Please cite as: Sabharwal, R, Chugh, R, Hossain MR & Wells, M, 2018, 'Learning Management Systems in the Workplace: A Literature Review', In *2018 IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE)*, 4-7 December, Wollongong, Australia, pp. 387-393, doi: 10.1109/TALE.2018.8615158.

Learning Management Systems in the Workplace: A Literature Review

Renu Sabharwal
School of Engineering and Technology
Central Queensland University Australia
Melbourne, Australia
renu.sabharwal@cqumail.com

Md Rahat Hossain
School of Engineering and Technology
Central Queensland University Australia
Rockhampton, Australia
m.hossain@cqu.edu.au

Ritesh Chugh
School of Engineering and Technology
Central Queensland University Australia
Melbourne, Australia
r.chugh@cqu.edu.au

Marilyn Wells
School of Engineering and Technology
Central Queensland University Australia
Rockhampton, Australia
m.wells@cqu.edu.au

***Abstract*—Learning Management Systems (LMSs) are a vital software platform to deliver education and training courses online. They enable the creation, management and delivery of educational content making it easier for businesses of all sizes and types to administer educational content. Like any system, LMS also needs to be user-friendly and easily usable. Usability is a measure of the degree to which users can use a product or system to effectively, efficiently, and satisfactorily achieve their objectives; this means that users will be trained quickly and efficiently if the degree of usability of LMS is high. This paper attempts to discover the essential usability factors, implementation and adoption issues and the barriers and enablers within the LMS domain, primarily in workplace settings. To achieve these aims, a review of the literature has been carried out by considering 23 research articles published between 2014 to 2018. The discussion highlighted current issues in the field, as well as gaps and possibilities for further research.**

Keywords—learning management system, usability, training, e-learning, organisations.

I. Introduction

According to Pankaja [1], Learning Management Systems (LMSs) began to evolve in the 1960s after the first system was developed at the University of Illinois, Urbana Champaign; new features were developed that enabled different users to interact with each other, so students could complete course materials, and assessors could mark them online. In 1983, the Massachusetts Institute of Technology (MIT) announced Project Athena, a five-year initiative to explore the innovative use of computers for teaching. In 2002 an open source Internet network called LMS Moodle was released; in 2008, Eucalyptus was released as the first open-source, AWS API-compatible platform for deploying private clouds, and in 2012, a modern LMS system was hosted in the cloud, freeing companies from the burden of installing and maintaining 'in-house systems'.

LMS has a well-defined way to plan, implement, and assess specific training packages. In recent years, online training is becoming more important, whether for education or workplace skill-based learning. This contemporary way of delivering training not only eliminates having to access learning material physically, but it also increases interaction between trainer and trainee.

LMS enables training material to be delivered via the internet and intranet, so employees can gain the knowledge and skills needed to perform their work tasks from anywhere and at any time. To enhance the usage of LMS for employee training, usability must be explored, but this aspect is generally ignored. Usability is the extent to which a system can be used by specified users to achieve specified goals effectively, efficiently, and satisfactorily in a specified context [2], and if the e-learning systems have poor usability, users can spend more time learning the system itself rather than learning the content it delivers [3].

Job satisfaction can be determined by increasing employee's level of motivation, and while there are numerous ways, efficient and effective training programs are vital because they increase skills and help them acquire new knowledge. Employee training can be carried out off site or on site, which is why LMS technologies are useful. For example, Hewlett-Packard allows regional trainers in different countries around the world to select the best delivery modes for training while emphasising its motto "one size does not fit all" [4]. Corporate sector managers visualise LMS as an essential way to deliver the training needs of their employees, which is why various organisations around the world are looking to embrace LMS to provide training.

Within the structure of online training, this paper aims at studying the usability factors of LMS, its implementation and adoption, as well as its limitations and barriers, with a specific emphasis on LMS in workplaces. Many literature reviews have described LMS, but little attention has been given to such a holistic perspective; this literature review paper aims to fill that gap. The unique contribution of this paper lies towards a theoretical analysis that provides a complete perspective of LMS in workplaces, considering a range of diverse issues that can ultimately improve LMS adoption. The analysis contributes to a better understanding of LMS, in particular to guide practitioners, managers and developers.

