Technology Acceptance Model and Learning Management Systems: Systematic Literature Review

https://doi.org/10.3991/ijim.v16i23.36223

Nadire Cavus[1,2](✉), Babatomiwa Omonayajo[1,2], Melissa Rutendo Mutizwa[1]
[1] Department of Computer Information Systems, Near East University, Nicosia, Cyprus
[2] Computer Information Systems Research and Technology Centre, Near East University, Nicosia, Cyprus
nadire.cavus@neu.edu.tr

Abstract—As the Internet has evolved rapidly, Learning Management Systems in recent years, particularly during the pandemic era, have become increasingly popular and can effectively override time and gives people new insights into the education field. A substantial amount of research was performed on a Technology Acceptance Model (TAM) framework and popularity in Learning Management Systems, in general, was indicated. However, there are gaps in established awareness of representative academic literature that form the basis of research in LMS and TAM. The summary of the current research effort on TAM implementation in the area of LMS is the main objective of this systematic literature review. This systematic literature review found 21 related studies between 2010 and 2020 based on the aim of this research through the systematic search of the most popular scientific databases. We hope that the findings of the review will inspire institutional administrators and users to recognize the factors that influence the quality and effectiveness of the use of LMS by TAM.

Keywords—Technology Acceptance Model, adoption, learning management systems, higher education, users

1 Introduction

The Learning Management Systems (LMS) is a common information system that many institutions around the world are equipping to improve the quality of education [1]. Unlike traditional learning environments, modern LMS provides a gamified environment to learners, making it more engaging and interactive, enabling learners to complete courses, while having a fun learning experience [2]. The Learning Management Systems assists students in the management, communication, and review of the class schedule, work submissions, assessments, and interactions with schoolmates [3]. The instructor can distribute quizzes, materials, and messages to students through a Learning Management system and save time [4]. Therefore, they have ample time to inspire students for better understanding and thoughts [5], especially during this COVID-19 pandemic for instance [6]. Today, most of LMSs have a mobile version that can be used

on mobile devices more easily, So, it can be said that LMS is the most important platform for mobile learning (m-learning), which is cost-effective, more engaging, and more accessible than traditional learning methods. Moreover, mobile learning applications/platforms such as LMS provide valuable support for lifelong learning. Today, all individuals must adopt lifelong learning [7] so that they can survive in the competitive world.

Traditionally, the Learning Management Systems have been studied using the Technology Acceptance Model (TAM), which is a theoretical information system that maps how the users embrace and use technology, the true implementation of the system at the end-point of technology use, and the behavioral intention that leads people to the use technology [8]. The TAM has been one of the most prominent models in technological acceptance with two primary elements affecting the user's decision to use a learning development system or, more broadly, any new technology: perceived ease of use and perceived usefulness. The perceived ease-of-use (PEOU), according to [9] is the extent to which a user feels that the use of a specific system is easy to operate while perceived usefulness is the user's perspective that using a certain system improves their performance, in context of students' academic performance, motivation, and engagement. Similar to [10], an individual feels that improving a certain device improves the efficiency of their usage [11]. These two variables are the main determinants of the adoption and application of information technology by individuals [12]. Also, these two variables form the basis of the system attitude such that the actual behavior is generated [13]. In this study, the literature is reviewed systematically, to offer a critical description of ongoing research activities and empirical data on the predictive validity available so far on Technology Acceptance Model and Learning Management Systems, and to define future research perspectives.

1.1 The aim of the study

This study aims to identify, review and analyze representative academic literature on Technology Acceptance Model and Learning Management Systems with the following research questions:

- RQ1: How is the distribution of the related studies on publication year and LMS's user?
- RQ2: How has the Technology Acceptance Model influenced students and instructors using learning management systems?
- RQ3: What are the future suggestions proposed to TAM and LMS?

2 Methodology

2.1 Research setting

A search of peer-reviewed papers underlying studies on the Technology Acceptance Model and Learning Management Systems was observed using the systematic literature

review method. This methodology adopted a PRISMA research technique for meta-analyses and systematic reviews. As a checklist, PRISMA is not just an instrument for quality assessment of systematic reviews; in all parts of articles such as title, summary, introduction, process, results, and discussion, it can be very useful for critical evaluation goals [14]. Related scientific studies have been chosen using a three-phase approach covering data collection, data analysis, and reporting the review.

2.2 Research strategy

For this study, Scopus, Web of Science, Science Direct, EBSCO, and IEEE Xplore are specifically selected for their key presentations of articles and journals on their platforms. Full-text journals were examined to select papers to be included in the study and the papers which did not meet the included criteria were excluded. The key strings used in the research are ("TAM" OR "Technology Acceptance Model" OR "Adoption") AND ("Learning Management System" OR "LMS") AND ("Higher Education" OR "University"). Ten years from 2010 to 2020 were used as the search filters for the period of the study.

2.3 Selection criteria

A few criteria were considered before selecting papers to achieve the primary goal of obtaining papers that are appropriate for the study. The criteria for the selection were based on language, which was limited to English, and on published papers that only focused on TAM and LMS under computer science topics from 2010 to 2020. These parameters provided a straightforward roadmap for determining which papers are appropriate for our study.

