Critical success factors for Learning Management Systems in higher education: A literature review

Sofie Otto, Anna Overgaard Markman

Department of Planning, Aalborg University, sio@plan.aau.dk, annaom@plan.aau.dk

Tanja Svarre

Department of Communication and Psychology, tanjasj@ikp.aau.dk

Abstract

Learning Management Systems count as a core component in the orchestration of learning in higher education and is widely prevalent around the world. This paper identifies the factors that are critical for learning management systems to be successful for learners. A literature review including 14 research papers forms the empirical basis and DeLone & McLean's (2003) model of IS success is used to map the papers. The papers focus on student users of implemented learning management systems, mainly studied through surveys. The analysis shows that 'user satisfaction' is most generally influenced by 'information quality' and 'system quality', while 'net benefits' is mostly influenced by 'user satisfaction'. The papers have either focused less on 'service quality', 'use' and 'intention to use', or they have not been able to identify significant correlations based on these variables. The findings are related to the role of LMS as mandatory information systems and the implications for the development of LMSs is discussed along with their role in higher education from a networked learning perspective.

Keywords

Learning Management Systems, LMS, Higher Education, Critical Success Factors

Introduction

Networked Learning is a research and practice field concerned with the intertwined phenomena of human/interpersonal relationships, technology, and collaborative engagement in valued activity (Networked Learning Editorial Collective (NLEC), 2021). Researchers within this field study how learners engage in learning through connections with other learners, tutors, communities, and resources, which is enabled by information and communication technologies (ICT) (Goodyear et al., 2004; McConnell et al., 2012). Learning management systems (LMS) count as a core technology for establishing some of these connections as they enable teachers and tutors to digitally manage course content and learning objects (McGill & Klobas, 2009; Ouadoud et al., 2018). LMSs are defined as a web-based software application that support teaching and learning by organizing administrative tasks, assisting in planning of courses, and providing students with information and course content (Nasser et al., 2011; Kasim & Khalid, 2016). The first generation of LMSs was initially developed to support practices of distance learning, but was quickly also embraced as a standard for supporting practices of campus-based higher education, and has been recognized as a solid part of educational technologies (Svensson et al., 2017; Aldiab et al., 2019). Today, LMSs are commonly considered to be a mandatory technology for both faculty members and students in preparing for and following higher education lectures (Petter et al., 2008; McGill & Klobas, 2009; Aldiab et al., 2019).

Previous studies have identified how the implementation of LMSs can be associated with various challenges that may differ across user and system types (Gunesekera, 2020). Generally, it is important that both faculty and students experience the benefits of using LMSs to ensure successful implementation (Song, 2011). However, the challenges are not just an expression of the technical solution, but also pedagogical initiatives (Ouadoud et al., 2018). In an e-learning review of students, instructors, and employees, Gunesekera (2020) identified differences in correlations between different user groups, when it comes to 'user satisfaction' and 'intention to use'. Significant correlations were found for students and instructors. For all user groups usability attributes related to satisfaction had a positive impact on both 'intention to use' and 'net benefits'. On this basis, the study concludes that usability is an important focus point for developers of e-learning systems, and in particular aspects related to subjective satisfaction, learnability, and efficiency. In the current study we will take a student focus in

answering the following research question: What characterizes the critical success factors of LMSs in higher education?

Theoretical framework

LMSs can be understood as an information system (IS) because of their affordances to store and display information (Teichroew, 2003). Critical success factors (CSF) reflect elements that need to be addressed to ensure the success of an IS (Miranda et al., 2014). To examine CSFs, DeLone & McLean developed a model of IS success that maps factors in achieving success with an IS (1992). A systematic literature review by Al-Nuaimi & Al-Emran (2021) analyzing the most predominant theoretical models for LMSs concludes the DeLone & McLean information success model (ISSM) to be among the most utilized. In the first version of the model, two constructs, 'information quality' and 'system quality', were modelled to be influencing factors on the constructs 'use' and 'user satisfaction', that were forming first 'individual impact' and then 'organizational impact' (DeLone & McLean, 1992). In 2003, the model was updated. Here 'service quality' was added, and 'individual impact' and 'organizational impact' were merged into the 'net benefits' construct. Furthermore, the 'use' construct was divided into two sub constructs: 'use' and 'intention to use' (Delone & McLean, 2003). Although 'use' and 'intention to use' are connected in the ISSM, the authors distinguish between them by describing the first as an attitude variable and the latter as a behavior variable. The current paper is attributing the 2003-version of the ISSM model to address the research question.

Petter et al. (2008) discuss the role of ISs as to whether they are associated with voluntary or mandatory use. Additionally, they discuss how that characteristic affect the 'use' and 'usefulness' of an IS. When an IS is voluntary, 'use' is an acceptable measure of success. However, if the 'use' is required, success may be measured better by means of 'usefulness'. Although a certain level of 'use' must be assumed in a mandatory IS, some variance can still be expected (Delone & McLean, 2003). With this argument in mind, the aim of this paper is to identify the CSFs of LMSs that enable students to reach the benefits of this type of IS.