The next section outlines the research method and then a review of literature which covers usability and LMS. This is

followed by the implementation and adoption of LMS, and then its barriers and problems. A brief discussion and conclusion is then presented with limitations and recommendations for future research.

II. Research Method

This research paper provides a narrative literature review. Narrative studies are generally based on the availability of literature or the author's selection. Narrative reviews are used to express a focus on clearly identified issues, appraise published literature and conduct a general debate around a topic [5].

In order to also retain the nuances of a systematic method, essential keywords and phrases were used - learning management systems, organisation, usability, online training, e-learning, workplace/corporate. Truncation and wildcarding along with appropriate Boolean operators were used while searching. The databases used to search for the literature were: Science Direct Elsevier, IEEE Xplore, Springer Link, PubMed, Taylor and Francis, Emerald, Bio Med Central and EBSCOhost. Only peer-reviewed publications in English language from 2014-2018 were selected. Firstly, the titles and abstracts of articles yielded by the databases were screened, followed by an evaluation of the full text. Any article that was not relevant to the usage of LMS in workplaces was disqualified. After further screening, based on the identified inclusion and exclusion criteria, only 23 publications were found to be relevant to LMS usage in workplaces, and these have been presented in Table 1.

Table 1 illustrates those 23 articles in chronological order; 1 related article was published in 2014, 9 articles in 2015, and 8 articles in 2016, 3 articles in 2017 and 2 articles in 2018. A decline in learning management studies was evident although the whole of 2018 was not captured. It was also identified that there are a few articles that focus on usability in the traditional sense but other articles are more about acceptance rather than usability. However, implementation, adoption and challenges are closely linked to acceptance. Key features from each study are outlined in the last column of Table1.

TABLE I. Shortlisted Articles

Publication Year and Author Details	Study Title	Research Method Used	The Key Feature (s) of the Study
Shahid and Abbasi 2014	Usability testing of an E-Learning System: A comparative study of two evaluation techniques	Survey	Use of learning management systems at the user end
Boubahi and Alrazgan 2015	Investigating IT faculty resistance to learning management system adoption using latent variables in an acceptance technology model	Survey	Factors influencing faculty members' acceptance of LMS
Dodson et al. 2015	Possibilities for MOOCs in corporate training and development	Case study	Uses of MOOCs in the corporate world
Kuijk et al. 2015	Usability in product development practice; an exploratory case study comparing four markets	Interview	Attitude towards usability
Lee and Kim 2015	Users' preferential factors in Web-based e-learning systems for ease of workplace learning in Korea	Survey	Investigate users' preferential factors of ease of workplace learning in Korean WLS business organizations
Little 2015	The purchasing and practical benefits of a learning management system	Case study	LMS features and characteristics
Medina and Gamboa 2015	Usability evaluation by experts of a Learning Management System	Questionnaire	Evaluates the usability of locally built LMS
Shin and Kang 2015	The use of a mobile Learning Management System at an online university and its effect on learning satisfaction and achievement	Questionnaire	Students' acceptance of mobile learning and its influence on learning achievement using an information system
Sriprasertpapa 2015	The development of online training model for Srinakharinwirot University in Thailand	Mix-method (group discussion, questionnaire, in-depth interview)	An online training model for blended learning in the traditional classroom and on the job training for students
Stoffregen et al. 2015	A barrier framework for open E-Learning in public administrations	Systematic literature review	Identify challenges to open E-Learning in public administration
Al-Gahtani, 2016	Empirical investigation of e-learning acceptance and assimilation: A structural equation model	Survey	Acceptance of LMS
Almarashdeh 2016	Sharing instructors experience of learning management system: A technology perspective of user satisfaction in distance learning course	Questionnaire	Measures instructors' satisfaction
Alsabawy et al. 2016	Determinants of perceived usefulness of e-learning systems	Survey	Factors affecting perceived usefulness of e-learning
De Smet et al. 2016	The design and implementation of learning paths in a Learning Management System	Quasi-experimental study	Implementation of LMS

