AJET | ASCILITE

The important elements of LMS design that affect user engagement with e-learning tools within LMSs in the higher education sector

Nastaran Zanjani, Sylvia L. Edwards, Shaun Nykvist & Shlomo Geva
Queensland University of Technology

In recent years, universities have been under increased pressure to adopt e-learning practices for teaching and learning. In particular, the emphasis has been on learning management systems (LMSs) and associated collaboration tools to provide opportunities for sharing knowledge, building a community of learners, and supporting higher order learning and critical thinking through conversation and collaboration. Due to the greater level of data continuity, reliability, and privacy that LMSs can provide compared to the available free applications, LMSs are still the central platform for many universities to deliver e-learning. Therefore, it is vital to investigate the LMS structure requisites that affect user engagement. This paper focuses on the important LMS design factors that influence user engagement with e-learning tools within LMSs. Results were extracted from 74 interviews about Blackboard with students and lecturers within a major Australian university. A user-friendly structure, avoidance of too many tools and links, support for privacy and anonymous posting, and more customisable student-centred tools were identified as LMS design factors that affect user engagement.

Background and motivation

The Internet's evolution and its impact on education has revolutionised the way in which educators now work, giving them a new set of information and communication (ICT) tools to connect with students together with the ability to use these tools for the development of critical thinking and problem solving (Nykvist, 2008). Many higher education institutions now capitalise on some type of learning management system that supports students' learning activities by providing an extensive and integrated range of services and tools for learners.

LMSs can provide an opportunity for students with different lifestyles to be able to study free from time and space limitations in a secure environment (Bradford, Porciello, Balkon, & Backus, 2007; Chawdhry, Paullet, & Benjamin, 2011; Heirdsfield, Walker, Tambyah, & Beutel, 2011). They can also facilitate organising and managing course content (Heirdsfield et al., 2011; Squillante, 2014; Wilson, 2007), submitting assignments (Wilson, 2007), providing feedback to students (Bradford et al., 2007), setting up groups, organising grades (Chawdhry et al., 2011; Wilson, 2007) and assessing students (Heirdsfield et al., 2011). Moreover, LMSs provide spaces to share information which can be useful for students to get a broader view about subjects. The collaboration tools within LMSs have the potential to enhance students' social connectivity and help them to connect to other students they do not know, as well as finding people with similar interests in a secure environment.

However, the real-world implementation of LMSs has fallen well short of their promise. Even the addition of functionalities like grade book, discussion boards, and email, as well as social media elements such as blogs and wikis, have not sufficiently supported LMSs to keep pace with the rapid changes of technology, specifically with types of collaboration and interaction that well-known online social tools such as Twitter and Facebook foster (Stern & Willits, 2011). There are debates on whether the embedded collaboration tools within LMSs are as efficient as other available collaborative applications. Dabbagh and Kitsantas (2012) claim that social media tools are more user-friendly and provide a better interactive area than those embedded within LMSs.

Therefore, this research investigates the LMS design determinants that impact user engagement with LMS tools in higher education. Blackboard was selected as the LMS to be studied since it is used both in university studies and broadly across the sector; therefore, the results can be widely applied. Specifically this research question is what features should be figured out in the design of LMS tools to enhance users' engagement.

Literature review

Student engagement was initially understood in terms of the behavioural indexes of student participation in educational settings (Jimerson, Campos, & Greif, 2003). It was broadly described as "energy in action" or the active participation of the learner in school-associated efforts (Russell, Ainley, & Frydenberg, 2005, p. 1). Student engagement concepts have expanded in the past few decades to include the involvement developed through cognitive and emotional processes (Fredricks, Blumenfeld, & Paris, 2004). Therefore, most researchers now view student engagement as a multidimensional concept that involves behavioural, academic, psychological and cognitive factors (Appleton, Christenson, & Furlong, 2008; Reschly, Huebner, Appleton, & Antaramian, 2008; Skinner, Kindermann, & Furrer, 2009).

According to Finn and Zimmer (2012), four levels of engagement can be defined, based on existing engagement models: academic engagement, social engagement, cognitive engagement and affective engagement. Academic engagement deals with behaviours pertaining to the learning process, such as completing assignments, being attentive, and participating in academic activities. Social engagement is related to the students' behaviour towards the class rules, for example, being on time and interacting effectively with peers and the lecturer. Cognitive engagement refers to the level of student endeavour needed to understand complex subjects and go beyond the minimal obligations. Attitudes such as asking questions, completing difficult tasks, and studying resources beyond the course requirements fall into this category. Finally, affective engagement refers to the extent to which students feel emotionally involved in their learning community.

The relationship between students' engagement behaviour and their academic performance is consistently statistically significant and repeatedly confirmed in empirical research (Finn & Zimmer, 2012). According to Barkley (2009), engaged students become more involved in academic tasks and make use of higher-order thinking skills such as problem-solving or information analysis. Therefore, active learning strategies that encourage student engagement are important to enhance higher-order thinking skills of students (Madhuri, Kantamreddi, & Goteti, 2012).

