

Perceptions and Prioritization of a Portable Learning Management System

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Abstract—This paper presents two substantial findings before the development of the portable learning management system. Specifically, this paper describes the perception level of the respondents towards the development of the proposed portable system. It discusses also the prioritization level of the features of the said teaching tool. The result shows that the proposed portable learning management system is useful and somewhat easy to use. The features presented in the study are rated with a remarkable prioritization degree. The study concludes that the perception of the teacher educators towards the development of a portable learning management system is positive and encouraging. The study recommends developing portable learning management system using a feature-driven development method.

Keywords—information science, portable learning management system, ICT in Education, e-learning

I. INTRODUCTION

Online learning is referred to by many names—e-learning, blended learning, virtual learning, cyber learning, mobile learning, distance education, online education. “It can take on many forms and delivered through various platforms, but one thing remains the same: technology is a core component” [1]. Online learning is described by most authors as access to learning experiences via the use of some technology [2]. Watson and Kalmon simply define online learning as the delivery of instruction and content that comprises a combination of instructional modalities, delivery media and technologies, learning theories, pedagogical dimensions primarily over the Internet [3]. A number of online learning innovations have been developed through the years. Here are some of them that Educause has described [4]. In a flipped classroom, background or lecture material is shared online, and then face-to-face time is used for discussion, exercises, and problem solving after. Massively open online courses (MOOCs), such as Khan Academy, have usually “canned” lectures, testing is automated, and student participation is not mandatory. In adaptive learning environments, students are presented with tools, instruction, and assistance matched to their level of understanding. A very popular online innovation is gamification which uses elements such as feedback, rewards,

badges, or competition to motivate students and accelerate learning. Another innovation that is gaining more attention is simulation. They are complex, computer-driven models of real phenomena or environments (e.g. flight simulators) and are abstractions of reality that allow students to manipulate variables to understand outcomes; many of which are the basis of instructional games. Remote instrumentation provides students with access to learning experiences via the Internet that would otherwise be unavailable to them. For example, students might control devices such as astronomical instruments, spectrometers, or other electronic equipment from their computers, allowing them to run experiments or conduct research. Intelligent tutoring systems use software to simulate a human tutor. The system helps students study by posing questions, evaluating responses, and offering customized instruction and feedback. It uses analytics to improve the help offered. eTeacher is an intelligent agent or pedagogical agent, that supports personalized e-learning assistance and builds student profiles while observing student performance in online courses [5]. The student as a producer model allows students to participate in broader communities to tackle real problems that are first presented as assignments. They may co-create assignments or the curriculum with instructors. A very familiar innovation is telepresence, which is the application of complex video technologies to give geographically separated participants a sense of being together in the same location. Mobile options could extend the audiences for field studies, allowing those on-site in remote rainforests, botanical gardens, or archeological digs to examine specimens and artifacts [6]. All these innovations of online learning are hosted, integrated, and delivered online using a learning management system.

UNESCO Bangkok defined learning management system as a software package that helps teachers and educators to manage learning content and resources, and to deliver them to students. Usually, an LMS is web-based so that students can access learning content anywhere and anytime. An LMS enables teachers to manage large numbers of students, instructors and courses, and provide online forums [7]. LMS is also known as virtual learning environment (VLE) and course management system (CMS), among other names. A learning management system for educational background is able to do the following common functions: centralize and automate administration, use self-service and self-guided services, assemble and deliver learning content rapidly, consolidate training initiatives on a scalable web-based platform, support portability and standards, and personalize content and enable knowledge reuse [8]. LMS is a mainstream application for the organization, management,