Method of research

A systematic literature review (Booth et al., 2016) was carried out to answer the research question of this study. The search for research papers was conducted in the scientific databases Web of Science (ISI), Scopus (Elsevier), the ACM Digital Library, Academic Search Premier (EBSCO), ERIC and ABI/INFORM Complete (ProQuest). The databases were selected either because of their broad coverage or their specific topical focus.

The search string consisted of two facets. The first facet included terms related to CSFs, and the second contained terms related to LMSs. The facet for CSFs were based on the following search terms: 'success factor', 'success factors', 'IS success', 'information system success', and 'information systems success'. The LMS facet included a combination of variations of LMS inspired by Alshammari et al. (2018) and specific system names inspired by Kasim & Khalid (2016). To enhance the focus of the search, only peer reviewed papers published between 2011 and 2020 were included.

As seen in figure 1, a total of 1.346 papers were retrieved through the selected databases, leaving 1.068 papers after removing 278 duplicates. Subsequently, titles were assessed which resulted in 841 papers being removed due to irrelevant subjects. When assessing the abstracts of the remaining 227 papers, only papers that met the following criteria were included in the review: 1) Evaluation of specific and implemented LMSs, 2) Direct focus on students through data collection, 3) The CSFs must be related to the LMS, and not for instance learning or teachers, 4) Removal of papers related to distance learning, 5) Removal of papers about systems that do not entirely classify as a LMS, and 6) Focus on higher education. The sixth criterium was important, as the pool of retrieved papers did not only include papers about higher education, but also about workplaces and primary and secondary schools. The many criteria for being included in the review was chosen, as the aim was to identify papers that very precisely addressed the research question. They also explain the significant reduction of papers from the first query to the final number of 14 papers to be included in the review.

The abstract assessment resulted in 181 papers being removed, leaving 46 papers that met the criteria. For the full text assessment, at least two authors assessed each paper according to the 6 criteria mentioned above to ensure reliability of the assessments. First, it was decided which papers should be included in the review by comparison between the authors' individual assessments. When disagreements occurred between the assessments, all three authors reassessed the paper. As a result of the full text assessment, 32 papers were removed leaving 14 papers as a part of the review.
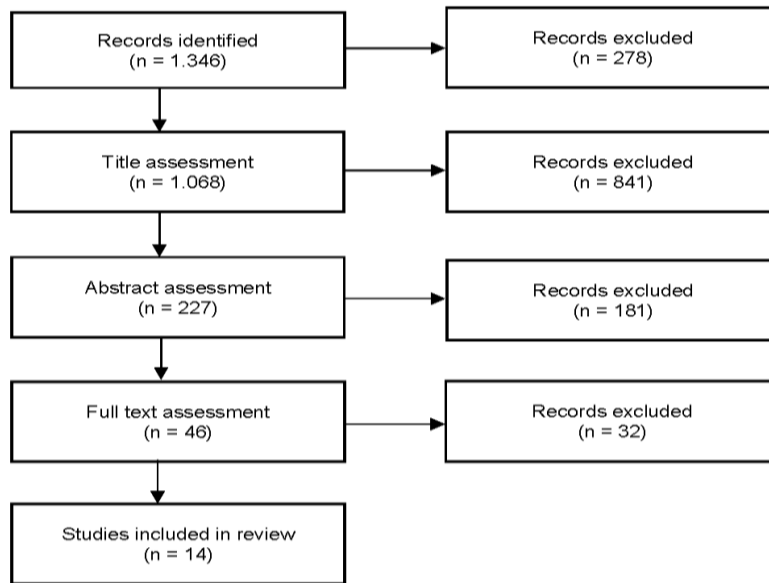
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┌─────────────────────┐          ┌─────────────────────┐
│  Records identified  │─────────▶│  Records excluded    │
│    (n = 1.346)       │          │     (n = 278)        │
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│  Title assessment    │─────────▶│  Records excluded    │
│    (n = 1.068)       │          │     (n = 841)        │
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Figure 1: Flow chart of the process of selecting papers

The classification of the remaining 14 papers was carried out in Microsoft Excel. Each paper was mapped according to publication year and channel, geographical setting, applied research methods, theoretical framework, type of respondents, education level and pivotal system of investigation. Subsequently, the CSFs identified in each paper were mapped in accordance with the components of the 2003 version of the ISSM. For the mapping we identified significant correlations between ISSM variables in the papers. The aim of the mapping was to identify minor (identified in 1-2 studies), medium (identified in 3-4 studies) and major (identified in 5 studies or more) correlations between success factors across the studies. Needless to say, qualitative studies do not fit into this kind of mapping. Instead, we have looked towards qualitative elements in the studies for explanations of the results of the mapping. Papers based on alternative theories were mapped according to the ISSM. Other papers required interpretations of the terms used in the ISSM as they were not consistent with the terms used by the ISSM. To illustrate, in Pérez-Pérez, Serrano-Bedia & García-Piqueres (2020) the term 'perceived learning outcome' were considered to correspond to 'net benefits'. Likewise, Ramírez-Correa et al. (2017) used 'perceived LMS satisfaction', which can be directly converted into 'user satisfaction'.