Lower-level thinking procedures and activities support the transfer of knowledge from the educator to the student, but higher-order thinking skills enable student capabilities to apply, analyse, synthesise, and evaluate the provided knowledge (Nichols, 2010). A variety of techniques are suggested to enhance students' critical thinking skills and active learning, including problem-based teaching (Edgerton, 1997); asking questions (Chung, Raymond, & Foon, 2011; Williams, 2003); stating agreement and opinions (Chung et al., 2011); collaboration (Gokce, O'Brien, & Wilson, 2012); real-world and open-ended discussions (Miri, David, & Uri, 2007); brainstorming (Bradley, Thom, Hayes, & Hay, 2008); and providing a competitive environment and using artefacts such as images (Barkley, 2009). To implement these techniques, ICT, specifically LMS e-learning tools, can be used to provide collaborative learning opportunities, encourage reflective and active engagement of students, provide feedback facilities, and engage students in real-word activities (Bransford, Brwon, & Cocking, 1999; Greenhow, Robelia, & Hughes, 2009).

Regardless of the claims that an LMS might be able to alter teaching and learning by offering constructive and social learning opportunities (Rudestam & Schoenholtz-Read, 2002), many lecturers only use LMSs for sharing teaching resources and communication (Becker & Jokivirta, 2007; Heaton-Shrestha, Gipps, Edirisingha, & Linsey, 2007; Malikowski, Thompson, & Theis, 2007). The potential for online learning is not being realised because traditional didactic approaches are transferred to the online environment (Zanjani, Nykvist, & Geva, 2012). This approach only mimics the traditional classroom, with lecture notes and resources being placed online, and the LMS is seen as a web-based delivery of course resources or as a communication tool, and its asynchronous and synchronous discussion tools are rarely used.

While initial adoption is an important factor of using an LMS, continuous use is still required to achieve tangible success. Many users stop using virtual learning tools such as those embedded within the LMS after initial adoption (Sun, Tsai, Finger, Chen, & Yeh, 2008). Studies (Chiu, Sun, Sun, & Ju, 2007; Ivanović et al., 2013) show that the intention to continue using an LMS is not high, and LMS use is often discontinued after initial adoption. A review of the literature reveals that the LMS design factors that can affect the intention to continue using LMS tools are perceived ease of use (PEU) (Abdalla, 2007; Chiu, Hsu, Sun, Lin, & Sun, 2005; Iqbal & Qureshi, 2011; Lau & Woods, 2009; Liaw, 2008; Selim, 2007; Sun

et al., 2008), which is sometimes called effort expectancy (Chiu & Wang, 2008); perceived usefulness (PU) (Abdalla, 2007; Liaw, 2008); appropriate course management tools (Iqbal & Qureshi, 2011; Liaw, 2008); as well as the interactivity of the system (Iqbal & Qureshi, 2011; Liaw, 2008; Pituch & Lee, 2006).

PEU is one of the technology acceptance model (TAM) parameters, which describe the user's perception of how easy it is to work with the system. PU is another TAM parameter, which is the level of work enhancement after using the system. TAM is a framework that has been applied in many technology adoption studies. Its focus is to predict and assess user willingness to accept technology (Davis, 1989). TAM investigates the relationships between PEU, PU, and attitudes and intentions in adoption. User perception and attitudes towards the system are influenced by both these factors. To apply TAM in the context of LMS adoption, PEU is defined as students' perception of the ease of using the LMS, and PU determines students' perception of the learning enhancement level as a result of the LMS adoption. It should be noted that the PEU of the system influences the PU of the system (Lau & Woods, 2009; Pituch & Lee, 2006), meaning that when users perceive the system as easy to use, they perceive it to be more useful.

Although there are studies (Abdalla, 2007; Bradford et al., 2007; Carvalho, Areal, & Silva, 2011; Chawdhry et al., 2011; Green et al., 2006; Heirdsfield et al., 2011; Liaw, 2008; Squillante, 2014; Vassell, Amin, & Winch, 2008; Wilson, 2007) that have investigated the state of the use of e-learning tools within LMSs, and specifically Blackboard, they do not provide adequate details of the characteristics of the LMS structure required to enhance user engagement. A survey of 119 students shows that participants ranked their satisfaction with collaboration and group activities through the LMS lowest (Chawdhry et al., 2011). Students and staff in another survey also complained about the user-friendliness of the discussion board and wiki of the LMS they were using (Heirdsfield et al., 2011). However, there is not a comprehensive, detailed study of the problems users encounter while using LMS tools. Additionally, while the literature emphasises the importance of the PEU in technology adoption and acceptance (Chiu et al., 2005; Chiu & Wang, 2008; Lau & Woods, 2009; Lee, 2010; Roca, Chiu, & Martínez, 2006; Selim, 2007; Sun et al., 2008; Wilson, 2007), none of the aforementioned studies explain the details of PEU factors that foster user engagement with LMS tools.

To fill in the identified gap, this research focuses on the problems surrounding the structure of e-learning tools within LMSs that are based on real-world data. This approach helps to identify the aspects of the LMS structure that affect user engagement with LMS tools. Semi-structured interviews with students and lecturers from different disciplines reveal details that explain the LMS functionalities that affect user engagement. Semi-structured interviews allow participants to be heard and give specific feedback, compared to most studies in this area that are based on survey data (Abdalla, 2007; Carvalho et al., 2011; Chawdhry et al., 2011; Liaw, 2008; Squillante, 2014; Vassell et al., 2008; Wilson, 2007). Although it is appropriate to use surveys in large-sample studies, respondents are limited to pre-designed answers or limited open-ended ones.

Method

The philosophical position of the research decides whether the logic of the study is inductive or deductive. In a deductive approach, the study begins with a definition of hypotheses and creates a pre-model, which then may be confirmed or rejected based on the collected data. In an inductive method, the conclusion is derived from a thorough study of events (Neuman & Robson, 2004). This research is predominantly an inductive study, since hypotheses or a model were not preliminarily developed, but empirical data was first collected about the subject under study, and then results were derived by analysing the collected data. However, it is also deductive, since some concepts from existing theories were used to explain the final results.