Mahoney et al. 2016	Implementing an electronic learning management system for an Ophthalmology residency program	Interview	Investigation of different E-LMS
Saidin and Iskandar 2016	Proposed model to evaluate the impact of e-training on work performance among IT employees in Malaysia	Survey	Evaluates the effect of e-training towards the performance of employees
Walker et al. 2016	Learning Management System usage: Perspectives from university instructors	Survey	Instructor's perception of LMS usage
Zhang et al. 2016	Facilitating professionals' work-based learning with context-aware mobile system	Survey	Engagement with work-based learning
Kimiloglu et al. 2017	Perceptions about and attitude toward the usage of e-learning in corporate training	Questionnaire	Examines the attitudes of corporations regarding the usage of e-learning for corporate training
Park and Jo 2017	Using log variables in a learning management system to evaluate learning activity using the lens of activity theory	Questionnaire	Evaluates the activation pattern of LMS
Ramirez et al. 2017	Moderating effect of learning styles on a learning management system's success	Survey	Students' perception of learning styles
Kumar and Mohite 2018	Usability of mobile learning applications: a systematic literature review	Systematic literature review	Usability evaluation of mobile learning applications
Nurakun et al. 2018	Learning management system implementation: a case study in the Kyrgyz Republic	Mix-method (Survey, questionnaire, interview)	Students' attitude toward online education

III. Usability and LMS

The key focus of usability is for users to be able to use a product or system with effectiveness, efficiency and satisfaction. A usable interface indicates how easily employees are able to use a system, whether for training or skill development. If users spend more time learning to use a LMS rather than the training content, it is not user-friendly and does not help in meeting objectives. According to a research on the usability of e-learning at University of Sargodha Women Campus Pakistan, a right user interface always leads to excellent user fulfilment levels [6]. Shahid and Abbasi [6] compared Nielsen's ten heuristics technique, from which it was concluded that e-learning success has three primary features: efficiency, effectiveness, and user satisfaction.

Usability is a comparative but independent approach that describes the nature of the interaction between people and systems [7]. Kuijk et al. [7] compared four multi-national markets and concluded that usability and user-centred design influence a company's product-market combination target. Moreover, usability helps to integrate various aspects of digital systems and allows the quality of a design to be characterised from the perspective of users' experience [8]. Medina-Flores and Morales-Gamboa[8] designed an instrument to evaluate usability factors and also carried out a usability test on the development of an in-house built LMS called Metacampus. In other words, usability testing is a technique used in user-centred interactive design to evaluate a product by testing it on users; this helps to identify problems before and after implementing LMS.

Businesses need a useable LMS, which is why an exploratory study examined the attitude of 106 corporations towards the usability of online training [9]. Kimiloglu et al. [9] explained that LMS adoption consists of many elements such as cost-effectiveness, functionality, customisability and maintainability. This authors found that online training is a flexible and efficient way to develop employees' skills and knowledge.

Usability is a primary factor for successfully adopting technology. Mobile learning is an extension of e-learning that allows users to accomplish learning using small and portable wireless devices [10]. The researchers used 23 publications and a systematic review to measure the research activity, attributes, research methodologies, and limitations. Mobile learning has a wide range of benefits such as flexibility, cost-effectiveness, location-based services, and it reduces the distance of learning. Mobile learning can be used as a formal or informal tool for online-training. Shin and Kang [11] determined the acceptance of mobile learning and its effect on learning satisfaction and achievement using Technology Acceptance model (TAM) and Information System Success (ISS) model. Shin and Kang [11] found from 1117 survey responses that learners began to accept mobile LMS as a new learning tool which influenced their learning acceptance.

Another study by Zhang et al. [12] examined how context-aware mobile system is used in professional work-based learning. This research presented a work-based learning activity design, system technical implementation, structure design, functionalities and evaluation of learning achievements, as well as user attitudes and acceptance towards the learning system. Zhang et al. [12] highlighted that professionals could use their mobile devices to get adaptive, personalised and just-in-time learning support.

According to Dodson et al. [13] corporate LMS is different from educational LMS; a study about MOOC (massive open online course), which is off-the-shelf LMS for online and distance education, revealed that LMS can be customised according to audience requirements. The corporate LMS's primary role is to ensure that employee has skills and knowledge to assist an organisation to develop and expand, while an education LMS's primary focus is only on knowledge transfer.