Results

General characteristics

Table 1 displays an overview of bibliometric and general characteristics of the 14 papers. The publication of papers was dispersed across the selected period, with four years not being represented. Most papers were published in journals (13), while only conference paper was included. All papers utilized surveys as research method, which was combined with respectively a case study and interviews in three papers. Similarly, all papers targeted students as respondents in the research, which was supplemented with instructors in one paper.

Table 1: Bibliometric and general characteristics of the 14 papers

Publication year	2012 (2), 2014 (3), 2016 (2), 2017 (1), 2018 (2), 2020 (4)
Channel	Conference paper (1), journal paper (13)
Research methods	Survey (11), combined (3)
Respondents	Students (13), students and instructors (1)
Theoretical framework	IS (2), modified IS (8), TAM (2), modified TAM (2), other (2)

Two papers applied the ISSM as their theoretical framework (Ramirez-Correa et al., 2017; Arenas-Gaitán et al., 2018), while eight utilized a modified version of the model (Kim et al., 2012; Lwoga, 2014; Mtebe & Raisamo, 2014; Ghazal et al., 2018; Abdurrahaman et al., 2020; Koh & Kan, 2020; Ngo Ngoc Minh, 2020; Pérez-Pérez et

al., 2020). Two papers (Indahyanti & Sukarjadi, 2015; Asampana et al., 2017) built on the technology acceptance model (TAM) (Venkatesh & Bala, 2008), while another two applied modified versions of the model (Ghazal et al., 2018; Pérez-Pérez et al., 2020). Out of the above-mentioned papers, two combined modified versions of the ISSM and TAM models in the research. Lastly, one paper utilized institutional theory (Naveh et al., 2012), while another developed their own model (Valsamidis et al., 2016).
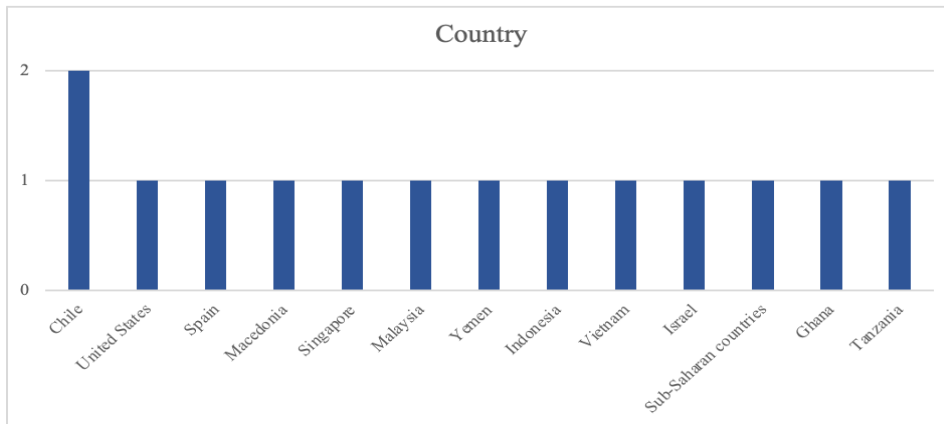

Figure 2: Geographical setting of papers

Furthermore, the papers were mapped according to the geographical setting of the conducted research. Figure 2 shows an overview of the geographical distribution of papers. In general, the papers were dispersed across five continents, with Asia and Africa having most representations in respectively six and three papers. Europe and South America were represented in two papers each, whereas North America was represented in one paper.
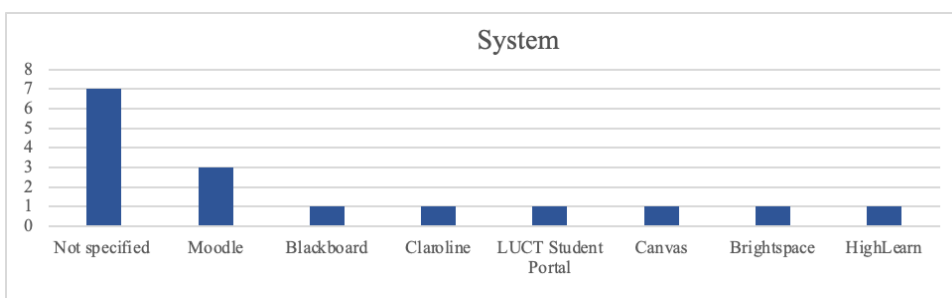

Figure 3: System specification

The pivotal system of investigation was additionally mapped according to type and system specification. Figure 3 displays an overview of the specified systems. Seven papers did not specify the exact system of investigation. Out of these, six described the system as a LMS and one as a CMS. Out of the remaining eight, Moodle was studied in three papers, while Blackboard, Claroline, Canvas, Brightspace, LUCT and HighLearn were investigated in one paper each.

