 10) identified theme. This confirms the study of Uzunboylu et al. (2009) stating that designers of m-learning systems need to consider the environment and context of use. Other issues identified were related to content quality, for example information being too textual or too theoretical (f = 9).

Table 6. Negative features.

Themes (openSAP e-learning)	**Frequency Count *(f)***	**Sample comments**
Duration of videos	8	*Videos too long; Some videos are too long(easily lose concentration)*
Information overload	6	*"Too much theory to read"*
Themes (SAP Learn Now m-learning)	**Frequency Count *(f)***	**Sample comments**
Fat finger and icons too small	10	Icons too small to click
Content related issues	9	It is quite a lot of information to take in

5. CONCLUSIONS AND RECOMMENDATIONS

The results of the two field studies showed that both e-learning and m-learning systems for ERP education programmes can be successfully used to assist learners with improving their productivity and learning. In addition the systems are perceived by learners as easy to use. However these systems should be context aware just as they are in other learning environments. The m-learning system could be used to help those users who do not have the time to have a full experience with particular modules of ERP but wish to have a quick and easy understanding of ERP. Hence m-learning can be used to help those who need an introduction to ERP concepts and to get a simulated experience of hands-on tasks in an ERP system. The m-learning system should present content that is easy to understand. From the study the use of media content such as videos and audio tutorials could make the learning experience more efficient to the user. However the quality of content is an important issue for both e-learning and m-learning systems, and the fat finger problem needs to be taken into consideration when preparing the content to enable interactive experience of m-learning systems to be optimal. The study described in this paper was a preliminary study undertaken with a small sample size of ERP learners at one university. This study forms part of a larger study which involves the development of an m-learning system for ERP education and training purposes. In conclusion, the results obtained from the study indicate a positive acceptance of e-learning and m-learning by ERP learners. The study focused on the factors used in the TAM model and it was not always clear what the impact of content was on this acceptance. Future research is needed that investigates the impact of these factors on the acceptance of m-learning systems.

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