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and delivery of online courses in Higher Education, since they enable efficient planning, implementation, administration, tracking, and reporting of educational and training activities. LMS provides to students facilities for enrolling in online courses, accessing lecture notes and supportive course material, communicating with their classmates and their tutors through online discussions, participating in online assessments, and monitoring their progress and grades. Moreover, LMS enables tutors to organize their courses' syllabus and teaching material, gather, grade, and provide feedback to students' assignments, track students' progress and participation to their courses, and communicate with their students for answering their questions. Also, LMS provides to the administrators efficient ways of assigning tutors to the courses and administrating enrolled students. Finally, LMS is offering to the Higher Educational Institutions an effective way for online delivery of their courses towards reaching a larger and globally dispersed audience beyond traditional campuses [9]. Using the correct learning strategies, LMS can increase motivation of learners, promote learning, encourage interaction, provide feedback, and support can be provided during the learning process. LMS supports content in various formats, e.g. multimedia, video, and text. The learners have a variety of choices since various activities are offered to them. Reuse of the learning activities can be done; with this, time and effort can be saved and the cost of improving online content is also reduced [10]. A plethora of LMS manufacturers has entered the market today to provide online learning solutions to many higher education institutions. Here are some of the biggest names among LMS providers, how they have distinguished themselves, and what they provide. Two of the most sought-after, open-source LMS providers are Moodle and Instructure. Moodle is the gorilla in the room of open-source LMS. It is primarily aimed at the education market, and it is guided by a "social constructionist pedagogy". It is known as a robust, open-source platform; Moodle is totally free, with more than 81 million users in 255 countries [11]. Instructure's Canvas is an open-source LMS that offers numerous features including analytics, hands-free updates, speed grading, lossless learning, and a 99.9% guaranteed uptime Service Level Agreement. According to Instructure's philosophy, Canvas was built, and continues to be updated, according to feedback and suggestions [12]. Proprietary LMSs are as in demand as their open-source counterparts. Blackboard and D2L (formerly Desire2Learn) are examples of such. Blackboard is known for being an industry-leading proprietary LMS and dominant vendor in the education market. It is at the forefront of partnering with institutions to build a better educational experience. A lot of schools are already using Blackboard, and it is considered to be a great value for the money, especially for large institutions with a lot of resources [13], [14]. D2L remains a key player in the LMS market. The company has a grasp of predictive analytics that none of its competitors have. D2L's Brightspace was the only LMS to receive perfect scores in the categories of innovation, student performance and retention, and accessibility [15]. All of these and more comprise a swelling offering of learning management systems that are continuously

nurtured and improved.

II. PROBLEM STATEMENT

While a number of limitations are enumerated as regards the usefulness of LMS, one immediate limitation in its implementation is an Internet connection. Because most of the learning management system is a web-based, it created issues in the accessibility and utilization [16]. Schools need to have at least reliable Internet connections. The Philippines has the second slowest average download speed among 22 Asian countries, according to a study on consumer Internet speeds as of May 2015. Aside from having slow Internet speed, the study showed that Philippine Internet users spend \$18.19 per Mbps, compared to an average of \$5.21 per Mbps worldwide. This ranks the Philippines at 161st of 202 countries [17]. In another study, 65.6 % of the respondents said that their school has installed within 1 to 5 Mbps of Internet bandwidth [18]. Because of this limitation, a portable LMS was proposed and developed. A portable LMS is a content management system that is transferable to multiple environments and manageable to a variety of infrastructure specifications.

This article is culled from two separate but interrelated studies of the project titled "ICT in Teacher Education in Region 7, Philippines". The first part of the discussion presents the result of the perceptions of teacher educators towards the development of a portable learning management system. It specifically describes the levels of perceived usefulness and ease-of-use towards a portable learning management system. The second part discusses the prioritization level of the features of a portable learning management system.

III. RESEARCH METHODS

The two studies are conducted separately. Both studies employed a descriptive approach and utilized a survey method. The studies were conducted in all recognized higher education institutions (HEIs) offering any teacher education programs in the four provinces in Central Visayas, Philippines. Teacher education program refers to degree programs such as Bachelor of Science in Secondary Education and Bachelor of Science in Elementary Education offered in public and private HEIs. All private and public HEIs including community colleges were included. The respondents of the two studies are all full-time faculty teaching any professional or specialization courses of teacher education program in the provinces of Bohol, Cebu, Negros Oriental and Siquijor. All HEIs offering teacher education programs in the Central Visayas were considered.

A total enumeration of respondents was employed during the conduct of the perception study. The identification of HEIs was based on the list given by CHED Region 7 office, dated January 31, 2013. A total of 76 out of 107 HEIs participated during the administration of the survey. All schools in Bohol and Siquijor participated in the investigation. In Negros Oriental, 12 out of 21 schools from Negros Oriental participated and included in the analysis of the study. Five HEIs in Negros Oriental are not anymore offering teacher education program as listed in CHED's database. Some HEIs in Negros Oriental did not

return the questionnaires. In Cebu, 40 out of 62 HEIs were included in the analysis of the study. There were filled up questionnaires from two schools rejected due to the qualifications of the person who answered the survey questionnaire. Some Cebu schools opted not to participate in the study, and some did not return the questionnaires after several days of extension. In total, responses from 23 (30.26%) public and 53 (69.74%) private HEIs were included in the analysis of the study.