Identified critical success factors

Figure 4 presents the mapping of significant correlations between ISSM constructs identified in the 14 papers. The figure illustrates how the major correlations link from 'system quality' and 'information quality' to 'user satisfaction' and from 'user satisfaction' to 'net benefits'. The following sections present the figure in detail and elaborate on the findings from the reviewed papers.

System quality has been measured as a determinant factor of 'use' (3 studies), 'intention to use' (1 study) and 'user satisfaction' (9 studies) in the retrieved papers. The results show a significant positive relationship between 'system quality' and 'use' in two out of three papers (Mtebe & Raisamo, 2014; Ramirez-Correa et al., 2017). Mtebe & Raisamo (2014) stress the implications for system developers, who should ensure a user-friendly interface as well as making sure the LMS is easy to use and easy to learn to maximize use and suit the system to the context of learners. In a third paper, the overall results did not support 'system quality' as a direct

antecedent of 'use', although the authors noted it will indirectly affect the level of 'use' if it reverts in greater 'user satisfaction' (Arenas-Gaitán et al., 2018).

Additionally, 'system quality' emerged as a significant positive determinant of 'user satisfaction' in eight out of nine papers, who measured the variable. Lwoga (2014) emphasized the importance of 'system quality' characteristics, e.g., response time, interactivity, interface and design functionalities to increase the utilization and satisfaction of the LMS. Similarly, Ghazal et al. (2018) suggests that interactivity, a user-friendly interface, and response times are important factors for user satisfaction. User friendliness was also a prominent 'system quality' related factor highlighted among reliability, data flexibility, integration and ease of use in relation to navigation and findability in another study that showed a significant positive relationship between 'system quality' and 'user satisfaction'. However, the paper showed an insignificant relationship between 'system quality' and 'intention to use' (Abdurrahaman et al., 2020). Pérez-Pérez et al. (2020) also found 'system quality' as a predictor of 'user satisfaction', stressing the importance of a reliable, quick, stable and accessible system. From qualitative interviews, Naveh et al. (2012) elaborated upon the need for efficient navigation and easy access to relevant information, stressing how students compare course websites to other information services, e.g., Google, and thus have high expectations for simple and convenient navigation.
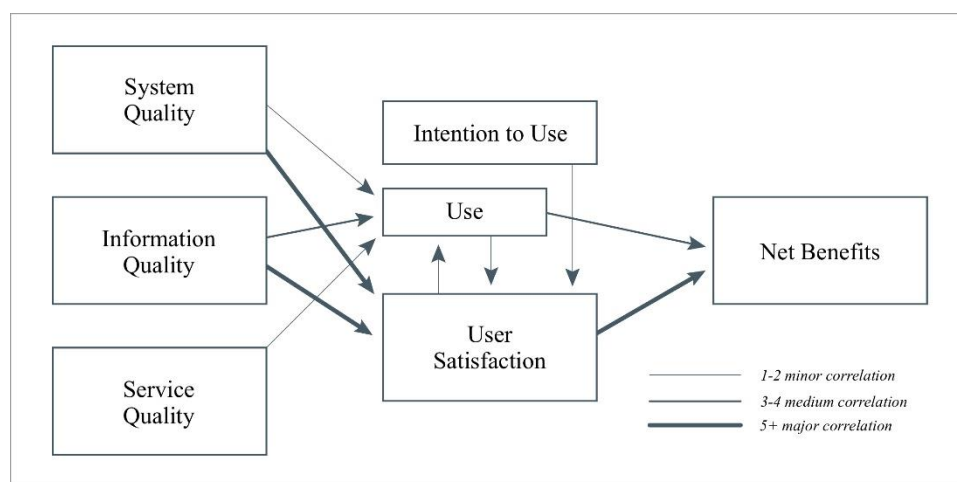