Participants

Non-probability sampling was adopted in this qualitative research, using purposive and snowball sampling techniques. Participants ($N = 74$) consisted of students ($n = 60$: 27 female and 33 male) and teachers ($n = 14$: eight male and six female) from the faculties of Science and Engineering, Education, Business, Law and Health, in a major Australian university. Coursework students who were at least second-year level were selected to ensure that all participants had experienced working with the LMS

tools. Six lecturers voluntarily participated in the study, while eight others were selected through the snowball mechanism.

Data collection method

This research adopted a qualitative approach through semi-structured interviews. Interviews were face-to-face, audio-recorded, conducted from late-2010 to 2012 by the first author, and lasted from 15 to 30 minutes. No personal information was asked, and the recorded interviews were non-identifiable. Recorded interviews were labelled T-n for lecturers and S-n for students (n stands for the interview number) and transcribed by a native speaker. Interviews focused on problems relevant to the LMS structure that students and lecturers encountered while working with its tools. Samples of interview questions are: What is your reflection about LMS tools?
Can you explain the activities you have done with LMS tools? How do you evaluate LMS tools from the engagement point of view?

In-depth interviews help to investigate respondents' experiences deeply and explore the interpretations they assign to their experiences (Seidman, 2012), allowing them to state their own perceptions with their own expressions (Teddlie & Tashakkori, 2009). Participants can talk in their own words about the subject under study, free of the limitations forced by the fixed answer questions that usually appear in quantitative studies.

The number of interviews was brought to an end once a saturation point had been reached where no new data was collected from participants (Bryman, 2012). Saturation is accomplished at a relatively low level (Griffin & Hauser, 1993; Guest, Bunce, & Johnson, 2006), and usually not more than 60 participants are required (Charmaz, 2006; Creswell, 1998). However, since the number of Blackboard users is high and they are from multiple disciplines, 74 people were interviewed to ensure that enough data was collected for the purposes of this research. Ethical clearance for the study was granted by the university ethical committee.

Data analysis

To analyse the collected data, an applied thematic analysis approach (Guest, MacQueen, & Namey, 2011) was adopted in this research. Initial segmentation, word searches and key word in context techniques were the first steps implemented to establish the starting point for code book development. Then, the code book was generated by identifying existing themes within the text, and revised by conducting the coding process again, adding more codes that were not identified in the first step. Categorising the related codes and discussing deviant cases were the last steps in the analytic process.

Following Guest et al. (2011), the first author read the interview transcripts several times, found themes, and then prepared a code book by refining themes into codes. Guest et al. (2011) recommend using multiple coders to enhance the analysis, because this can neutralise biases any individual coder may bring to an analysis, mostly when subjective labelling and interpretation of meaning are required. However, since there was no one but the first author to code the data, the researcher re-coded data again 1 month after the first round of coding. This helped to refresh viewpoints and reduce any short-term falsifying effects that plunging into the data might have caused. After classifying primary categories in previous steps, the key themes of the study were identified.

Validity and reliability

To enhance reliability and validity in qualitative research, this research employed Guest et al.'s (2011) recommendations, including:

- explaining the rationale for selecting the study design and its suitability for defined research questions
- selecting a purposive sample of students and lecturers following the criteria defined in the research to choose proper and adequate participants

- reviewing both sets of interview questions (for lecturers and students) by the educational researcher to avoid any invalidity
- reviewing a number of recorded interviews and coded transcripts by another educational researcher, in the early stages of collecting data and the coding process
- conducting pilot interviews to ensure that questions made sense to participants
- conducting both the primary and secondary coding rounds by review of the whole coding process one month after the first coding phase by the first author
- presenting data excerpts, within the limitations of the paper, as records for readers to evaluate researcher interpretations
- providing detailed documentation of the research process
- including contradictory data in the analysis of the data.

Quotes from different participants are presented in the paper as much as possible. However, each participant is not given an equal weighting, since it is necessary to focus on perceptions and their relations, not individuals. To achieve this goal, the excerpts most relevant to the concepts were inserted in this paper.

Limitations

The scope of this research was limited to the higher education sector. It also focused exclusively on LMSs and not on any other e-learning tool and only the features of one LMS (Blackboard) were investigated. Moreover, the study was conducted in only one university, with few participants. Results would be more generalisable if more than one LMS were studied in more than one university. However, the consistency between the findings of this research and what the literature claims supports the results of this thesis.

Another limitation of the current study was that interviews were coded and categorised by the researcher. The results may have been affected by the interpretations of the researcher. However, to reduce this effect, another educational researcher reviewed a number of coded transcripts. Further, the researcher conducted a secondary coding round by reviewing the whole coding process one month after the first coding phase.

Another limitation of this study was that the recruitment flyer was sent to both on-campus and off-campus students. This may have affected the research results, since the way these two groups used e-learning tools might be different. However, the researcher did not recognise any specific differences between the responses of on-campus and off-campus students.

Finally, it should be noted that this study does not include required institution-level policies and project management necessities, such as LMS implementation procedures, ethical considerations, and financial constraints.

Results

The study results show that participants had problems pertaining to the Blackboard structure, which influenced their effective engagement with its tools. These problems included:

- not a user-friendly structure
- the need for privacy and posting anonymously
- the need for more customisable student-centred tools
- too many tools and links.