The instrument used in data gathering to determine the perception was a survey questionnaire. Questions related to perceptions are adapted from the Technology Acceptance Model [19]. Respondents were asked to evaluate their perception e level of their competency according to the seven-point Likert scale choices: 1 – extremely unlikely, 2 – quite unlikely, 3 – slightly unlikely, 4 – neither, 5 – slightly likely, 6 – quite likely, and 7 extremely likely. The survey administration process was done in two distribution periods. In total, 383 responses were accepted and included in the analysis coming from 76 private and public HEIs in the four provinces.

Another descriptive study was conducted to determine the prioritization level of the proposed functionalities. A total of 122 respondents participated in the study; some were also participants of the perception study. The majority (82, 67.2%) of respondents are coming from the public HEIs and female (85, 69.7%). More than half of the respondents (62, 50.8) are single, 56 (45.9%) are married, 4 (3.3%) have another civil status. Many respondents (54, 44.3%) have a master’s degree, 37 (30.3%) have a bachelor’s degree, and 31 (25.4%) have a doctoral degree. The selection of the respondents was based on the database of respondents during the previous study. Some respondents were also chosen because of their online presence and accessibility as well as their social network connections. It follows a combination of purposive and snowball sampling. The formulation of questions was based on the features, information, and processes compiled in Moodle Docs 2.9. The survey administration process was done in a hybrid. It was done online through Google Form, and mailing of the printed copies was done through the provincial coordinators. The administration took from May 15 to July 15, 2015.

IV. RESULTS AND DISCUSSION

A. Perceptions towards a Portable Learning Management

Table I shows that the perceived usefulness towards PLMS is rated with an aggregate mean of 5.61, described as “quite likely.” Interestingly, all six statements about the perceived usefulness towards PLMS are described “quite likely.” The highest of all the means is 5.70 with the statement “Using PLMS would make it easier to do my job”. On the contrary, the statement “Using the PLMS in my job would enable me to accomplish tasks more quickly” is rated with a mean of 5.50.

TABLE I: PERCEIVED USEFULNESS TOWARDS PLMS

PERCEIVED USEFULNESS	(\bar{x})	DESCRIPTION
a. Using the PLMS in my job would enable me to accomplish tasks more quickly.	5.50	Quite Likely
b. Using PLMS would improve my job performance.	5.59	Quite Likely
c. Using PLMS in my job would increase my productivity.	5.62	Quite Likely
d. Using PLMS would enhance my effectiveness on the job.	5.58	Quite Likely
e. Using PLMS would make it easier to do my job.	5.70	Quite Likely
f. I would find PLMS useful in my job.	5.67	Quite Likely
Aggregate Mean	5.61	Quite Likely

The perceived ease of use towards PLMS is described as “slightly likely” with an aggregate mean of 5.26 as shown in Table 17. Notably, all statements, except for the statement about flexibility ($\bar{x} = 5.31$, quite likely), are rated “slightly likely”. The statement “Learning to operate PLMS would be easy for me” garnered the lowest mean with 5.20.

TABLE II: PERCEIVED EASE OF USE TOWARDS PLMS

PERCEIVED EASE OF USE	(\bar{x})	DESCRIPTION
a. Learning to operate PLMS would be easy for me.	5.20	Slightly likely
b. I would find it easy to get PLMS to do what I want it to do.	5.22	Slightly likely
c. My interaction with PLMS would be clear & understandable.	5.27	Slightly likely
d. I would find PLMS to be flexible to interact with.	5.31	Quite Likely
e. It would be easy for me to become skillful at using PLMS.	5.27	Slightly likely
f. I would find PLMS easy to use.	5.28	Slightly likely
Aggregate Mean	5.26	Slightly likely

The result of the opinions of the respondent towards the development of a portable learning management system implies that teachers will accept and use the tool in their classroom. Specifically, the result implies that the teachers believe that using PLMS would enhance their teaching job. On the contrary, the result, which falls on the second highest scale, may also imply that the teachers have reservations about using PLMS. These reservations may include skills and technology related issues.