Table 1. Data collection and description

Data collection	Description
Database	Papers downloaded from Scopus, Web of Science, Science Direct, Springer Link, and IEEE Xplore.
Search keywords	("TAM" OR "Technology Acceptance Model" OR "Adoption") AND ("Learning Management System" OR "LMS") AND ("Higher Education" OR "University").
Date of publications	Studies published between 2010 and 2020.
Language of publications	The studies will be restricted to those published in English.
Included criteria	• Studies that focus on Technology Acceptance Model or/and learning management systems. • Studies carried out under computer science topic. • Studies published from 2010 to 2020. • Studies published only in peer-reviewed journals/Articles.
Excluded criteria	• Studies using models other than Technology Acceptance Model in learning management systems. • Studies that are open access or not full texts will be excluded

2.4 Selection criteria

The data analysis identified several terms as guidelines to capture and report the literature findings. The search results were obtained from the five scientific databases that are most popular all over the world. The detailed selection process of the studies can be seen in Figure 1.

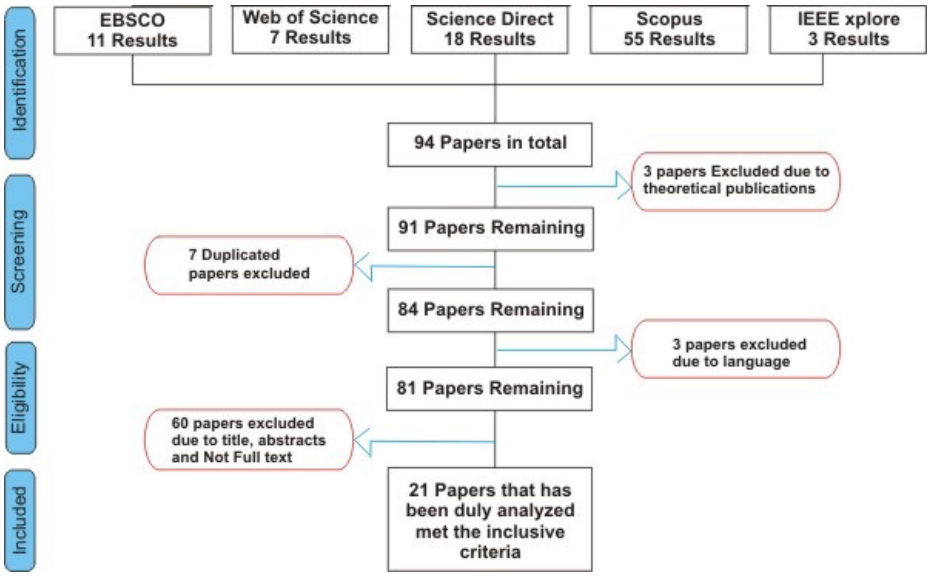

Fig. 1. Flow diagram of the publication selection process

At the beginning of the search in the chosen scientific databases which is the PRISMA research technique's identification stage, 94 articles were acquired that included "TAM" or "Technology Acceptance Model" alongside the keyword "Learning Management System" or "LMS" and "Higher Education" or "University" as described in the title of the publication. Since these were the findings of the search in all five databases, the screening and eligibility stages were observed to find papers that are truly relevant to our study. In that process, 3 papers were omitted due to theoretical writing, and 7 replications were removed as well, resulting in 84 academic publications with distinct titles. To guarantee the relevance of content concerning requirements of inclusion criteria, the title, abstract, and text were examined (full-text publications and languages). During this procedure, 60 publications were removed due to the title, abstracts, and not full-text: three (3) due to the language issues (not English), resulting in 21 papers that have been duly analyzed and aligned with the inclusive criteria in the included stage of the PRISMA research technique.

2.5 Data extraction

The following information was extracted from the study in the data extraction stage:

- Author(s)
- The aim
- Research type
- Participants
- Most important findings

2.6 Data extraction quality assessment

The assessment of the quality of any research project is critical. This paper assessed the quality of the final 21 papers whose aim is to improve the selected articles by determining the objectives of each article, their most important results, the research types, and participants. Participants of the selected articles are categorized into instructors and students, and related studies' research methods are identified as survey, interview, or systematic analysis. The details of the related studies' assessments can be seen in Table 2 below.

Table 2. Analyzed information from the related studies

Reference	Aim of Study	Research Type	Participants	Most Important Findings
[15]	Evaluating models defining the preference for performing tasks using either LMS or alternate means and illustrating the importance of effective usage and ease of use.	Survey Method	Instructors	A two-step process, inspired by its usefulness and ease of use, is one of the above models, which offers the clearest persuasive representation of the decision process.
[16]	Explaining the various tools inside LMS from a technology acceptance perspective should be identified.	Survey Method	Instructors	TAM refers to the level of the combination of methods and tasks. This particular LMS tool was inspired by the utility of software and simple use.
[17]	To research the impact of LMS on student experience and e-learning satisfaction.	Survey Method	Students	The findings showed an ease of use and usefulness between computer anxiety and students. The characteristics of the students are important to promote the acceptability and satisfaction of the positive use of LMS.
[18]	Explaining the factors that impact user expectations and collaborative technology adoption.	Survey Method	Students	For project-based learning, the TAM can be extended to group developments by extending the TAM by combining additional factors directly relevant to research innovation.
[1]	Results of e-learning system use for hybrid courses were examined.	Survey Method	Students	Students put little emphasis on their perceived ease of use, as their prediction of perceived learning assistance is poor and their perceived usefulness is placed more on their analysis when assessing the impact of e-learning systems.