The lack of user-friendly tools was identified as an issue by 60% of students and 50% of lecturers; this was the most prominent factor contributing to the effect of LMS design on the use of e-learning tools in Blackboard.

Not a user-friendly structure

The complex structure of Blackboard was one of the major problems indicated by students (60%) and lecturers (50%). Functions are hidden and are difficult to find in the different layers of Blackboard. There are many subfolders, and when users open a subfolder, they lose their overall view of other folders. One of the students said:

> I'd never liked the interface … Because it took me a while to really get through what the set-up was … In Blackboard when you go to a course, for example, you are directly into that unit … so if you want to go back you just have to go back to the whole from the start. (S-3)

Besides the difficult navigation structure of Blackboard, 13.3% of students indicated that Blackboard was difficult to learn. One student viewpoint was, "You will spend a lot of time to try to understand how to do a task" (S-48). Another one commented that, "It should be something that yells out at you how you can do it" (S-30).

A lecturer considered that it was hard to set up and answer quizzes with special mathematical symbols using Blackboard. Moreover, if the lecturer wants to use the LMS to distribute multiple versions of assignments to students in such a way that nobody knows who else has received the same version several steps are required. The lecturer said, "Although there was a way to do that, it was a long and complex procedure" (T-4). Therefore, it seems that both students and lecturers were mostly not satisfied with the way Blackboard is configured and would prefer a more straightforward navigation structure.

In addition to users' general complaints about the non-user-friendly structure of Blackboard, another contested issue is that Blackboard discussion board, wiki, blog, and chat tools are not well designed to support collaboration and interaction. They lack functionalities that reduce user efforts to do an online task. Supporting this claim, 21.7% of students who had experienced the discussion board ($N = 23$) found it was not user-friendly, and was messy and confusing. One of the students commented:

> I found it's not really user-friendly because when we type it in and then when we post it, it comes out differently than what we type in … And the way it arranges the topics and who posts first and who posts next, we don't really know. After I posted it's hard for me to find what I posted. (S-5)

A lecturer also criticised the discussion board: "Discussion board and Blackboard don't have a really good set-up for discussion" (T-11). He said that even Blackboard wiki did not support easy content editing: "The general complaint is that it's not easy to edit because, for example, to insert a table it's really difficult to do" (T-11).

The Blackboard chat tool also needs to be modified, according to students:

> It needs to be able to see when others are typing, need to have a notification sound for when someone has commented, need to be able to surf the Internet without being disconnected from the room so that you can share video links, etc., and it needs an auto correction for typing. (S-55)

A notification mechanism to alert users of any new entry was identified as a need by 43.5% of those students who had used the discussion board ($N = 23$). One student described: "Blackboard does not send email notifications when there has been a post on the discussion board" (S-55). This problem exists in the Blackboard blog too; as one student said: "The blog tool is awesome but it would be great to be notified when someone posts something via email as the notification tool does not do this" (S-55).

It can be concluded that one of the reasons why students do not respond as expected to online activities designed via Blackboard is how Blackboard tools are designed and structured. These tools are far from current Web 2.0 facilities that generally support easy interactions and require less technical skill to generate content. Supporting this conclusion, two students declared that Blackboard tools are old

technology and should be modernised. One of them commented: "I think it's extremely important that you make it look modern, that it has a Web 2.0 feel" (S-33).

The need for privacy and posting anonymously

Another concern of students (17.3%) who had used the collaboration tools of Blackboard (*N* = 23) was privacy. The Blackboard structure does not let students set their desired privacy settings to be anonymous to their classmates or teachers when posting on Blackboard. Lecturers (35.7%) also agreed that privacy is important for students. A student said: "If we want to discuss something we prefer to talk only to the lecturers and we don't want to have other students to look at what we are discussing with the lecturer" (S-5). Another one asked for "no monitoring from lecturers" (S-1).

The preference to be anonymous may be due to language barriers and fear of asking silly questions. One student said, "Sometimes we feel like is it appropriate for us to ask this question? Because it might be silly questions … we also feel embarrassed to ask because of the language barrier" (S-5). For those students who are interested in participating in discussions, providing an online environment where they can anonymously ask questions and express ideas will help.

The need for customisable more student-centred tools

Another need expressed by participants was to have the ability to customise the online environment they use. Students (25%) were eager to have more control of what they did online using Blackboard. This is because all the Blackboard tools must be set up and initiated by the lecturer. One student stated, "Sometimes my friends want to share some links that are useful for assignments and for the subject itself, but then we cannot do it" (S-46).

To overcome this problem, one student suggested providing applications through Blackboard, where students can make their own accounts, add friends and lecturers, and customise the environment as they want. This view is further evidence that students demand modern tools that are like Web 2.0 ones. He said he would like, "a student blog that you could customise and maybe even keep for the whole of your degree or to create a free account and then add friends as you go along and search for friends and add lecturers" (S-23).

Lecturers (21.4%) also saw customisable tools as an important requirement. One lecturer advised, "You want to be able to customise it so that you just have the features you want" (T-7). More control over the privacy settings and the structure of the environment which handles online teaching and learning practices is required.

Too many tools and links

While many participants asked for more customisability of LMS tools, some (10% of students and 14.3% of lecturers) complained of too many tools available via Blackboard, which discouraged users (10%) from "even having a look at them" (S-13). One student said, "There is too much unnecessary/unused information cluttering the interface" (S-51). One lecturer agreed and said, "That just seems like too much flexibility; I want to have … a template so that I could just say I want to use this" (T-8). Therefore, it seems that users would prefer a simpler environment that does not confuse them with many available features. Simplicity rather than complexity is thus a factor that affects the user-friendliness of the system.