Figure 4: Mapping of identified correlations in the reviewed papers

Koh & Kan (2020) measured the perceptions of LMS quality and satisfaction in three segments of users characterized by different levels of perceived usage frequencies. They found 'system quality' to be a significant predicter of satisfaction for average frequency and frequent users. According to the authors, the findings foster theoretical implications for contextualizing the ISSM for LMS evaluation, as perceptions of quality and satisfaction may differ according to whether the user perceive themselves as frequent, average, or infrequent LMS users. Arenas-Gaitán et al. (2018) also utilized user segmentation to fit the ISSM more accurately, when analyzing the excellence of a LMS and showing the impact of new Internet tools on the students' perceptions of LMS. Latent class segmentation was applied resulting in two distinct user groups: 1) one characterized by attributing greater importance to the pivotal LMS of investigation, 2) the other characterized by a stronger prominence of Facebook. Regarding implications for LMS development, improvements should derive from 'system quality' related factors, e.g., adapting mobile systems, aligned with the preferences of the user group that values LMSs. Primary LMS improvements should on the other hand focus on factors related to 'system quality' and 'information quality', e.g., integration with commonly used tools or applications, aligned with the user group that values Facebook. Context-dependent variables related to the users were also incorporated into the ISSM by Ramírez-Correa et al. (2017), who found that learning styles had a modifying effect on the relationship between the ISSM variables. Regarding 'system quality' they found that the sensing-intuitive dimension and sequential-global dimension moderated its relationship with 'user satisfaction'.

'Information quality' has been measured as a determinant factor of 'use' (3 studies) and 'user satisfaction' (10 studies) in the retrieved papers. Here, the relation between 'information quality' and 'use' was found to be significant in three out of three papers, while information quality emerged as a determinant factor of 'user satisfaction' in eight out of 10 papers. Koh & Kan (2020) found 'information quality' as a significant predictor

of 'user satisfaction' for infrequent and average frequency users, while no significant correlation was found with frequent users. In another study, 'information quality' was found as the most relevant determinant of 'user satisfaction' to all respondents, which leads the authors to deduce that when the information provided is perceived as useful and up-to-date, the users feel more satisfied and thus interested in using the LMS (Pérez-Pérez et al., 2020). In general, timeliness and accuracy have been found as recurring implicating factors throughout the studies who found 'information quality' as a determinant of 'user satisfaction'. This aligns with the results of Mtebe & Raisamo (2014) stressing the implications for instructors, who should ensure accurate and up-to-date course content to both maximize 'use' and enhance 'user satisfaction' with the LMS. Abdurrahaman et al. (2020) also showed 'information quality', i.e., completeness, accuracy, relevance, consistency, and timeliness had a large effect on 'user satisfaction', encouraging the LMS management to ensure everyday efforts to provide quality information to the users. Similarly, Naveh et al. (2012) found a significant positive correlation between overall 'user satisfaction' and quantity of items posted on the LMS, suggesting that satisfaction increases concurrently with a more complete repository of learning materials. However, if the posted items are not current and up-to-date, satisfaction decreases. Contrary, Lwoga (2014) showed an insignificant relationship between 'information quality' and 'user satisfaction', which may be ascribed to the newly introduction of the system according to the author. Similarly, Ghazal et al. (2018) showed an insignificant influence of 'information quality' on easiness of use and satisfaction, which according to the authors can be due to a pre-existing positive perception of the online course quality

'Service quality' relates to services of the IS and has been measured as a determinant a factor of 'use' (1 study), 'intention to use' (1 study), and 'user satisfaction' (4 studies). Four out of the six papers measuring 'service quality' examined the relationship between 'service quality' and 'user satisfaction', but no significant association was observed between the two success dimensions. Mtebe & Raisamo (2014) found that 'service quality' had a positive effect on 'use', but Abdurraham et al. (2020) found no significant relation between 'service quality' and 'intention to use'. Mtebe & Raisamo (2014) argue that because of the low exposure to ICT solutions for students in developing countries, institutions need to provide support services such as training, hotline and helpdesk. This is supported by Ghazal et al. (2018) and Lwoga (2014) who argue that technical support can aid students at using the e-learning system, leading to increased 'user satisfaction'. According to Abdurraham et al. (2020), the institution needs to consider their service delivery to identify where they fall short as improving service delivery can as well make the students satisfied.

'Use' has been measured as a significant determinant factor of both 'user satisfaction' (2 studies) and 'net benefits' (3 studies). Mtebe & Raisamo (2014) argue that if students use the LMS more frequently and efficiently, they are likely to improve their learning outcome and thus 'net benefits'. Therefore, universities should find strategies to ensure a higher degree of LMS use to increase users' satisfaction with the LMS. Asampana et al. (2017) argue that the availability of infrastructure, teacher ICT proficiency, and teacher frequency on online engagement and prompt responds to technical concerns of students improve students' 'use' of a LMS. Furthermore, they found that students' intention to use a LMS depend on computer facilities. 'Intention to use' has not been measured as a determinant factor of any variables of the ISSM in the retrieved papers, while only one paper sought to measure 'system quality', 'service quality' and 'user satisfaction' as determining factors of 'intention to use'. As LMSs are often considered mandatory systems for students in higher educations, the little focus on 'intention to use' can be due to the students are obliged to access the LMS to find e.g., course materials. Therefore, the proper measure of success may often relate to attitude-oriented measures in preference to behavior-oriented measures when the system is characterized by mandatory use.