[19]	Explanation of individual decision-making in academic environments to consider and assimilate e-learning.	Survey Method	Students	Direct ties among the core aspects of the original TAM indicate strong beneficial effects. The perceived ease of use affects behavioral intention quite positively.
[20]	Reviewed the application of university e-learning programs and recognize factors promoting the use of LMS by students.	Survey Method	Students	Perceived usefulness and perceived ease of use affect each other positively.
[21]	To identify and evaluate the most commonly identified external variables by reviewing TAM study studies.	Survey Method	Students	The external variables most commonly used are the method, material and information quality, device automaticity, subjective standards, enjoyment, and accessibility. The consistency of the systems and knowledge has positive effects on the usefulness of e-learning for students.
[22]	To investigate studies also interprets the difference in the generation to be useful in technology for students and teachers.	Survey Method	Students	Students are more experts in using technology since there is a slight gap between generations in the perceived usefulness and significance of digital technology.
[23]	Proposing a TAM model that would explain how young school students continue to use LMS. This model was verified.	Survey Method	Students	These results supported findings from past literature that perceived ease of use can influence the perceived influence and thus influence satisfaction positively and strongly.
[24]	To study what motivates students to replace LMS for information sharing and collaboration using cloud-based file hosting services.	Survey Method	Students	In cloud file hosting, it is very easy to use and more user-friendly than LMS which students use because they are not user-friendly and are obligatory.
[25]	Exploring the compatibility between the use of the e-learning framework and its performance.	Survey Method	Students	The results suggested that the relationship between e-learning and academic success can be moderated if compatibility is perceived.
[26]	Factors to explore influence customer acceptance of e-book use by implementing a model which integrates the acceptance of the technology model.	Survey Method	Students	The study found significant support for the hypothesized model, and optimistic and significant correlations between the updated TAM and the intention of users to continue the use of e-books.
[27]	The main factors influencing flow experiences and their role in using them were studied in this document (LMS).	Survey Method	Students	The study shows that perceived knowledge has a favorable association with flow experience, which means that students' capacity to strengthen institutions should be strengthened and returned to effective performance.

[28]	Using Moodle to assess the perceived utility and usability of students.	Survey Method	Students	The study showed that students perceive Moodle utility and perceive difficulties in integrating Moodle, which greatly leads to how students rate Moodle students.
[29]	To test if U-learning is capable of transforming conventional classroom education.	Systematic Review	Students	Traditional schooling can be modified by the use of learning. This is primarily because students observe real and faithful environments at various school levels.
[30]	Developing countries like Pakistan recognize the effect of essential problems that generate obstacles for e-learning flows.	Interviews	Others (e-learning experts)	At least 16 existing critical issues were established which serve as obstacles in Pakistan's e-learning institutions.
[31]	This paper presented emerging developments of methods such as virtual education in the standardization of computer-based education.	Survey Method	Others (the components of the e-learning standardization process)	Official standardized, many of which are under the basis of current decisions and proposals, are highly dynamic standards of delivery.
[32]	Understanding contact recognition and communication skills.	Survey Method	Students	Increasing students' communicative willingness, which is a precondition for improving successful communication, were effective learning techniques implemented to minimize their communications anxiety.
[33]	The instructors' understanding is focused on a common LMS blackboard method.	Survey Method	Instructors	Educators were able to see meaning and success shaped the priorities of the board. Training influenced perceived utility but did not influence satisfaction. PC self-sufficiency doesn't have any effect on obvious usefulness.
[34]	This research explored the effect of human factors on LMS efficacy in a mixed learning setting at high schools in Kuwait.	Survey Method	Students	Help, gain, knowledge, and trust are the factors that have the greatest impact on user satisfaction and have a positive effect on a good LMS and speed.

3 Results

3.1 The publication year and LMS's users of the related studies

The graphs below summarize the year the related studies are published and the participants of the related studies.

This research selected 21 final papers after the collected papers were analyzed and the papers were published between the years 2010 and 2020 as illustrated in the graph Figure 2 and Table 2 respectively. As seen in Figure 2, there is a noticeable change before and after the year 2016. The increase in 2014 and 2018 could be a result of LMS being more popular and how papers were now not only focused on the technical usage

of LMS but also the factors that influence students or instructors' usage of LMS [34], [17].