Findings discussed in this section reveal the details of what the LMS structure needs to enhance students' and lecturers' engagement with LMS tools. Although this finding is emphasised in the literature, our findings provide more details on the requirements of designing an engaging LMS. This is discussed further in the next section.

Discussion

Our results show that the interactive design of the LMS is one of the major features of effective LMS usage. User-friendly structure, avoiding too many tools and links, supporting privacy and posting anonymously, and more customisable student-centred tools, were identified as LMS design factors that

affect user engagement. The general consensus from participants was that Blackboard was difficult to navigate and it was not user-friendly enough.

This finding is consistent with the research literature in regard to the limitations of the Blackboard structure (Bradford et al., 2007; Liaw, 2008; Ozkan & Koseler, 2009; Selim, 2007), and also regarding the emphasis on the significant role of PEU in technology adoption and acceptance (Chiu et al., 2005; Chiu & Wang, 2008; Lau & Woods, 2009; Lee, 2010; Selim, 2007; Sun et al., 2008; Wilson, 2007). However, there is little evidence in the literature about the specific properties that users demand to perceive the LMS as user-friendly. The lack of adequate research on specific user-friendly properties of LMS highlights the contribution of this research, in the detail it provides about what additional or modified features are needed for the LMS to be perceived as easy to use.

The features that the study found to be central to user perceptions of the ease of using the Blackboard LMS included easy navigation structure, easy editing functionality, the existence of notification and auto-correction features, customisability, providing opportunities for students to post anonymously, and avoiding technology overload. Participants asked for a notification mechanism in Blackboard e-learning tools. This function relieves users from checking the tool regularly for new entries. Anderson (2008) believes that the e-learning tool should let users notify others of their presence and activities both asynchronously and synchronously. Each of these features of the TAM parameters affect the PEU of the LMS, and thus influence the system's adoption and acceptance. However, in the extensive literature reviewed in this research, there is only one reference (Chawdhry et al., 2011) that points out the lack of a proper notification procedure in Blackboard. Other functionalities, including the need for flexible editing possibilities and an auto-correction feature in LMS tools, are not reported in the literature, to the knowledge of this researcher, and are uniquely identified in this research.

While users talked about the non-user-friendliness of some of the LMS tools, specifically the collaboration ones, they mentioned the availability of many different tools through Blackboard. Generally, if there were fewer tools that could handle tasks better, it would be more beneficial to students and teachers. One student stated, "I just don't like it how it's, … it's like one thing I only want to do but there's like three other things, two other things on the side that I never use" (S-2). Users prefer tools that are more focused with a fewer number of options.

This phenomenon is called *technology overload* in this paper. The phrase is borrowed from Karr-Wisniewski and Lu (2010, p. 1061), who refer to overload in technology use. In this paper, technology overload refers to the overload in technology availability. Based on Parkin's (1998) law of diminishing marginal returns, when increasing a variable parameter while other factors stay constant, a point is reached where adding one more item of the variable parameter will cause a diminishing return rate, and the outcome will decline. It can be expected that once the technology availability exceeds the optimal level, negative outcomes may occur. However, it is critical to consider that the technology overload dimensions are affected by individually perceived limitations. That is, two students or teachers utilising the same LMS environment may perceive the LMS technology overload differently, depending on their individual distinctions.

The review of the existing literature shows that the effect of technology overload of the LMS tools on user engagement was not addressed in any of the LMS adoption and acceptance studies. Further research is required to discover approaches for finding the optimum level of available LMS tools to maximise teacher and student engagement.

The need for privacy and posting anonymously was another concern regarding the LMS design element. In this research, privacy and anonymity means the capacity to ask questions or post comments anonymously in the LMS environment. This is important, since anonymity may increase students' confidence to ask questions. Hage and Aïmeur (2009) showed that when online students were anonymous to the lecturer they performed better, their mean score increased, and they spent less time on answering questions.

While the literature emphasises the role of anonymity in online realms, this research specifically reveals the need for this functionality in the LMS environment to improve user engagement. Moreover, it uniquely highlights the point that while the LMS under study (Blackboard) allows lecturers to set a forum

for students to be anonymous, students have no control over their desired anonymity settings in the LMS. This finding highlights the need for more student-centred applications to enhance learner engagement with LMS tools.

Revisiting the purpose of this research, which is to explore the required LMS structure parameters that enhance students' and teachers' engagement, it was found that more user control over the LMS environment is an important factor in acceptance. This can be achieved through designing and providing more customisable and student-centred tools within an LMS.

It is apparent from the findings of this research and the literature that Blackboard does not offer a user-friendly interface, specifically with its collaboration and discussion tools. This is not specific to Blackboard. There are other reports in the literature indicating the inefficient structure of collaboration tools within other widely used LMSs such as Moodle (Blin & Munro, 2008; Carvalho et al., 2011; Deng & Tavares, 2013; Dias & Diniz, 2014; Ivanović et al., 2013) and WebCT (Ituma, 2011).

As our results show, the wide gap between the applications that the LMS presents for discussion and many available communication and collaboration tools on the Internet hinders users' active engagement with tools embedded within the LMS. Capabilities such as easy editing, simplicity, customisability, and easy navigation structure are not well supported in current LMS design, which strongly affects how end users interact with the LMS tools.