User satisfaction has been measured as a significant factor of 'intention to use' (1 study), 'use' (1 study) and 'net benefits' (5 studies). Arenas-Gaitán et al. (2018) argue that universities are responsible for their students' satisfaction in how they deliver knowledge. They must improve their e-learning environments in correspondence with the students to enhance their learning experience. This is supported by Mtebe & Raisamo (2014) who present a hypothesis that equate 'user satisfaction' with the level of LMS 'use'. If universities deliver a proper LMS that satisfy the students, the students also tend to utilize the system to a greater extent. Abdurrahaman et al. (2020) found a significant relation between 'user satisfaction' and 'intention to use' and argues that when students are satisfied with the LMS, it affects their intention to use the system. In Pérez-Pérez et al. (2020), a high correlation was found between 'user satisfaction' and 'net benefits'. They describe the net benefits as 'perceived learning outcome' and argue that better learning performance depends on students' satisfaction.

Discussion and concluding remarks

This paper reports the process and findings from a systematic literature review aiming to identify factors that are critical for LMSs to be successful in higher education. Throughout the process, it has been attempted to ensure transparency in the systematic approach. However, certain limitations should be acknowledged regarding the delimitation of the search query and inclusion criteria. The search string consisted of two facets representing CSF and LMS related terms respectively. Consequently, the papers included in the review were mainly attributing either ISSM, TAM, or a modified version of both. It can be discussed whether papers were excluded unintentionally. Studies with a focus on user satisfaction, but with no mention of IS success could have elaborated our understanding of CSF but have not been included due to the nature of the search query. As one of the inclusion criteria focused on students, studies that merely focused on instructors or other stakeholders were removed. However, Cigdem & Topcu (2015) argue that it is important to include instructors when examining LMSs as their 'intention to use' the LMS is essential to a successful implementation. This is acknowledged as a limitation in the current study, but at the same time it was an active delimitation of the scope. When assessing the papers, it also became clear that they all utilized quantitative surveys as their primary method for data collection. Future studies should include qualitative methods for a more nuanced view of CSFs in LMSs.

The analysis reveals a substantial focus on 'user satisfaction' as a success dimension with major correlations to both 'system quality' and 'information quality' as determinant variables in the 14 papers. This implies that the satisfaction of learners is highly explained by the quality of the system and the information provided within the system. Furthermore, the findings showed minor or medium correlations between all quality related measures and the two use-based success dimensions. This pattern implies a greater emphasis on satisfaction compared to usage in LMS research, which may be alluded to the mandatory characteristic of the technology (McGill & Klobas, 2009). Further, quality factors related to the system may not affect the use, as users are already obliged to a certain degree of interaction with the system. Nevertheless, 'use' and 'intention to use' can yield 'net benefits' on various levels, which in turn can impact the level of 'user satisfaction' and the further 'use' of the system. The findings showed a medium correlation between 'use' and 'net benefits', while none of the retrieved papers measured 'intention to use' as a determinant factor of 'net benefits'. A major correlation has been identified between 'user satisfaction' and 'net benefits', which again highlights the general preference of assessing satisfaction as a measure of success compared to use. Hence, the findings support the importance of assessing the system according to its status as either voluntary or mandatory, and correspondingly whether acceptable measures of success are behaviour or attitude oriented. Moreover, to ensure the prerequisites of users reaching the preferred 'net benefits', the findings emphasize the importance of securing quality factors related to the system and the provided information.

The above expresses general commonalities across the 14 research papers investigating implemented LMSs, however, the individual findings should necessarily be viewed in light of its specific context. As expressed by Koh & Kan (2020), the learners' perceptions of the quality related factors of the ISSM may vary according to discipline and context, which points to a need for contextualization efforts in LMS evaluation. Other factors related to the user characteristics were similarly identified in the current review, such as learning styles, which Ramírez-Correa et al. (2017) found to have a modifying effect on the relationships between the variables of the ISSM. Additionally, some studies included measures that exceeds the ISSM to improve the contextualization of the model. Since the model does not cater to user interaction, Koh & Kan (2020) included the measure 'interaction quality', which considers both peer and instructor interaction to articulate the pedagogical dimension of LMS evaluation with respect to students of the arts. Similarly, Pérez-Pérez et al. (2020) adapted 'communicativeness' as a variable referring to the facilitation of both teacher-student and student-student interactions as predictor of perceived learning outcome. The inclusion of such measures for evaluation can add to the value of the model in a networked learning context.

