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New Lms Mobile Framework Based on Multiplatform: A Literature Review of Mobile Lms Theory, Design and Implementation

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ABSTRACT: Online learning has become an option to be implemented in various schools because the development of IT technology and the COVID-19 pandemic have made online learning more popular to implement. Mobile LMS is the most dominant used in online learning. This study aims to produce a Mobile LMS framework developed from previous research based on the advantages and disadvantages. The review method used narrative review by identifying and summarizing previously published articles, avoid duplication of research, and look for new fields of study that have not been studied. The literatures are focused on three things such as (1) Mobile LMS theory, concept and approach, (2) Mobile LMS design and framework, and (3) Mobile LMS implementation. From articles researching about Mobile LMS published in reputable journals, there are 17 purposive selected papers. Based on the literature review, the Mobile LMS framework has not been integrated into devices and operating systems. Therefore, the author developed a Mobile LMS framework design based on Multiplatform, which is integrated by device and operating system based on references that have been used by previous researchers. This new Mobile LMS framework can be a reference for teachers and future researchers.

KEYWORDS: Design, Mobile LMS, New Framework, Implementation, Theory.

1. INTRODUCTION

The requirement to continue to carry out learning during the Covid-19 Pandemic makes teachers have to use online-based learning media. Online-based learning becomes a new habit and option after the pandemic by considering its effectiveness and efficiency. However, the quality of online-based learning must be able to match or be expected to exceed the effectiveness of direct learning in achieving the learning objectives that have been set. Mobile Learning Management system (LMS) is one of the media becoming the main tool in online-based learning [1]. The use of Edmodo-based mobile LMS on dynamic fluid materials can increase the interest and achievement in learning physics for high school students [2]. The results of students' abilities on multiplatform LMS, google meet and google classroom are in the good category [3]. Tthe use of mobile LMS student involvement is very important in creating quality learning. The teacher's involvement is in directing the correct use either for the nature or level of use [4].

Utilization and integration of technology become the main challenges of the 21st century on how to achieve learning objectives [5]. Online learning can support students' independence, commitment, communication and collaboration as an effort to build the effectiveness of active and meaningful learning, although it has not been able to run optimally [6]. Therefore, it is expected every education provider can prepare educators who are able to use various types of technology to achieve content targets effectively and create more learning opportunities for students [7]. Through mobile learning, users can access learning content anywhere and anytime without having to visit a certain place at a certain time. The use of mobile devices among students can have a positive impact in achieving learning objectives [8].

Mobile learning is very promising in the development of education in the future. Mobile technology has a very promising potential in order to create new experiences in learning [9]. Mobile learning can facilitate communication between educators and students to be active in the classroom by helping students build the required communication [10]. Mobile LMS provides an opportunity to combine and connect technology and education in learning [11]. Thus, it is expected that teachers can collaborate with various parties to be able to create a learning environment that can create a good learning atmosphere for students in the future. It can be carried out by nomadic students, institutions, children and adult users and various independent learning environments. So that, a new generation of distance learning (Mobile LMS) will be built. It can be used to solve traditional learning

system problems. When using Mobile technology, the user plans, organizes, executes and evaluates his learning because he is the controller of the mobile based activities. Thus, the learner is not a passive person who takes the required information, but he or she is a person who uses cognitive and mega-cognitive abilities to achieve tasks. So, users improve higher order thinking skills [12]. The designed mobile LMS includes complete and well-defined technical quality aspects for the development of mobile learning [13]. The quality of the mobile learning system, based on the views of 392 university students, affects the success of mobile learning [14].

The current Mobile LMS is not a multi-platform based and operates only on certain operating systems, so, there are limitations in use. The operating system used is very diverse ranging from Android and IOS. Therefore, a multi-platform-based Mobile LMS is needed. The literature review in this article aims to produce a multi-platform-based mobile LMS framework design developed to fix the shortcomings of pre-existing LMS cars. The study focuses on the following three things:

1. Theories, concepts and approaches of Mobile LMS
2. Design and framework of Mobile LMS
3. Exploring LMS implementation

2. METHOD

The literature review approach used in this article was a narrative review. It aims at to identify and summarize previously published articles, avoid duplication of research, and look for new fields of study that have not been studied [15]. Articles were searched through the Scopus database with the keywords "Mobile LMS" and "multiplatform". The authors find and analyzes 17 articles focused on discussing mobile LMS.