These results are compatible with the parameters of perceptions of innovation characteristics (PCI) (Rogers, 1995) model. In this model, relative advantage is a PCI parameter defining the level of enhancement a system offers compared to previous tools for accomplishing the same task; compatibility is a PCI parameter referring to the degree to which a system is consistent with the learner's current requirements, values and previous experiences. Both of these impact on how a system is perceived as useful. Our results show that students and lecturers evaluate the LMS according to their previous experiences with other available tools, and as a result they demand LMS tools that are as efficient as web applications they have tried previously.

Overall, the current research reveals a number of changes needed to improve the structure of e-learning tools within LMSs to further engage students and lecturers. LMS designers should provide more user-friendly e-learning tools that let both students and teachers set privacy and anonymity settings. Moreover, the customisability of the LMS e-learning tools without too many tools and options was found to be other important LMS design parameters. The contribution of this research is in the details it provides regarding the need for user-friendly LMS tools to ensure good user engagement, and the importance of user control over anonymity in the LMS realm, as well as the need to avoid technology overload.

This research finding assists LMS designers to know about both students' and lecturers' perspectives on and expectations regarding the existing LMS tools. The details provided in this paper can extend LMS designers' knowledge of current challenges in the LMS structure, and provide suggestions to enhance the user-friendliness of e-learning tools within LMS.

The theoretical contribution of this research is in the details it provides about the PEU of LMSs such as Blackboard in the e-learning realm. Two main factors impact the ease of using a system. One is the level of user knowledge and skills to perform the task, and the other is the level of complexity of the system design. Regarding the focus of this research, from the LMS structure perspective, easy editing procedure, notification and auto-correction functionalities, customisability, the ability to post anonymously and avoidance of technology overload enhances the PEU of the e-learning system. These parameters can be applied to assess the PEU of any e-learning system; however, the significant level of the effect of each of these factors requires further study.

The findings of this study are qualitative and mostly tentative, and may require further testing and validation. Therefore, the most important area for further investigation could be to conduct a quantitative study to validate and generalise the presented parameters, as well as the identified PEU parameter of the respective LMS.

Conclusion

To conclude, participants (60 students and 14 teachers) suggested that Blackboard is difficult to navigate and it is not user-friendly enough, and specifically, not well designed for discussion and collaboration activities. Four major parameters were found to be important in the LMS design: user-friendly structure, support for privacy, posting anonymously, and more customisable student-centred tools, as well as avoiding too many tools and links. The new finding of this research into LMS design parameters was the impact of anonymity and technology overload on the user's tendency to engage with LMS tools. Moreover, this study uniquely found efficient editing functionality, notification procedure, and auto-correction features to be important factors affecting the PEU of LMSs. Further research is required to investigate the optimum level of functionalities that LMS can offer.

References

Abdalla, I. (2007). Evaluating effectiveness of e-blackboard system using TAM framework: A structural analysis approach. *AACE Journal, 15*(3), 279–287. Retrieved from https://www.learntechlib.org/p/21805/article_21805.pdf

Anderson, T. (2008). *The theory and practice of online learning*. Edmonton: Athabasca University Press.

Appleton, J. J., Christenson, S. L., & Furlong, M. J. (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. *Psychology in the Schools, 45*(5), 369–386. doi:10.1002/pits.20303

Barkley, E. F. (2009). *Student engagement techniques: A handbook for college faculty*. San Francisco, CA: Jossey-Bass.

Becker, R., & Jokivirta, L. (2007). *Online learning in universities: Selected data from the 2006 Observatory Survey*. Redhill: The Observatory on Borderless Higher Education. Retrieved from http://www.obhe.ac.uk/documents/view_details?id=15

Blin, F., & Munro, M. (2008). Why hasn't technology disrupted academics' teaching practices? Understanding resistance to change through the lens of activity theory. *Computers & Education, 50*(2), 475–490. doi:10.1016/j.compedu.2007.09.017

Bradford, P., Porciello, M., Balkon, N., & Backus, D. (2007). The blackboard learning system: The be all and end all in educational instruction? *Journal of Educational Technology Systems, 35*(3), 301–314. doi:10.2190/X137-X73L-5261-5656

Bradley, M. E., Thom, L. R., Hayes, J., & Hay, C. (2008). Ask and you will receive: How question type influences quantity and quality of online discussions. *British Journal of Educational Technology, 39*(5), 888–900. doi:10.1111/j.1467-8535.2007.00804.x

Bransford, J., Brwon, A. L., & Cocking, R. R. (1999). *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.

Bryman, A. (2012). *Social research methods*. Oxford: Oxford University Press.

Carvalho, A., Areal, N., & Silva, J. (2011). Students' perceptions of Blackboard and Moodle in a Portuguese university. *British Journal of Educational Technology, 42*(5), 824–841. doi:10.1111/j.1467-8535.2010.01097.x

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. London: Sage.

Chawdhry, A., Paullet, K., & Benjamin, D. (2011). Assessing Blackboard: Improving online instructional delivery. *Information Systems Education Journal, 9*(4), 20. Retrieved from http://isedj.org/2011-9/N4/ISEDJv9n4p20.html

Chiu, C. M., Hsu, M. H., Sun, S. Y., Lin, T. C., & Sun, P. C. (2005). Usability, quality, value and e-learning continuance decisions. *Computers & Education, 45*(4), 399–416. doi:10.1016/j.compedu.2004.06.001

Chiu, C. M., Sun, S. Y., Sun, P. C., & Ju, T. L. (2007). An empirical analysis of the antecedents of web-based learning continuance. *Computers & Education, 49*(4), 1224–1245. doi:10.1016/j.compedu.2006.01.010

Chiu, C. M., & Wang, E. T. G. (2008). Understanding Web-based learning continuance intention: The role of subjective task value. *Information & Management, 45*(3), 194–201. doi:10.1016/j.im.2008.02.003

Chung, L. I. M. S., Raymond, C. W. S., & Foon, H. E. W. K. (2011). Critical thinking in asynchronous online discussion: An investigation of student facilitation techniques. *New Horizons in Education, 59*(1), 52–65. Retrieved from ERIC database. (EJ955477)

Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five approaches.* Thousand Oaks, CA: Sage.