Furthermore, some papers touched upon the need to consider different strategies to enhance the value of LMS from information sharing and one-way communication to foster more collaborative instructional dimensions (Koh & Kan, 2020), student cooperation (Arenas-Gaitan et al., 2018) as well as peer and teacher interactions (Pérez-Pérez et al, 2020). These identified potentials have previously been a point of criticism regarding the role of LMSs in higher education. Despite the extensive prevalence of the technology, it has been depreciated for emphasising an instructor-centric assumption, thus enabling the administration of learning rather than enabling learning itself (Brown et al., 2015). Previous research shows how LMSs are primarily used to support communication with instructors and accessing learning materials, while student collaboration and dialogue is unfolding in parallel practices outside the LMS (Caviglia et al., 2018), thus constituting alternative technological infrastructures to the ones offered by the institution (Thomsen et al., 2016). This is also manifested within

networked learning, as the focus seems to have shifted from LMSs and VLEs towards social media and services residing outside the institution's technological infrastructures (de Laat & Ryberg, 2018). However, if students and instructors does not inhabit the same socio-technical environments, it can be difficult to organize shared places in which they challenge each other and co-develop new practices with networked technologies. This underlines the importance for institutions to adopt a broader view of digital learning environments beyond the LMS (Thomsen et al., 2016; Caviglia et al., 2018). According to Brown et al. (2015), the next generation of digital learning environments do not only encompass a single application, but rather an ecosystem of applications, content and platforms that can be assembled in customized ways. Such ecosystems can provide learners with multiple entry points to networked learning, in which LMSs can be retained as a core component for the administration of learning, while being further advanced to promote dialogues with both online resources as well as with others, which can impact the students' perceived learning outcomes more than just having access to information (Pérez-Pérez et al., 2020).

References

Abdurrahaman, D. T., Owusu, A., & Bakare, A. S. (2020). Evaluating Factors Affecting User Satisfaction in University Enterprise Content Management (ECM) Systems. Electronic Journal of Information Systems Evaluation, 23(1), 1–16.

Aldiab, A., Chowdhury, H., Kootsookos, A., Alam, F., & Allhibi, H. (2019). Utilization of Learning Management Systems (LMSs) in higher education system: A case review for Saudi Arabia. Energy Procedia, 160, 731–737.

Al-Nuaimi, M. N., & Al-Emran, M. (2021). Learning management systems and technology acceptance models: A systematic review. Education and Information Technologies, 26(5), 5499–5533.

Alshammari, S. H., Bilal Ali, M., & Rosli, M. S. (2018). LMS, CMS and LCMS: The confusion among them. Science International, 30(3), 455–459.Arenas-Gaitán, J., Rondán-Cataluña, F. J., & Ramírez-Correa, P. E. (2018). Modelling the success of learning management systems: Application of latent class segmentation using FIMIX-PLS. Interactive Learning Environments, 26(1), 135–147.

Asampana, I., Akanferi, A. A., & Ami-Narh, J. (2017). Reasons for poor acceptanceof web-based learning uning an LMS and VLE in Ghana. Interdisciplinary Journal of Information, Knowledge & Management, 12, 189–208. aph.

Booth, A., Sutton, A., & Papaioannou, D. (2016). Systematic Approaches to a Successful Literature Review. SAGE.

Brown, M., Dehoney, J., & Millichap, N. (2015). The Next Generation Digital Learning Environment: A Report on Research (s. 11). Educause.

Caviglia, F., Dalsgaard, C., Davidsen, J., & Ryberg, T. (2018). Students' digital learning environments. Proceedings of the 11th International Conference on Networked Learning 2018, 165–172.

Cigdem, H., & Topcu, A. (2015). Predictors of instructors' behavioral intention to use learning management system: A Turkish vocational college example. Computers in Human Behavior, 52, 22–28. aph.

de Laat, M., & Ryberg, T. (2018). Celebrating the Tenth Networked Learning Conference: Looking Back and Moving Forward. I N. Bonderup Dohn, S. Cranmer, J.-A. Sime, M. de Laat, & T. Ryberg (Red.), Networked Learning: Reflections and Challenges (s. 1–20). Springer International Publishing.

DeLone, W. H., & McLean, E. R. (1992). Information Systems Success: The Quest for the Dependent Variable. Information Systems Research, 3(1), 60–95.

Delone, W. H., & McLean, E. R. (2003). The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. Journal of Management Information Systems, 19(4), 9–30.

Ghazal, S., Aldowah, H., Umar, I., & Bervell, B. (2018). Acceptance and satisfaction of learning management system enabled blended learning based on a modified DeLone-McLean information system success model. International Journal of Information Technology Project Management, 9(3), 52–71. Scopus.

Goodyear, P., Banks, S., Hodgson, V., & McConnell, D. (2004). Research on Networked Learning: An overview. I P. Goodyear, S. Banks, V. Hodgson, & D. McConnell (Red.), Advances in Research on Networked Learning. Kluwer.

Gunesekera, A. (2020). Moderating role of user types and system usabilityon IS success model: A meta-analysis of e-learning user satisfaction. International Journal of Information, Business and Management, 12(4), 39–61.