IV. Implementation and Adoption of LMS

LMS is a means to provide high-quality training for employees and also make them aware of compliance and

skill development via an online medium. To implement and adopt LMS, an organisation requires planning and preparation, as indicated by this medical college research, conducted in the United States for an Ophthalmology residency program that explored faculty members' experience towards electronic learning, by encouraging staff to implement electronic LMS (e-LMS) [14]. Mahoney et al.[14] have found it necessary to implement an e-LMS to consolidate external electronic educational resources, host internal electronic education resources, and provide a space for developing new online learning contents [14]. With help from 12 interviews to determine the features, the authors also examined 4 LMSs and found a cost-effective solution for curriculum management, which has all the functions needed to complement current teaching methods.

A research by Al-Gahtani [15] highlighted that implementation failure of e-learning systems costs millions of dollars and low adoption and acceptance could be the reasons of underutilisation. Al-Gahtani [15] primarily focused on individual behaviour towards acceptance and assimilation of e-learning in Saudi Arabia (King Khalid University) with the help of 286 participants' survey; the research based on TAM3 determined factors that influence the users' intention to use e-learning, with a key focus on managerial interventions for increased acceptance [15].

Nurakun Kyzy et al. [16] investigated the adoption factors such as users' preferences and attitude towards LMS and concluded that four factors: technical characteristics of LMS, ease of use, feedback options of LMS and advantages of use influenced the students' perception of LMS.

A study by Almarashdeh [17] examined the factors that influence instructor satisfaction and found that service quality, perceived usefulness, system quality and information quality has a significant effect on user satisfaction and also proved with 110 survey responses that perceived ease of use have no impact on instructor satisfaction. An Australian institution (University of Southern Queensland) focused on the impact of IT infrastructure services and IT quality on perceptions of the usefulness of e-learning systems and created a model with 720 students' response; which proved that IT infrastructure services substantially impacted system quality, information quality, SDQ, and perceived usefulness [18].

On a similar note, instructors (faculty members) should understand the concept of the usability of LMS. A study conducted at King Saud University investigated the personal factors influencing faculty member's acceptance of LMS [19]. Bousbahi and Alrazgan [19] found that the perception of the usefulness of LMS depended upon personal factors; motivation, load anxiety, and organisational support; and the ease of use of LMS has no impact on the usefulness of LMS. Lee and Kim [20]'s study in Korea which focused only on employer's preferences towards web-based e-learning found six preferential factors for ease of workplace learning - content selection and clarity, feedback of learning, controls process, motivational possibilities, and information sharing which can help design successful Web-based learning systems.

De Smet [21] stated that the design of learning path and group setting (collaborative versus individual) have an impact on learning outcomes; this quasi-experimental study involved 360 students and found the importance of the design of learning path and effect of an individual versus a collaborative setting. Another study by Little [22] discussed that LMS adoption could import tangible benefits such as improve efficiency and business goals for the organisation. Little [22] revealed selection factors such as the user interface, support and service, features, unique selling propositions, the speed of innovation, and adaptability and consumer feedback.

Whereas a study by Park and Jo [23] evaluated the activation levels and usage patterns of LMS using activity theory through online activity information from 7940 courses which result in different activity patterns within different courses colleges as well as the low use of virtual campus with minimal changes. Another study by Ramírez-Correa et al. [24] assessed Delone and McLean (D&M) model of Information system and effect of learning styles on the success of LMS from students' perspective with the help of 258 survey responses and justified the D&M model to explain user satisfaction, and perceived benefits of a learning management system.

The adoption of online-training within corporate organisations has a positive impact on both employees as well as organisations. The employees can access online training at any time and from anywhere because of its remote nature, which improves employees' skills and knowledge. Research of Malaysian organisations by Saidin and Iskandar [25] focused on evaluating the effectiveness of e-training towards work performance within the ICT sector. Saidin and Iskandar [25] proposed a research model to evaluate the employee's performance as well as the impact on the utilisation of e-training using task-technology and social cognitive theory.

Walker et al. [26] focused on determining LMS features to benefit online learning and teaching and secondly, focused on the impact of LMS's quality which can help to accomplish instructor's requirements. Walker et al. [26] found the positive and negative attitude towards seven features of LMS: grade book, assessment tools, course materials, communication tools, interface, administration of classes, and student engagement. Walker et al. [26] advised that positive attitude towards LMS features confirmed the LMS selection whereas negative attitude focuses on threats that ought to be addressed in the future for LMS adoption.