The perceived ease of use towards PLMS implies that the teachers somewhat believe that using PLMS would be effortless to them. The statement with the highest mean in the perceived usefulness suggests that the respondents pay extra attention to the flexibility of the interaction of the tool. The result also connotes that the teachers are open to training and learning the new digital teaching tool.

B. Prioritization of Features of Portable Learning Management System

When asked about prioritization of the 11 features of a learning management system, the study revealed six features that are highly prioritized. These are activities ($\bar{x} = 8.72$), questions ($\bar{x} = 8.65$), grades ($\bar{x} = 8.62$), resources ($\bar{x} = 8.58$), tracking progress ($\bar{x} = 8.36$), and reusing activities ($\bar{x} = 8.29$).

Five characteristics of an LMS are rated medium priority. These are blocks ($\bar{x} = 7.88$), class enrollment ($\bar{x} = 7.81$), grouping users ($\bar{x} = 7.80$), classes ($\bar{x} = 7.75$), and editing text ($\bar{x} = 7.59$). The highly prioritized feature is on the function and process where teachers can involve students in the learning, particularly in creating assignments, forums, quizzes and others ($\bar{x} = 8.72$). On the other hand, least priority is a function where a teacher can use the text editor and icons of the LMS ($\bar{x} = 7.59$).

TABLE II: PRIORITIZATION OF PLMS FEATURES

FEATURES	FUNCTIONS AND PROCESSES	(\bar{x})	DESCRIPTION
Activities	I can involve students actively in their learning (assignments, forum, quiz, etc...)	8.72	High Priority
Questions	I can create questions for use in quizzes and other tests.	8.65	High Priority
Grades	I can use the gradebook, scales and advanced grading methods.	8.62	High Priority
Resources	I can add static materials to my course (pdf, documents, video, links, etc...)	8.58	High Priority
Tracking Progress	I can control and display progress through a course.	8.36	High Priority
Reusing Activities	I can copy or recycle elements of my course.	8.29	High Priority
Blocks	I can add extra items and information to the sides of my course page (calendar, menu, feedback, etc.)	7.88	Medium Priority
Class Enrollment	I can give students access to my class.	7.81	Medium Priority
Grouping Users	I can put students into groups and why this is useful.	7.80	Medium Priority
Classes	I can set up classes.	7.75	Medium Priority
Editing Text	I can use the text editor and what the icons mean.	7.59	Medium Priority

The features presented in this study are rated with a remarkable prioritization value. The result implies that the presented modules, functions, and processes are found to be significant in a learning management system. Unsurprisingly, the activity module is considered as the most important feature of a portable learning management system. It can be noted that activity modules provide the main activities of a course. This module will allow teachers to let their students get involved actively in the learning process. These activities include assignments, forum, quiz, and so on. On the other hand, editing text has the lowest mean among the medium prioritized feature. The result may suggest that the teachers did not care so much of the flexibility and accessibility of the editing environment of a learning management system.

V. CONCLUSION

The perception of teacher educators towards to the development of a portable learning management system is positive and encouraging. The perceived usefulness and ease of use are significant variables linked to the behavioral intention

to adopt any technology [19]–[21]. The higher the perceived usefulness and ease of use, the more chances there are of actual use of the technology. It can be concluded that teacher educators in Region 7 will strongly adopt the proposed tool and integrate these into their teaching and learning activities. In the same way, the proposed tools may help in the improvement of the ICT competency level of the teachers.

This study recommends developing the portable learning management system using a feature-driven development method. The prioritization value must be emphasized during the development and customization processes. Once developed and implemented, a usability study must be conducted then correlate the result with the perception level result.

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REFERENCES

- [1] EDUCAUSE. (no date). EDUCAUSE Library: online learning [Online]. Available: <http://www.educause.edu/library/online-learning>
- [2] J. L. Moore, C. Dickson-Deane, and C. Galyen, "e-Learning, online learning, and distance learning environments: are they the same?," *Internet and Higher Education*, vol. 14, pp. 129–135, Mar 2011 <http://dx.doi.org/10.1016/j.iheduc.2010.10.001>
- [3] J. F. Watson, and S. Kalmon, *Keeping Pace with K–12 Online Learning: A Review of State-Level Policy and Practice*, Naperville, IL: Learning Point Associates, 2005, ch 6, pp. 82-92. Available: <http://files.eric.ed.gov/fulltext/ED489514.pdf>
- [4] EDUCAUSE. (June 2014). Foundations of online learning: where digital living and education meet [Online]. Available: <http://net.educause.edu/ir/library/pdf/pub4008.pdf>