Indahyanti, U. & Sukarjadi. (2015). Applying the Technology Acceptance Model to Measure the Learning Management System Acceptance by Students of Politeknik Sakti Surabaya. JURNAL TEKNOLOGI, 72(4, SI).

Kasim, N. N. M., & Khalid, F. (2016). Choosing the Right Learning Management System (LMS) for the Higher Education Institution Context: A Systematic Review. International Journal of Emerging Technologies in Learning (IJET), 11(06), 55–61.

Kim, K., Trimi, S., Park, H., & Rhee, S. (2012). The Impact of CMS Quality on the Outcomes of E-Learning Systems in Higher Education: An Empirical Study. Decision Sciences Journal of Innovative Education, 10(4), 575–587.

Koh, J. H. L., & Kan, R. Y. P. (2020). Perceptions of learning management system quality, satisfaction, and usage: Differences among students of the arts. Australasian Journal of Educational Technology, 36(3), 26–40.

Lwoga, E. T. (2014). Critical Success Factors for Adoption of Web-Based Learning Management Systems in Tanzania. International Journal of Education and Development Using Information and Communication Technology, 10(1), 4–21.

McConnell, D., Hodgson, V., & Dirckinck-Holmfeld, L. (2012). Networked Learning: A Brief History and New Trends. I L. Dirckinck-Holmfeld, V. Hodgson, & D. McConnell (Red.), Exploring the Theory, Pedagogy and Practice of Networked Learning (s. 3–24). Springer Science+Business Media.

McGill, T. J., & Klobas, J. E. (2009). A task–technology fit view of learning management system impact. Computers & Education, 52(2), 496–508.

Miranda, P., Isaías, P., & Costa, C. (2014). From Information Systems to e-Learning 3.0 Systems's Critical Success Factors: A Framework Proposal. HCI.

Mtebe, J. S., & Raisamo, R. (2014). A model for assessing learning management system success in higher education in sub-saharan Countries. Electronic Journal of Information Systems in Developing Countries, 61(1).

Nasser, R., Cherif, M., & Romanowski, M. (2011). Factors that impact student usage of the learning management system in Qatari schools. International Review of Research in Open and Distance Learning, 12(6).

Naveh, G., Tubin, D., & Pliskin, N. (2012). Student Satisfaction with Learning Management Systems: A Lens of Critical Success Factors. Technology, Pedagogy and Education, 21(3), 337–350.

Networked Learning Editorial Collective (NLEC). (2021). Networked Learning: Inviting Redefinition. Postdigital Science and Education, 3(2), 312–325.

Ngo Ngoc Minh. (2020). The role of learning management system on university branding: Evidence from Vietnam. PalArch's Journal of Archaeology of Egypt/Egyptology, 17(4), 931–947.

Ouadoud, M., Nejjari, A., Chkouri, M. Y., & El-Kadiri, K. E. (2018). Learning Management System and the Underlying Learning Theories. I M. Ben Ahmed & A. A. Boudhir (Red.), Innovations in Smart Cities and Applications (s. 732–744). Springer International Publishing.

Pérez-Pérez, M., Serrano-Bedia, A. M., & García-Piqueres, G. (2020). An analysis of factors affecting students´ perceptions of learning outcomes with Moodle. Journal of Further and Higher Education, 44(8), 1114–1129.

Petter, S., DeLone, W., & McLean, E. (2008). Measuring information systems success: Models, dimensions, measures, and interrelationships. European Journal of Information Systems, 17(3), 236–263.

Ramirez-Correa, P. E., Javier Rondan-Cataluna, F., Arenas-Gaitan, J., & Alfaro-Perez, J. L. (2017). Moderating effect of learning styles on a learning management system's success. Telematics and Informatics, 34(1), 272–286.

Song, X. (2011). Teaching and learning experince with Learning Management Systems: An adapted IS success model in LMS context. ITME 2011 - Proceedings: 2011 IEEE International Symposium on IT in Medicine and Education, 2, 148–152.

Svensson, L., Utrianien, C., & Winman, T. (2017). E-quality in infrastructures for learning in higher education. ICERI2017 Proceedings, 408–413.

Teichroew, D. (2003). Information systems. I Encyclopedia of Computer Science (s. 865–868). John Wiley and Sons Ltd.

Thomsen, D. L., Sørensen, M. T., & Ryberg, T. (2016). Where have all the students gone? They are all on Facebook Now: Networked Learning Conference 2016. Proceedings of the 10th International Conference on Networked Learning 2016, 94–102.Valsamidis, S., Kazanidis, I., Aggelidis, V., Kontogiannis, S., & Karakos, A. (2016). Critical success factors for the of acceptance and use of an LMS: The case of e-CLASS. CSEDU 2016 - Proceedings of the 8th International Conference on Computer Supported Education, 2, 331–338.

Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions. Decision Sciences, 39(2), 273–315.