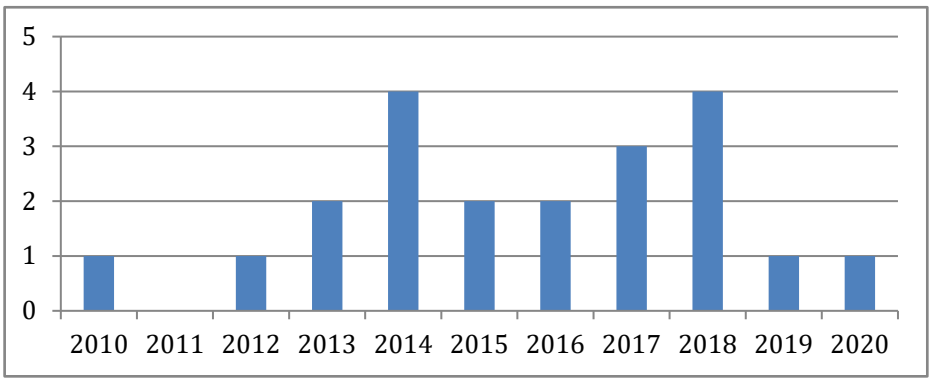

Fig. 2. Papers published yearly

It can be seen in Figure 3 and Table 2 that the related studies focus on both students and instructors, the majority focus on the students because this sector of the participant is the main reason the TAM and LMS came into existence. The systematic review found that sixteen papers focus on the adaptation [22], [24], [25], [29], [32], satisfaction [1], [17], [18], [20], [21], [23], [27], [28], [34], and intention [19], [26] of the students. On the other hand, only three papers [15], [16], [33] concentrated on instructors based on perceived usefulness, ensuring that LMS delivers its function accordingly. As a result, it has been observed that most research in the past has focused more on the students than instructors (shown in Figure 3 and Table 2) in the learning environment as they are both users of the learning management systems.

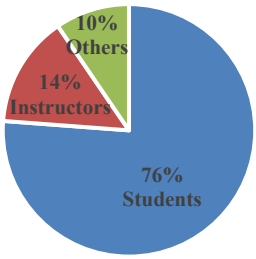

Fig. 3. Distribution of LMS users in the literature

3.2 How Technology Acceptance Model influence students and instructors using learning management system

TAM influencing LMS's users (students and instructors) is based on perceived usefulness and perceived ease of use aimed at their purpose to use the systems and understanding that real use influences user satisfaction and user satisfaction influences future intention to use the system. [23] and [20] indicated that while perceived ease of use does not contribute significantly to the intention of using LMS in the early stages, its relationship to the use of LMS and the contentment of LMS in the latter stage becomes greater. Also, they stressed that perceived usefulness has a stronger relationship with the purpose and satisfaction of students and instructors than perceived ease of use, but perceived ease of use also has a substantial positive effect on perceived usefulness. It can be said that students using e-learning technologies learn with ease in mandatory contexts and have a positive experience of continuous use of LMS.

[22] and [15] underlined that students are better suited to LMS with a little variation in the purpose and usage of LMS for learning and teaching. Task importance influences users in making choices to either perform a specific task or not and choices between performing the task using the LMS or not. While on the other hand as stated by Schoonenboom [16], the low LMS purpose can be explained by low task or performance and usefulness or ease of use of systems. [18] and [33] highlighted that the ability to share information, training, user-interface design, and technical support is aimed and conducted towards the learning platforms in the collaborative learning environment. Perceived usefulness (PU) affects the assurance of LMS, and then both perceived usefulness and satisfaction are influenced by the user's continuous intentions to use the learning management systems. [17] and [21] also found that certain factors like quality of systems, systems performance, information quality, and perceived enjoyment affects satisfaction on students' perceived ease of use and usefulness of LMS and consequently their satisfaction. On the other hand, [28] underlined the fact that users' perceived usefulness and challenges of LMS combined, contribute significantly to users' rate of LMS usage.

3.3 Future suggestions proposed to TAM and LMS

Every technology has its great advantages and limitations, past research has shown many limitations and proposed insight into future improvements. [1] and [25] suggesting future studies should concentrate on how students' perceived assistance will be enhanced through the incorporation of important design-related features such as significance, clarification, institution, communication, etc., in developing great e-learning systems. Also, more research has been made into how a cooperative e-learning environment can be developed to affect the students' academic performance positively [17], [20-23], and the impact on the outcomes of the e-learning systems, use of other significant aspects which have been established in previous studies [27]. The ideas of further development have been proposed to explore how the behavior of users can influence e-learning outcomes, to create other advantages that LMS can assist to improve the effects of e-learning and analyze how this behavior can affect students' group support.

On the other hand, [24] suggested that future designs should involve other variables such as computer anxiety, subjective norm or perceived behavioral control and role of personality traits, users' continual LMS-intentions, such as the design of a sampling system that links individuals with less computer expertise to improve causal-causality skills. [23] and [18] suggested that future research can provide more objective details on the framework usage of students and concentrate on finding additional decomposed concepts that can further clarify students' motivational perception in LMS. Also, [32] and [34] suggested that future studies should be pursued to better assess communication skills using the treatment and tracking community trials to explore the causal linkages between active learning policies and other communication levels so that problems overcome can be better understood and future solutions for these challenges can be studied. More research is needed to fill the gaps in the attention provided to instructors, as instructors are also essential to the effectiveness of LMS.