For each article, the abstract and methods section were read to ensure the article met the research criteria so that the researcher could perform data analysis. The researcher checked whether there was methods section in each article. Then, each article was assigned based on its research methodology: quantitative, qualitative, mixed and literature study. An article is called qualitative if the data collected is qualitative; or the data are in the form of a narrative without using statistics or quantitative data. In addition, an article can be called quantitative: if there is the word quantitative in the abstract, method, or data collection section; or/and the data collected contains quantitative data or reported by using any quantitative method. If a research methodology that aims to collect and extract the essence of previous research and analyze some of the overviews of experts written in the text [16] an article is coded as mixed methods: if data are collected from quantitative and qualitative sources; and data for qualitative and quantitative sources are reported in the results section [17].

Table 1. Articles and Method for Each Topic

Topics	Method	References
Therory, concept and approach Mobile LMS	Mix-method dan Library research	Ozan (2013) Siemens and Conole (2011) Tura, Kutvonen, and Ritala (2018)
Design of Framework Mobile LMS	Quantitative, Qualitative, Mix-method and Library research	Hemabala (2012) Kumar(2019) Gorbunovs (2018) Ruipérez-Valiente (2020) Tura (2018) Navarro (2012) Hussein (2022)
Implementation of Mobile LMS	Quantitative and Qualitative,	Al-Fahad (2009) Kabir (2017) Añonuevo (2019) Ozkan (2020) Khatser (2022) Gorbunovs (2018) Smith (2018)

3. RESULT AND DISCUSSION

3.1 Theories/Concepts, and Approaches

The concept of scaffolding and the connectivism approach can be used together to meet the needs of Mobile LMS. Behavior theory, connectivism and constructivism develop a learning view of the environment. However, learning is turning into an informal, connected, and technology-enabled arena. It is even emphasized that connectivism is a learning theory in the digital era, stating that learning is a process of connecting certain nodes or sources of information with students that can improve their learning by connecting with existing networks [18] [19]. Overall, platform design framework (from conceptualization to application uses 1) platform architecture, 2) value creation logic, 3) governance, and 4) platform competition). The research shows that in the design of the DORA platform, which has unique competitive features in integrating information. The key technology of the DORA platform is collaboration while the development and innovation consists of the ecosystem and policy platform [20]. Mobile learning used by several groups of students to be adopted by Moroccan universities. The findings of this study indicate that most Moroccan students have a positive perception of m-learning. This perception makes them believe that the adoption of the mobile learning model should be well-received by Moroccan universities [21].

3.2 Design/Framework

LMS system design can improve students' knowledge, performance, achievement, problem solving skills and individual learning systems. The LMS design consists of learning content, learning evaluations, learning modules, web servers and mobile devices (mobile phones, laptops, notebooks, smartphones and PDAs). This design can be implemented online and offline both on campus and off campus activities [1]. The adoption of learning with mobile LMS, which is most popularly used among students is smart phones, tablets and laptops. Attitude, intention, convenience of use, enjoyment, experience, usefulness, learning ability, personal and social are the main factors influencing the adoption of learning Other factors that have minimal impact are interest, technology, financial and pedagogical factors [22].

The concept of an adaptive LMS for New Generation allows it to meet the special needs of students based on the previous level of students' knowledge, activities and behavior patterns during learning. The prospective information system aims to increase the motivation and engagement of LMS users in the knowledge acquisition process by recommending them appropriate content and personalized learning paths that best suit the needs of learners. Personalized feedback about students' learning progress increases their involvement in the learning process. Students can review the objects and types of learning offered, as well as suggested learning paths based on their level of proficiency [23].

The research results have developed a framework for platform design involving four elements: 1) platform architecture, 2) value creation logic, 3) governance, and 4) platform competition. This platform's design framework provides an empirical illustration of design choices in DORA's Mobility-as-a-Service (MaaS) platform providing changes to the value creation model, especially market characteristics and network effects [20].

3.3 Implementation

Learning with mobile can understand, measure students' attitudes and perceptions, and can improve student memory [8]. This technology can be used anytime and anywhere. Furthermore, this approach can adopt a mobile learning system with the aim of improving communication and enriching student experiences in open and distance learning.

Learning using LMS in a local Nigerian environment provides distance learning transformation from an e-learning system to mobile learning using technology in learning where a location context that can be done everywhere. The results show that in Nigeria teachers are aware that mobile devices in education can transform classroom learning to other locations, such as home, office, market, company, and provide opportunities for educational groups, personal development and improvement as they master learning challenges, life challenges and work [24].