Additionally, Sriprasertpap [27] aimed to design and develop an online training model for blended learning in the conventional classroom and on the job training for students and teachers. Sriprasertpap [27] designed an online training model which has five elements: creativity, LMS, instruction media, interaction, and evaluation. The author outlined the interaction between the teacher and the students and advised that this is two-way communication through online learning and evaluation plays an important role in usability assessment.

V. Barriers and Problems of LMS

This research also explored the obstacles and the difficulty of using LMS which included face-to-face interaction, technical knowledge, cost, individual adoption behaviour and content of LMS. This part of the paper reveals the barriers and limitations of LMS by investigating the relevant literature.

A Saudi Arabian study found that distance learning has some limitations such as technology dependence, individual experience, motivation and time management [17] and secondly, the study was only limited to higher education's instructors.

Alsabawy et al. [18] explained the impact of IT infrastructure services but only limited to the education sector. The research did not include e-learning systems in organisations which can be a hurdle to generalising the findings of this student group to organisations adopting e-learning systems due to the differences surrounding universities and organisations and the purpose of using e-LMS.

The lack of motivation is the most significant barrier to LMS usefulness. Bousbahi and Alrazgan [19] explained the impact using TAM; the instructors are not motivated enough to engage in the new method of teaching and the study only limited to IT faculty members. The adoption of LMS can be vital for early adopters or non-adopters as explained in a Turkish organisational study [9]. Kimiloglu et al.[9] explained two types of disadvantages of e-learning; personal disadvantages which included lack of acquaintance, concentration and communication of the employees and organisational disadvantage which included necessary infrastructure, qualified team, supportive management and competent employees to benefit from e-learning. The attitude towards LMS is another factor, which varies through human interaction and experience [7].

Despite all other factors, language is another limitation; the users do not feel supportive if the training module is not in the shared language. Little [22] assessed two case studies and described that users feel comfortable if LMS content is designed in their language. Little [22] advised that due to a large number of LMS currently available in the market which makes it difficult to acquire the appropriate one for the organisation. Inactive user-interface is another barrier which stops users to access the learning material via portable devices such as mobile phones and tablets. Kumar and Mohite [10] advised in this research conducted in Fiji that mobile learning has some limitations due to mobile small screen size, limited input capability, and changing user context which make it difficult to abide to the traditional methods of usability.

Another research by Medina-Flores and Morales-Gamboa [8] identified eight attributes: searchability, communicability, reliability, configurability, design, comprehensibility, ease of use, and navigability to measure the usability of an in-house built LMS. With the help of the above mentioned eight attributes, Medina-Flores and Morales-Gamboa [8] found that in-house built LMS has usability problems: low reliability, lack of flexibility to meet the varying user demands, and missing search facilities. Research by Stoffregen et al. [28] was aimed to identify the challenges to open e-learning in public administrations and developed a contextual framework that covers more than 40 obstacles in organisational, social and technical dimensions.

VI. Discussion

From the review, it is evident that many of the shortlisted articles are geared towards academic applications of LMSs. The scope of this study though aims at figuring out usability in a workplace setting. Although the common denominator is still education and training, it is important to distinguish between the two settings – academic and workplaces. What works for one population may not necessarily work for others. The role of LMS in workplaces is to ensure staff can be trained with the relevant knowledge, skills and behaviours expected within a workplace, with an aim to efficiently enable staff to complete job-related tasks. In contrast, an academic LMS may have functionality similar to workplace LMS but the goals and user base are different. In academia, LMS primarily focusses on imparting subject knowledge, ubiquity of learning content and course administration. In both contexts, the overlap is on virtually managing learning and development to create an effective learning environment.

To develop employees' skills and knowledge, online training is a flexible and efficient way [9]. The selection of a suitable LMS within an organisation depends upon many factors: user interface, support and service, features, unique selling propositions, the speed of innovation, and adaptability and consumer feedback [22]. Implementation and adoption issues should not be an after-thought and should be considered early in the planning stages. However, before adopting any e-learning tool, it is important to ensure that the intended outcomes are clarified and aligned with learner needs [29].