4 Discussion

We are living in an age of advanced technology, which affects our lives in numerous ways and which has changed the political, social, economic, and cultural spheres. In modern society, educational environments have been recognized as a strong channel for knowledge innovation. Also, a wide range of educational technology is involved which supports the translation and acquisition process of information. As a result, research on technology acceptability has become increasingly common in the field of Learning Management Systems [35], [36] and the Technology Acceptance Model is generally accepted as a good framework for planning and carrying out observational studies in educational affairs [8]. The most highlighted result in this study was that perceived usefulness and perceived ease of use were the main factors influencing intention and continuous usage of LMS. This result was supported by Sensuse and Napitupalu [20], Cheng and Yeung [23], and [1] in their studies that for maximum results, perceived ease of use and perceived usefulness complement each other and positively affect each other. Even when it comes to selecting an LMS tool to use as stated by Essel and Wilson [28] students perceive usage and difficulties will influence how they will rate the tool. The presented study analyzes the academic literature in Learning Management Systems concerning the Technology Acceptance Model. The research analysis provides a broad variety of tested learning technologies with various research methods based on technology acceptance shedding light on the topic. New extensions and modifications of the model are proposed to encompass various factors affecting the decision to adopt and accept, instead of rejecting a particular technology in the learning and teaching environment. Instructors are as important [37-40] as their students because, without the instructors, students will have a limited understanding of acquired knowledge or no knowledge at all. Since education needs students and instructors [41-44] to be effective, they must also be in the LMS, so future studies should focus more on instructors as well.

Also, the COVID-19 pandemic situation has been a great advantage to the learning management systems [45-47] which has brought about the growth of the LMS in major

parts of the world and has boosted the perceived usefulness and ease of use of users to achieve satisfaction and delivery of its purpose [15], [19] as LMS stands as the only means to continue education process without delays. Before the COVID-19 pandemic, LMS was considered a waste of time as it is less preferred than attending lectures in classes [48-50]. Also, LMS is likely to be a fresh start in the global education sector, where the bulk of operations will be carried out by Learning Management Systems [51-53]. Therefore, a curriculum that enables recognizable changes in student learning awareness, experience, and critically thinking must be built and governments must ensure that effective communications resources with high-quality digital learning experiences are available to support technology-enabled learning for students during and after the COVID-19 pandemic [54] as COVID-19 pandemic has given the educations circle an idea of LMS usefulness. Researchers, institutions, and even students and instructors should integrate online learning platforms and concentrate more on LMS adoption based on the pandemic situation as it might take more years before things go back to normal. But factors that affect the intention to use and the success of LMS should be identified. From this perspective, the results of this systematic literature review can be kept light to researchers in this area [55-57].

5 Conclusion

In recent years, Learning Management Systems got more popular among researchers because LMS involves a wide range of users of learning technology which should support the process of knowledge transfer and acquisition. However, new technologies like LMS should be searched before integrating human life if they can adapt and be accepted by potential users. In this context, the Technology Acceptance Model is accepted by researchers in the literature as a suitable model to identify factors that affect users' opinions on adaption and acceptance of the new technology. As a result of this, TAM research in the field of LMS has become increasingly popular. The result of this systematic literature review found that TAM is widely acknowledged as a solid frame for planning and conducting evaluation in the field of education, especially when it comes to instructors as an essential aspect of the LMS. Also, it was determined that the studies that investigated the factors affecting the use of LMS by teachers were not sufficient. Consequently, more focus and efforts should be placed on instructors in the future in the context of LMS usage. Moreover, a variety of factors affecting the decision to follow and approve LMS in the learning environment are proposed to be included in new extensions and revisions of TAM and LMS. We hope that the findings of this review can create awareness of the important role of LMS in e-learning, and give ideas to the educational institutes' administration and teachers to identify that the factors that affect the quality and success of LMS usage by the TAM can be used.

Some of the limitations encountered in this research were choosing the databases with the specified keywords therefore in future research; the database can be extended to other popular scientific databases. The data range is another limitation of the study which may be wide in future studies to analyze literature in more detail.

6 References

[1] Islam, A. N. (2013). Investigating e-learning system usage outcomes in the university context. Computers & Education, 69, 387-399. https://doi.org/10.1016/j.compedu.2013.07.037

[2] Turnbull, D., Chugh, R., & Luck, J. (2020). Learning Management Systems, An Overview. Encyclopedia of education and information technologies, 1052-1058. https://doi.org/10.1007/978-3-319-60013-0_248-1

[3] Çavuş, N. (2020). Evaluation of MoblrN m-learning system: Participants' attitudes and opinions. World Journal on Educational Technology: Current Issues, 12(3), 150-164. https://doi.org/10.18844/wjet.v12i3.4978

[4] Cavus, N. (2013). Selecting a learning management system (LMS) in developing countries: instructors' evaluation. Interactive Learning Environments, 21(5), 419-437. https://doi.org/10.1080/10494820.2011.584321

[5] Piña, A. A. (2012). An overview of learning management systems. Virtual Learning Environments: Concepts, methodologies, tools and applications, 33-51. https://www.igi-global.com/chapter/content/63117

[6] Aljarrah, A. A., Ababneh, M. A. K., & Cavus, N. (2020). The role of massive open online courses during the COVID-19 era: Challenges and perspective. New Trends and Issues Proceedings on Humanities and Social Sciences, 7(3), 142-152. https://doi.org/10.18844/prosoc.v7i3.5244