Dabbagh, N., & Kitsantas, A. (2012). Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *The Internet and Higher Education, 15*(1), 3–8. doi:10.1016/j.iheduc.2011.06.002

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340. doi:10.2307/249008

Deng, L., & Tavares, N. J. (2013). From Moodle to Facebook: Exploring students' motivation and experiences in online communities. *Computers & Education*, *68*, 167–176. doi:10.1016/j.compedu.2013.04.028

Dias, S. B., & Diniz, J. A. (2014). Towards an enhanced learning management system for blended learning in higher education incorporating distinct learners' profiles. *Journal of Educational Technology & Society, 17*(1) 307–319. Retrieved from http://www.jstor.org/stable/jeductechsoci.17.1.307

Edgerton, R. (1997). *Education white paper.* Philadelphia, PA: Pew Charitable Trusts.

Finn, J. D., & Zimmer, K. S. (2012). Student engagement: What is it? Why does it matter? In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement*, (pp. 97–131). Boston, MA: Springer.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59–109. doi:10.3102/00346543074001059

Gokce, D. K., O'Brien, D., & Wilson, L. (2012). A learning odyssey: Artistic collaboration around a Greek myth. *Schools: Studies in Education, 9*(2), 147–159. Retrieved from http://www.jstor.org/stable/10.1086/667912

Green, S. M., Weaver, M., Voegeli, D., Fitzsimmons, D., Knowles, J., Harrison, M., & Shephard, K. (2006). The development and evaluation of the use of a virtual learning environment (Blackboard 5) to support the learning of pre-qualifying nursing students undertaking a human anatomy and physiology module. *Nurse Education Today, 26*(5), 388–395. doi:10.1016/j.nedt.2005.11.008

Greenhow, C., Robelia, B., & Hughes, J. E. (2009). Learning, teaching, and scholarship in a digital age: Web 2.0 and classroom research: What path should we take now? *Educational Researcher, 38*(4), 246–259.doi:10.3102/0013189X09336671

Griffin, A., & Hauser, J. R. (1993). The voice of the customer. *Marketing Science, 12*(1), 1–27. doi:10.1287/mksc.12.1.1

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods, 18*(1), 59–82. doi:10.1177/1525822X05279903

Guest, G., MacQueen, K. M., & Namey, E. E. (2011). *Applied thematic analysis.* Los Angeles, CA: Sage.

Hage, H., & Aïmeur, E. (2009). (2009). The impact of privacy on learners in the context of a web-based test. In V. Dimitrova (Ed.), *Artificial intelligence in education: Building learning systems that care: From knowledge representation to affective modelling* (pp. 65–72). Amsterdam: IOS Press.

Heaton-Shrestha, C., Gipps, C., Edirisingha, P., & Linsey, T. (2007). Learning and e-learning in HE: The relationship between student learning style and VLE use. *Research Papers in Education, 22*(4), 443–464. doi:10.1080/02671520701651797

Heirdsfield, Walker, S., Tambyah, M., & Beutel, D. (2011). Blackboard as an online learning environment: What do teacher education students and staff think? *Australian Journal of Teacher Education, 36*(7), 1–16. doi:10.14221/ajte.2011v36n7.4

Iqbal, S., & Qureshi, I. A. (2011). Learning management systems (LMS): Inside matters. *Information Management and Business Review, 3*(4), 206–216. Retrieved from https://works.bepress.com/shakeel_iqbal/5/

Ituma, A. (2011). An evaluation of students' perceptions and engagement with e-learning components in a campus based university. *Active Learning in Higher Education, 12*(1), 57–68. doi:10.1177/1469787410387722

Ivanović, M., Putnik, Z., Komlenov, Ž., Welzer, T., Hölbl, M., & Schweighofer, T. (2013). Usability and privacy aspects of Moodle: Students' and teachers' perspective. *Informatica, 37*, 221–230. Retrieved from http://www.informatica.si/index.php/informatica/article/view/451

Jimerson, S. R., Campos, E., & Greif, J. L. (2003). Toward an understanding of definitions and measures of school engagement and related terms. *The California School Psychologist, 8*(1), 7–27. doi:10.1007/BF03340893

Karr-Wisniewski, P., & Lu, Y. (2010). When more is too much: Operationalizing technology overload and exploring its impact on knowledge worker productivity. *Computers in Human Behavior, 26*(5), 1061–1072. doi:10.1016/j.chb.2010.03.008

Lau, S. H., & Woods, P. C. (2009). Understanding learner acceptance of learning objects: The roles of learning object characteristics and individual differences. *British Journal of Educational Technology, 40*(6), 1059–1075. doi:10.1111/j.1467-8535.2008.00893.x

Lee, M. C. (2010). Explaining and predicting users' continuance intention toward e-learning: An extension of the expectation–confirmation model. *Computers & Education, 54*(2), 506–516. doi:10.1016/j.compedu.2009.09.002