Since organisations utilise a lot of resources to train their employees, having a balanced combination of usability factors in LMS helps make training easily accessible and will improve user satisfaction. This review has evaluated some usability factors of LMS and places the concept into practicality. LMS is a combination of tools that deliver online training in an efficient and timely manner. Workplace learning that occurs on a day-to-day basis at work when employees obtain skills and knowledge for the problem-solving and decision making can be delivered through LMS. LMS can help to save costs, enhance organisational performance and provide ubiquitous content. In this regard, an ideal LMS should make education and training activities streamlined, efficient and effective. From usability factors' perspective, a LMS should be intuitive, easy to learn and reduce ambiguity. In order to provide value, a LMS should enable administrators or managers to have easy access to reporting capabilities, have a low learning curve and offer functionality and features that can be used to engage learners in any educational setting.

VII. Conclusion

It appears that most LMSs are seamless for managing learning, but not for delivering learning. The navigation is often tedious, the analysis and analytics capabilities are basic and lack customisation features. It is vital that future iterations and advancements in the LMS arena prominently focus on the learners, providing them engaging learning experiences through the use of newer technologies such as artificial intelligence and virtual reality.

This research makes contributions to the literature on LMS with a focus on understanding usability, implementation and adoption issues and challenges of LMS usage. Nevertheless, this research paper may have some boundaries regardless of the truth; the study was planned with the purpose of accomplishing the maximum achievable certainty. Some relevant research may have been overlooked, and therefore might provide incomplete observation into the usability of LMS. The research has been constrained based upon the selection of literature in the usability domain of LMS and stuck to peer-reviewed journal articles and omitted reports, grey reports and web articles. The quest string can be questioned as the search has filtered using some keywords. To alleviate that risk, some database filters were applied resulting in the effective search string.

Future research can be based upon finding empirical issues towards LMS adoption and implementation to enhance the usability of LMS. This study has practical significance as it provides a better understanding of LMS, in particular to guide practitioners, managers and developers with an aim to improve LMS adoption in workplaces. Employee satisfaction with LMS usage and its role within different domains can also be investigated. More theory is required to understand the users, managers and administrative staff perception towards LMS which can help to guide the design, adoption and implementation of LMS in diverse settings.

References

[1] N. Pankaja, "A comparative study of popular online platforms for E learning solutions," Ph.D. dissertation, Educational Media Research Center, Univ. of Mysore, Mysore, 2015.

[2] J. Karat, "Evolving the scope of user-centered design," *Communications of the ACM,* vol. 40, no. 7, pp. 33–38, 1997.

[3] S. K. B. Wong, T. T. Nguyen, E. Chang, and N. Jayaratna, "Usability metrics for e-learning," in *Confederated International Conf.*, Catania, 2003, pp. 235–252.

[4] R. E. Derouin, B. A. Fritzsche, and E. Salas, "E-learning in organizations," *J. Mgmt.,* vol. 31, no. 6, pp. 920–940, 2005.

[5] R. Ferrari, "Writing narrative style literature reviews," *Medical Writing,* vol. 24, no. 4, pp. 230–235, 2015.

[6] S. Shahid and M. S. Abbasi, "Usability testing of an e-learning system: a comparative study of two evaluation techniques," *J. Comp. Eng.,* vol. 16, no. 6, pp. 39–43, 2014.

[7] J. van Kuijk, L. van Driel, and D. van Eijk, "Usability in product development practice; an exploratory case study comparing four markets," *App. Ergonomics,* vol. 47, pp. 308–323, 2015.

[8] R. Medina-Flores and R. Morales-Gamboa, "Usability evaluation by experts of a learning management system," *Tecnologias del Aprendizaje, IEEE Revista Iberoamericana de,* vol. 10, no. 4, pp. 197–203, 2015.

[9] H. Kimiloglu, M. Ozturan, and B. Kutlu, "Perceptions about and attitude toward the usage of e-learning in corporate training," *Comps. in Human Behavior,* vol. 72, pp. 339–349, 2017.

[10] B. Kumar and P. Mohite, "Usability of mobile learning applications: a systematic literature review," *J. Comps. Ed.,* vol. 5, no. 1, pp. 1–17, 2018.