[7] Ramirez-Asis, E. H., Srinivas, K., Sivasubramanian, K., & Jaheer Mukthar, K. P. (2022). Dynamics of Inclusive and Lifelong Learning Prospects Through Massive Open Online Courses (MOOC): A Descriptive Study. In Technologies, Artificial Intelligence and the Future of Learning Post-COVID-19 (pp. 679-696). Springer, Cham. https://doi.org/10.1007/978-3-030-93921-2_35

[8] Charness, N., & Boot, W. R. (2016). Technology, gaming, and social networking. In Handbook of the Psychology of Aging (pp. 389-407). Academic Press. https://doi.org/10.1016/b978-0-12-411469-2.00020-0

[9] Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. Management Science, 35(8), 982-1003. https://doi.org/10.1287/mnsc.35.8.982

[10] Mathwick, C., Malhotra, N. K., & Rigdon, E. (2002). The effect of dynamic retail experiences on experiential perceptions of value: an Internet and catalog comparison. Journal of Retailing, 78(1), 51-60. https://doi.org/10.1016/s0022-4359(01)00066-5

[11] Jahangir N. and Begum, N. The role of perceived usefulness, perceived ease of use, security, and privacy, and customer attitude to engender customer adaptation in the context of electronic banking. *African Journal of Business Management*, vol. 2, no. 2, pp. 32-40, 2008. https://doi.org/10.5897/AJBM.9000634

[12] Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 319-340. https://doi.org/10.2307/249008

[13] Salman, A., Abdullah, M. Y. H., Aziz, J., Ahmad, A. L., & Kee, C. P. (2014). Remodelling technology acceptance model (TAM) in explaining user acceptance towards information and communication technology. International Journal of Arts & Sciences, 7(1), 159. https://search.proquest.com/openview/853cec8bb2675ee1a3984c07c83e9f1a/1?pq-origsite=gscholar&cbl=626342

[14] Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group*. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Annals of internal medicine, 151(4), 264-269. https://doi.org/10.1371/journal.pmed.1000097

[15] Schoonenboom, J. (2012). The use of technology as one of the possible means of performing instructor tasks: Putting technology acceptance in context. Computers & Education, 59(4), 1309-1316. https://doi.org/10.1016/j.compedu.2012.06.009

[16] Schoonenboom, J. (2014). Using an adapted, task-level technology acceptance model to explain why instructors in higher education intend to use some learning management system tools more than others. Computers & Education, 71, 247-256. https://doi.org/10.1016/j.compedu.2013.09.016

[17] Ghazal, S., Al-Samarraie, H., & Aldowah, H. (2018). "I am still learning": Modeling LMS critical success factors for promoting students' experience and satisfaction in a blended learning environment. Ieee Access, 6, 77179-77201. https://doi.org/10.1109/access.2018.2879677

[18] Cheung, R., & Vogel, D. (2013). Predicting user acceptance of collaborative technologies: An extension of the technology acceptance model for e-learning. Computers & Education, 63, 160-175. https://doi.org/10.1016/j.compedu.2012.12.003

[19] Al-Gahtani, S. S. (2016). Empirical investigation of e-learning acceptance and assimilation: A structural equation model. Applied Computing and Informatics, 12(1), 27-50. https://doi.org/10.1016/j.aci.2014.09.001

[20] Sensuse, D. I., & Napitupulu, D. (2017). The study of user acceptance toward E-learning System in Higher Education. Indonesian Journal of Electrical Engineering and Computer Science, 7(2), 466-473. http://doi.org/10.11591/ijeecs.v7.i2.pp466-473

[21] Salloum, S. A., Alhamad, A. Q. M., Al-Emran, M., Monem, A. A., & Shaalan, K. (2019). Exploring students' acceptance of e-learning through the development of a comprehensive technology acceptance model. IEEE Access, 7, 128445-128462. https://doi.org/10.1109/access.2019.2939467

[22] Salajan, F. D., Schönwetter, D. J., & Cleghorn, B. M. (2010). Student and faculty inter-generational digital divide: Fact or fiction? Computers & Education, 55(3), 1393-1403. https://doi.org/10.1016/j.compedu.2010.06.017

[23] Cheng, M., & Yuen, A. H. K. (2018). Student continuance of learning management system use: A longitudinal exploration. Computers & Education, 120, 241-253. https://doi.org/10.1016/j.compedu.2018.02.004

[24] Stantchev, V., Colomo-Palacios, R., Soto-Acosta, P., & Misra, S. (2014). Learning management systems and cloud file hosting services: A study on students' acceptance. Computers in Human Behavior, 31, 612-619. https://doi.org/10.1016/j.chb.2013.07.002

[25] Islam, A. N. (2016). E-learning system use and its outcomes: Moderating role of perceived compatibility. Telematics and Informatics, 33(1), 48-55. https://doi.org/10.1016/j.tele.2015.06.010

[26] Jin, C. H. (2014). Adoption of e-book among college students: The perspective of an integrated TAM. Computers in Human Behavior, 41, 471-477. https://doi.org/10.1016/j.chb.2014.09.056