Design, develop and create a mobile notification system function for high school LMS such as Saint John Colleges, Calamba City, Laguna aims to provide information to parents about activities that are being carried out by students, current events, and announcements through the built-in timeline interface, e-mail also provides an administrative dashboard that manages student activity, including account additions and updates, class sessions, courses and other interface tools. Respondents strongly agree that using Mobile LMS will help users in managing, and knowing information about school activities and other activities [25].

The LMS special portal using Moodle and ANN to support face-to-face learning in vocational schools gives a positive response and it is accepted by students. The effect of student acceptance on LMS is very important in the learning environment. So, JST can be used conveniently in other technology acceptance studies and contribute to understanding the factors that affect student or student acceptance. The results of the analysis state that performance expectations, effort, social influence, and conditions that facilitate the use of LMS are important predictors of student behavior goals. From performance expectations found

the most influential predictor of LMS acceptance [26]. This finding is in line with the finding that performance expectations have a direct influence on the goals of using the LMS [27] [28].

The results of research that examines several aspects of the features available in online learning. A survey was conducted of educators to identify LMS that are frequently used in their professional practice. Based on the data obtained, this article examines two LMS, Canvas and Moodle, in terms of efficiency and ease of use for educators and students. The results of the study have shown that the Canvas interface is more intuitive and flexible while the Moodle interface requires knowledge of basic programming and working principles of PHP. Canvas is more accessible and the navigation is simpler compared to Moodle [29].

Research presenting a model to evaluate the factors influencing educators in using Mobile LMS. The research objective is to develop component-based software that produces reusable components, with high quality and cost-effectiveness. The software components are also based on the needs of students. The findings of this study are component-based software development that is able to produce software that is easy to reuse and it has high quality and saves time. The flexibility of e learning software, which causes the software to operate on many devices. FUOLC's e-learning software based on multiplatform components has a simple and easy-to-understand program structure. The components have an integrated unit and can adapt to electronic devices that have their own platforms. FUOLC has the ability to be reused and has maintenance qualities, thus meeting the needs of students and lecturers [23].

The results of a study examining the participation and involvement of MOOC providers in the Arab world, and comparing global settings MITx and HarvardX with regional provider Edraak show that there are a slight educational and gender gap among young local residents. It is also found that MOOCs are trending more than global providers (MITx and HarvardX). Furthermore, there is a difference in participation and engagement between the edX platform and the Edraak platform. The survey results also show that Edraak's students' preference for Arabic content is an important factor for students [30]. Besides, research results providing tools for multiplatform users can distinguish changes that occur in learning based on statistics. The results show that different types of children's learning require different strategies to encourage student growth [31]. The development of the virtual campus shows that the multitier architecture is chosen to be used because of its ease of maintenance. The findings of this study have been tested for several years at UCM VC [32]. Research that developed an e-spelling system supported by sign language and finger language techniques show that the e-spelling system is easy to use by deaf students [33].

From several journals that have been analyzed, it shows that most of the research results provide theories, concepts, designs/frameworks and implementations of mobile LMS. The results of the theory and design can provide the concepts of learning, constructism, behavior and connection. The results of the article review for the category of Mobile LMS implementation show that mobile LMS is an appropriate learning tool for online learning. The Mobile LMS learning tool has been used by various levels of education units but tends to be used by universities with different platforms.

At the secondary school level, it is rarely studied about the multiplatform-based LMS model. Besides, the research also produces new findings that describe a multiplatform-based mobile LMS framework. The multi-platform-based M-LMS framework can be used as a teacher reference in mobile LMS management. Multiplatform is an application that can run on all operating systems. Multiplatform on information technology is a system that can support various types of other communication devices, not only on PC computers or laptops that are used, but it can be used on mobile phones with Android, BlackBerry and IOS operating systems. The implementation of learning using Mobile LMS in Nigeria shows success in learning. Mobile LMS provides scaffolding to learners in a mobile connectivist learning environment: (a) online learning, (b) to manage the network learning process, and (c) to interact in the network [24].

The design of the Mobile LMS framework based on multi-platform consists of learning content, learning modules and learning evaluations and knowledge interfaces that support online learning systems. Learning content can be divided into five authoring tools such as content development, content management, content distribution, content collaboration and content delivery. The design of the multi-platform-based Mobile LMS framework can be seen in Figure 2.