- [5] S. Schiaffino, P. Garcia, and A. Amandi, "eTeacher: providing personalized assistance to e-learning students," *Computers & Education*, vol. 51, pp. 1744-1754, Dec. 2008
<http://dx.doi.org/10.1016/j.compedu.2008.05.008>
- [6] EDUCAUSE. (September 2009). 7 Things you should know about...telepresence [Online]. Available: <https://net.educause.edu/ir/library/pdf/ELI7053.pdf>
- [7] UNESCO Bangkok. (December 2006). ICT in education: what is a learning management system [Online]. Available: <http://www.unescobkk.org/?id=5474>
- [8] R. K. Ellis (2009). *Field Guide to Learning Management Systems* [Online]. Alexandria, VA: ASTD Learning Circuits. Available: http://cgkit.nutn.edu.tw:8080/cgi/PaperDL/hclin_09102716309.PDF
- [9] D. G. Sampson, and P. Zervas, "Mobile Learning Management Systems in Higher Education," in *Higher Education Institutions and Learning Management Systems: Adoption and Standardization*, R. Babo, and A. Azevedo, Eds. Hershey, PA: Information Science Reference, 2012, pp. 162-177. doi:10.4018/978-1-60960-884-2.ch008
- [10] A. Sharma, and S. Vatta, "Role of learning management systems in education," *International Journal of Advanced Research in Computer Science and Software Engineering*, vol. 3(6), June 2013, pp. 997-1102
- [11] Moodle Docs. (no date). About Moodle [Online]. Available: https://docs.moodle.org/30/en/About_Moodle
- [12] Instructure. (no date). Higher education LMS features: Canvas learning management system [Online]. Available: <https://www.canvaslms.com/higher-education/features>
- [13] Blackboard. (no date). Higher education [Online]. Available: <http://anz.blackboard.com/sites/international/globalmaster/markets/higher-education.html>
- [14] iSpring. (August 2015). Moodle vs. Blackboard – that is the question [Online]. Available: <http://www.ispringsolutions.com/blog/moodle-vs-blackboard/>
- [15] D2L Corporation. (October 2015). D2L's Brightspace ranked the #1 LMS for next-gen online teaching and learning by global analyst firm Ovum [Online]. Available: <http://www.d2l.com/newsroom/releases/d2ls-brightspace-ranked-the-1-lms-for-next-gen-online-teaching-and-learning-by-global-analyst-firm-ovum/>
- [16] F. Paragina, S. Paragina, S. Jipa, A. Savu, and A. Dumitrescu. (June 2011) "The benefits of using Moodle in teacher training in Romania," *Procedia Social Behavioral Sciences* [Online], vol. 15, pp. 1135-1139. Available: <http://www.sciencedirect.com/science/article/pii/S1877042811004319>
<http://dx.doi.org/10.1016/j.sbspro.2011.03.252>
- [17] GMA News Online. (May 2015). LIST: Philippines ranks 21st of 22 Asian countries in Internet download speed [Online]. Available: <http://www.gmanetwork.com/news/story/489762/scitech/technology/list-philippines-ranks-21st-of-22-asian-countries-in-internet-download-speed#sthash.ab3lx4wp.dpuf>
- [18] D. Marcial. (2012). "Information technology resources in higher education institutions in the Philippines," *Philippine Information Technology Journal*, [Online], vol. 5 (1). Available: http://www.davemarcial.net/uploads/1/4/0/1/14014636/it_resources.pdf
- [19] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, vol. 13, pp. 319-340, Sept 1989
<http://dx.doi.org/10.2307/249008>
- [20] V. Venkatesh, and F. D. Davis, "A model of the antecedents of perceived ease of use: development and test," *Decision Sciences*, vol. 27(3), pp. 451-481, Sept 1996
<http://dx.doi.org/10.1111/j.1540-5915.1996.tb01822.x>
- [21] M. Chuttur. (Sept 2009). "Overview of the technology acceptance model: origins, developments and future directions," *All Sprouts Content* [Online]. Atlanta, GA: AIS Electronic Library. Available: http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1289&context=sprouts_all



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