[27] Khan I. U., Hameed Z., Yu Y. and Khan S. U. (2017). Assessing the determinants of flow experience in the adoption of learning management systems: the moderating role of perceived institutional support. *Behaviour & Information Technology*, vol. 36, no. 11, pp. 1162-1176. https://doi.org/10.1080/0144929x.2017.1362475

[28] Essel, D. D., & Wilson, O. A. (2017). Factors affecting university students' use of Moodle: An empirical study based on TAM. International Journal of Information and Communication Technology Education (IJICTE), 13(1), 14-26. https://doi.org/10.4018/ijicte.2017010102

[29] Cárdenas-Robledo, L. A., & Peña-Ayala, A. (2018). Ubiquitous learning: A systematic review. Telematics and Informatics, 35(5), 1097-1132. https://doi.org/10.1016/j.tele.2018.01.009

[30] Farid S., Ahmad R., Niaz I. A., Arif M., Shamshirband S. and Khattak M. D. (2015). Identification and prioritization of critical issues for the promotion of e-learning in Pakistan. *Computers in Human Behavior*, vol. 51, pp. 161-171. https://doi.org/10.1016/j.chb.2015.04.037

[31] Anido-Rifón, L. E., Fernández-Iglesias, M. J., Caeiro-Rodríguez, M., Santos-Gago, J. M., Llamas-Nistal, M., Sabucedo, L. Á., & Pérez, R. M. (2014). Standardization in computer-based education. Computer Standards & Interfaces, 36(3), 604-625. https://doi.org/10.1016/j.csi.2013.09.004

[32] Lie, T. (2017). The Effect of Active Learning Strategies on Communication Apprehension in Information Systems Students in Taiwan. IEEE Transactions on Professional Communication, 61(1), 101-109. https://doi.org/10.1109/tpc.2017.2747378

[33] Mouakket, S., & Bettayeb, A. M. (2015). Investigating the factors influencing continuance usage intention of Learning management systems by university instructors: The Blackboard system case. International Journal of Web Information Systems. https://doi.org/10.1108/ijwis-03-2015-0008

[34] Alomari, M. M., El-Kanj, H., Alshdaifat, N. I., & Topal, A. (2020). A framework for the impact of human factors on the effectiveness of learning management systems. IEEE Access, 8, 23542-23558. https://doi.org/10.1109/access.2020.2970278

[35] Al-Busaidi, K. A. (2010). 'Learners' acceptance of learning management systems: Developing a theoretical framework,''. In Proc. 4th Int. Multi-Conf. Soc., Cybern. Inform. https://squ.pure.elsevier.com/en/publications/learners-acceptance-of-learning-management-systems-developing-a-t

[36] Cavus N., Mohammed Y. B. and Yakubu M. N. (2021). An artificial intelligence-based model for prediction of parameters affecting sustainable growth of mobile banking apps. *Sustainability*, vol. 13, no. 11, 6206. https://doi.org/10.3390/su13116206

[37] Prahani, B. K., Alfin, J., Fuad, A. Z., Saphira, H. V., Hariyono, E., & Suprapto, N. (2022). Learning Management System (LMS) Research During 1991-2021: How Technology Affects Education. International Journal of Emerging Technologies in Learning (iJET), 17(17), pp. 28–49. https://doi.org/10.3991/ijet.v17i17.30763

[38] Jauhiainen, S., Krosshaug, T., Petushek, E., Kauppi, J.-P., & Äyrämö, S. (2021). Information Extraction from Binary Skill Assessment Data with Machine Learning. International Journal of Learning Analytics and Artificial Intelligence for Education (iJAI), 3(1), pp. 20–35. https://doi.org/10.3991/ijai.v3i1.24295

[39] Huseyin, U., & Gönül, A. (2020). A content and citation analysis of the studies on learning environments and special education. International Journal of Cognitive Research in Science, Engineering and Education, 8(2), 95-104. https://cyberleninka.ru/article/n/a-content-and-citation-analysis-of-the-studies-on-learning-environments-and-special-education

[40] Prodani R., Çobani S., Andersons A. and Bushati J., (2022). Digital technologies integration in the classroom. A teacher's perspective. *Cypriot Journal of Educational Science*, vol. 17, no. 8, pp. 2823-2837, 2022. https://doi.org/10.18844/cjes.v17i8.7781

[41] Nazim, M., & Alzubi, A. A. F. (2022). Evaluation of an online teacher-made test through blackboard in an English as a foreign language writing context. World Journal on Educational Technology: Current Issues, 14(4), 1025–1037. https://doi.org/10.18844/wjet.v14i4.7614

[42] Badrudin, B., Khusnuridlo, M., & Wahyu, M. Z. E. (2022). The influence of learning management information system and service quality on the customer satisfaction of Ruangguru

application. Cypriot Journal of Educational Sciences, 17(1), 148–158. https://doi.org/10.18844/cjes.v17i1.6692

[43] Salama, R., Qazi, A., & Elsayed, M. (2018). Online programming language—Learning management system. Global Journal of Information Technology: Emerging Technologies, 8(3), 114–123. https://doi.org/10.18844/gjit.v8i3.4051