[11] W. S. Shin and M. Kang, "The use of a mobile learning management system at an online university and its effect on learning satisfaction and achievement," *Int. Rev. of Research in Open and Distributed Learning,* vol. 16, no. 3, pp. 110–130, 2015.

[12] B. Zhang, C. Yin, B. David, Z. Xiong, and W. Niu, "Facilitating professional; work-based learning with context-aware mobile system," *Sc. of Comp. Prog.,* vol. 129, pp. 3–19, 2016.

[13] M. N. Dodson, K. Kitburi, and Z. L. Berge, "Possibilities for MOOCs in corporate training and development," *Performance Improvement,* vol. 54, no. 10, pp. 14–21, 2015.

[14] N. R. Mahoney, M. V. Boland, P. Y. Ramulu, and D. Srikumaran, "Implementing an electronic learning management system for an ophthalmology residency program," *BMC Med. Ed.*, vol. 16, no. 1, pp. 307, 2016.

[15] S. S. Al-Gahtani, "Empirical investigation of e-learning acceptance and assimilation: a structural equation model," *App. Computing and Informatics,* vol. 12, no. 1, pp. 27–50, 2016.

[16] Z. Nurakun Kyzy, R. Ismailova, and H. Dündar, "Learning management system implementation: a case study in the Kyrgyz Republic," *Interactive Learning Enviro.,* pp. 1–13, 2018.

[17] I. Almarashdeh, "Sharing instructors experience of learning management system: a technology perspective of user satisfaction in distance learning course," *Comps. in Human Behavior,* vol. 63, pp. 249–255, 2016.

[18] A. Y. Alsabawy, A. Cater-Steel, and J. Soar, "Determinants of perceived usefulness of e-learning systems," *Comps. in Human Behavior,* vol. 64, pp. 843–858, 2016.

[19] F. Bousbahi and M. S. Alrazgan, "Investigating IT faculty resistance to learning management system adoption using latent variables in an acceptance technology model," *Scientific World J.,* 2015.

[20] S. Lee and B. G. Kim, "Users' preferential factors in web-based e-learning systems for ease of workplace learning in Korea," *Learning and Ind. Differences,* vol. 39, pp. 96–104, 2015.

[21] C. De Smet, T. Schellens, B. De Wever, P. Brandt-Pomares, and M. Valcke, "The design and implementation of learning paths in a learning management system," *Interactive Learning Enviros.,* vol. 24, no. 6, pp. 1076–1096, 2016.

[22] B. Little, "The purchasing–and practical benefits–of a learning management system," *Industrial and Comm. Training,* vol. 47, no. 7, pp. 380–385, 2015.

[23] Y. Park and I.-H. Jo, "Using log variables in a learning management system to evaluate learning activity using the lens of activity theory," *Assessment & Evaluation in Higher Ed.,* vol. 42, no. 4, pp. 531–547, 2017.

[24] P. E. Ramírez-Correa, F. J. Rondan-Cataluña, J. Arenas-Gaitán, and J. L. Alfaro-Perez, "Moderating effect of learning styles on a learning management system's success," *Telematics and Informatics,* vol. 34, no. 1, pp. 272–286, 2017.

[25] S. S. Saidin and Y. H. P. Iskandar, "Proposed model to evaluate the impact of e-training on work performance among IT employees in Malaysia," *IEEE Conf. on e-Learning, e-Management and e-Services*, Langkawi, pp. 17–22, 2016.

[26] D. Walker, J. Lindner, T. Murphrey, and K. Dooley, "Learning management system usage: perspectives from university instructors," *Quarterly Rev. Dist. Ed.,* vol. 17, no. 2, pp. 41–50, 2016.

[27] K. Sriprasertpap, "The development of online training model for Srinakharinwirot university in Thailand," *Procedia - Social and Behavioral Sciences,* vol. 197, pp. 1913–1917, 2015.

[28] J. Stoffregen, J. M. Pawlowski, and H. Pirkkalainen, "A barrier framework for open e-learning in public administrations," *Comps. in Human Behavior,* vol. 51, pp. 674–684, 2015.

[29] R. Chugh, "E-learning tools and their impact on pedagogy," in *Emerging Paradigms in Commerce and Management Education*, D.S. Ubha & J. Kaur, Eds. Patiala: GSSDGS Khalsa College Press, 2010, pp. 58–81.