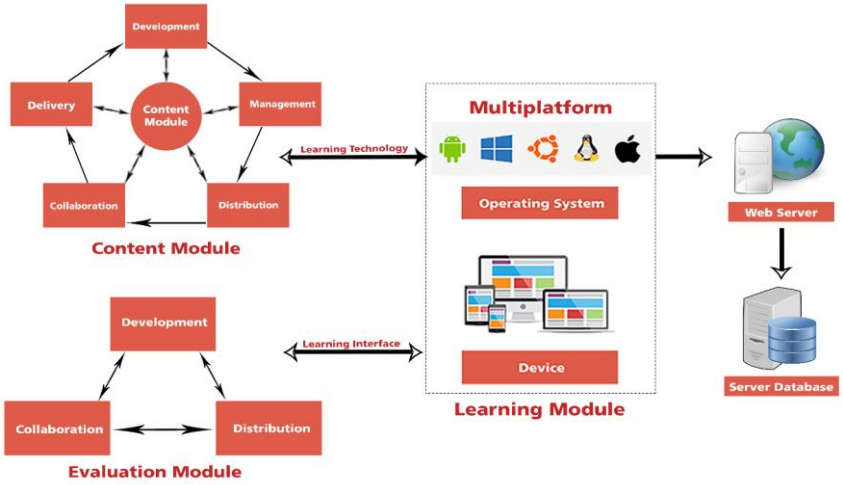

Fig. 3. Multi-platform based Mobile Learning Management System framework

From figure 2, it can be explained that the multiplatform-based M-LMS framework consists of learning content, learning evaluations, learning modules, web servers and mobile devices (mobile phones, laptops, notebooks, smartphones and PDAs) that can move on all operating systems and all devices. To use Mobile-LMS, a web server is needed to manage learning content, evaluation of learning and M-LMS users (teachers and students). In the setting of learning content, the teacher can download and search what is needed in the learning process. Besides, the teacher can develop learning based on words or text, images, audio, video, graphics and animation. Students also gain more ability to solve new problems, new ideas and strengthen their knowledge. For the delivery can be done through the database server and web server, the database server contains the login address and password, they immediately get details about their personal information and school schedules. The collaboration section is used to share knowledge and experiences between teachers and other students. The delivery department can act as mobile-content that can be accessed via wireless networks such as wi-fi, Bluetooth using equipment (web-based learning) such as PDAs, notebooks, tablets, laptops and smartphones. In the learning evaluation section, the teacher is able to organize and share knowledge with students. So that, students can access that knowledge through a network using a mobile device. Then, the multiplatform-based Mobile LMS framework is expected to provide solutions in online learning and becomes a reference for teachers in managing and teaching online.

4. CONCLUSION

Based on the results of 7 journals reviews including 17 papers, the authors conclude that there are three articles showing theories, concepts and approaches to Mobile LMS Ozan (2013), Siemens and Conole (2011), Tura, Kutvonen, and Ritala (2018); seven articles designing the Mobile LMS design or framework (Hemabala (2012), Kumar(2019), Gorbunovs (2018), Ruipérez-Valiente (2020), Tura (2018), Navarro (2012), Hussein (2022), and 7 articles exploring the results of the implementation of Mobile LMS Al-Fahad (2009), Kabir (2017), Añonuevo (2019), Ozkan (2020), Khatser (2022), Gorbunovs (2018) and Smith (2018). Based on the research method, the method used are for example: 1) Quantitative Method, 2) Qualitative method, 3) Mixed Method, and 4) Literature study method where six papers using quantitative research methods, four using mixed methods papers, five using qualitative method papers and two papers using library research methods. Research using quantitative methods is found in the articles of Ozan (2013), Siemens and Conole (2011), Tura, Kutvonen, and Ritala (2018). Research using a mixed methodology are Hemabala (2012), Kumar(2019), Gorbunovs (2018), Ruipérez-Valiente (2020), Tura (2018), Navarro (2012), Hussein (2022). The papers using qualitative methods are Al-Fahad (2009), Kabir (2017), Añonuevo (2019), Ozkan (2020), Khatser (2022), Gorbunovs (2018), Smith (2018) while Kumar(2019) and Siemens and Conole (2011) using the literature study method. From 17 papers, it shows that the theories, concepts and approaches produced are the theories of connetivism, constructivism and mobile LMS adaptation. The category of mobile LMS implementation has provided a good gap and involvement for teachers and students besides there are still mobile LMS that need to be managed properly. Then, for the Design category, the designed LMS framework has provided a good gap and engagement, but it has not been able to move on all platforms. Then, for the design category or framework, the Mobile LMS framework can be used by all devices, but it cannot move on all operating systems. This finding distinguishes the results of this study from previous studies. From the research results, it is necessary to realize a multi-platform-based Mobile LMS framework that can run on various devices and operating systems.

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