[44] Zhiyenbayeva, N., Sabirov, A., Troyanskaya, M., Ryabova, E., & Salimova, S. (2022). Implementing a conceptual model of participative management into an integrated e-learning system. World Journal on Educational Technology: Current Issues, 14(1), 255-267. https://doi.org/10.18844/wjet.v14i1.6723

[45] ALRikabi, H. T. S., Abdul-Rahman Al-Malah, D. K., Hassan Majeed, B., & Z. Abass, A. (2021). The Influence E-Learning Platforms of Undergraduate Education in Iraq. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 9(4), pp. 90–99. https://doi.org/10.3991/ijes.v9i4.26995

[46] Al-Zoubi, A. Y., Dmour, M.., & Aldmour, R. (2022). Blockchain as a Learning Management System for Laboratories 4.0. International Journal of Online and Biomedical Engineering (iJOE), 18(12), pp. 16–34. https://doi.org/10.3991/ijoe.v18i12.33515

[47] Al-Shammari, A. H. (2020). Social Media and English Language Learning during Covid-19: KILAW Students' Use, Attitude, and Prospective. Linguistics Journal, 14(1). https://pesquisa.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/resource/en/covidwho-863753

[48] Jahangard, A., Rahimi, A., & Norouzizadeh, M. (2020). Student attitudes towards computer-assisted language learning and its effect on their EFL writing. International Journal of New Trends in Social Sciences, 4(1), 01–09. https://doi.org/10.18844/ijntss.v4i1.4785

[49] Bianco, N. D.., Giaconi, C., Gison, G., D'Angelo, I., & Capellini, S. A. (2021). Inclusion at the University through technology: A case study in Italy. International Journal of Special Education and Information Technologies, 7(1), 01–15. https://doi.org/10.18844/jeset.v7i1.6793

[50] Mozombite-Jayo, N.., Manrique-Jaime, F., Castillo-Lozada, S.., Romero-Andrade, C.., Giraldo-Retuerto, M., Delgado, A., & Andrade-Arenas, L. (2022). Systemic Analysis of the Use of Technological Tools in the University Learning Process. International Journal of Engineering Pedagogy (iJEP), 12(4), pp. 63–84. https://doi.org/10.3991/ijep.v12i4.30833

[51] Alanazi, K., & Thompson, C. (2019). Using social networking technologies to promote language socialisation: English as foreign language teachers' perceptions in Saudi Arabia. Global Journal of Foreign Language Teaching, 9(3), 122–136. https://doi.org/10.18844/gjflt.v9i3.4129

[52] Karaca, A. (2020). Innovative technologies and living spaces; Updated living standards according to the evolution of homo sapiens. New Trends and Issues Proceedings on Advances in Pure and Applied Sciences, (12), 91–108. https://doi.org/10.18844/gjpaas.v0i12.4990

[53] Uzunboylu, H., & Gundogdu, E. G. (2018). A Content Analysis Study on Pre-School Education and Instructional Technologies. International Journal of Innovative Research in Education, 5(4), 119–128. https://doi.org/10.18844/ijire.v5i4.3974

[54] Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. International Journal of Educational Research Open, 1, 100012. https://doi.org/10.1016/j.ijedro.2020.100012

[55] Adebayo, D. O., Julius, E., & Fasasi, L. (2019). Incidence of Yahoo-Plus activities among in-school adolescents in Delta State, Nigeria. Global Journal of Guidance and Counseling in Schools: Current Perspectives, 9(1), 14–23. https://doi.org/10.18844/gjgc.v9i1.3950

[56] Devedzic, V., & Devedzic, M. (2019). Technology-Enhanced Assessment at universities and in schools: An initiative. International Journal of Learning and Teaching, 11(3), 89–98. https://doi.org/10.18844/ijlt.v11i3.4319

[57] Akhondi, A., Y. Yarmohammadian, M., & Â Haghani, F. (2015). Designing an e-learning curriculum for spelling on the basis of cognitive approach. Contemporary Educational Researches Journal, 5(1), 08–11. https://doi.org/10.18844/cerj.v5i1.9

7 Authors

Nadire Cavus is a professor of Computer Information Systems and director of the Computer Information Systems Research and Technology Centre at the Near East University in Cyprus. She is the chairperson of the Department of Computer Information Systems. She received his Ph.D. in Computer Information Systems from the Faculty of Economics and Administrative Sciences, Near East University, Cyprus in 2007. Her research areas include mobile learning, e-learning, technology-based learning, learning management systems, and technology acceptance and adoption (email: nadire.cavus@neu.edu.tr).

Babatomiwa Omonayajo is a Ph.D. candidate in Computer Information Systems from Near East University in Cyprus. He is currently working on his Ph.D. thesis. His research focuses on machine learning, the Internet of things, technology acceptance and adoption, and e-learning (email: 20212976@std.neu.edu.tr).

Melissa Rutendo Mutizwa is a Master's degree student in Computer Information Systems from Near East University in Cyprus. She is currently working on her Master's thesis. Her research focuses on e-learning, virtual platforms, and technology acceptance and adoption (email: 20204919@std.neu.edu.tr).

Article submitted 2022-09-18. Resubmitted 2022-10-19. Final acceptance 2022-10-22. Final version published as submitted by the authors.