Liaw, S. S. (2008). Investigating students' perceived satisfaction, behavioral intention, and effectiveness of e-learning: A case study of the Blackboard system. *Computers & Education, 51*(2), 864–873. doi:10.1016/j.compedu.2007.09.005

Madhuri, G., Kantamreddi, V., & Goteti, L. N. S. P. (2012). Promoting higher order thinking skills using inquiry-based learning. *European Journal of Engineering Education, 37*(2), 117–123. doi:10.1080/03043797.2012.661701

Malikowski, S. R., Thompson, M. E., & Theis, J. G. (2007). A model for research in to course management systems: Bridge technology & learning theory. *Educational Computing Research, 36*(2), 149–173. doi:10.2190/1002-1T50-27G2-H3V7

Miri, B., David, B. C., & Uri, Z. (2007). Purposely teaching for the promotion of higher-order thinking skills: A case of critical thinking. *Research in Science Education, 37*(4), 353–369. Retrieved from http://link.springer.com/article/10.1007/s11165-006-9029-2

Neuman, W. L., & Robson, K. (2004). *Basics of social research.* Boston, MA: Pearson.

Nichols, T. (2010). Ensuring higher order thinking skills development in distance learning. *Distance Learning: For Educators, Trainers, and Leaders, 7*(3), 69–73. Retrieved from http://www.infoagepub.com/dl-issue.html?i=p54c1165141471

Nykvist, S. (2008). *Arguing online: Expectations and realities of building knowledge in a blended learning environment* (Doctoral dissertation). Retrieved from http://eprints.qut.edu.au/17710/

Ozkan, S., & Koseler, R. (2009). Multi-dimensional students' evaluation of e-learning systems in the higher education context: An empirical investigation. *Computers & Education, 53*(4), 1285–1296. doi:10.1016/j.compedu.2009.06.011

Parkin, M. (1998). *Microeconomics* (4th ed). Reading, MA: Addison-Wesley.

Pituch, K. A., & Lee, Y. (2006). The influence of system characteristics on e-learning use. *Computers & Education, 47*(2), 222–244. doi:10.1016/j.compedu.2004.10.007

Reschly, A. L., Huebner, E. S., Appleton, J. J., & Antaramian, S. (2008). Engagement as flourishing: The contribution of positive emotions and coping to adolescents' engagement at school and with learning. *Psychology in the Schools, 45*(5), 419–431. doi:10.1002/pits.20306

Roca, J. C., Chiu, C. M., & Martínez, F. J. (2006). Understanding e-learning continuance intention: An extension of the technology acceptance model. *International Journal of Human-Computer Studies, 64*(8), 683–696. doi:10.1016/j.ijhcs.2006.01.003

Rogers. (1995). *Diffusion of innovations.* New York, NY: Free Press.

Rudestam, K. E., & Schoenholtz-Read, J. (2002). The coming of age of adult education. In K. E. Rudestam & J. Schoenholtz-Read (Eds.), *Handbook of online learning: Innovations in higher education and corporate training* (pp. 3–28). Thousand Oaks, CA: Sage.

Russell, V., Ainley, M., & Frydenberg, E. (2005). *Schooling issues digest: Student motivation and engagement.* Canberra: Department of Education, Science and Training, Australian Government.

Seidman, I. (2012). *Interviewing as qualitative research: A guide for researchers in education and the social sciences*. New York, NY: Teachers College Press.

Selim, H. M. (2007). Critical success factors for e-learning acceptance: Confirmatory factor models. *Computers & Education, 49*(2), 396–413. doi:10.1016/j.compedu.2005.09.004

Skinner, E. A., Kindermann, T. A., & Furrer, C. J. (2009). A motivational perspective on engagement and disaffection conceptualization and assessment of children's behavioral and emotional participation in academic activities in the classroom. *Educational and Psychological Measurement, 69*(3), 493–525. doi:10.1177/0013164408323233

Squillante, J. (2014). *Analyzing Blackboard: Using a learning management system from the student perspective.* (Master's dissertation). Retrieved from http://digitalcommons.lasalle.edu/mathcompcapstones/20/

Stern, D. M., & Willits, M. D. (2011). Social media killed the LMS: Re-imagining the traditional learning management system in the age of blogs and online social networks. *Cutting-edge Technologies in Higher Education, 1*, 347–373. doi:10.1108/S2044-9968(2011)0000001020

Sun, P. C., Tsai, R. J., Finger, G., Chen, Y. Y., & Yeh, D. (2008). What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education, 50*(4), 1183–1202. doi:10.1016/j.compedu.2006.11.007

Teddlie, C., & Tashakkori, A. (2009). *Foundations of mixed methods research*. Thousand Oaks, CA: Sage.

Vassell, C., Amin, N., & Winch, S. (2008, August). *Evaluating the use of wikis in student group work within Blackboard.* In H. White (Ed.), *9th Annual Conference of the Subject Centre for Information and Computer Sciences (ICS 2008)* (pp. 126–132). Ulster: Higher Education Academy. Retrieved from https://www.researchgate.net/profile/Thomas_Lancaster/publication/234127077_How_to_succeed_at_cheating_without_really_trying_Five_top_tips_for_successful_cheating/links/0c96053a0543beebf9000000.pdf

Williams, R. B. (2003). *Higher order thinking skills: Challenging all students to achieve*. Thousand Oaks, CA: Corwin Press.

Wilson, J. W. (2007). *The Blackboard jungle: A case study of instructor and student perceptions of the learning technology tool Blackboard* (Doctoral dissertation). Retrieved from http://soar-dev.wichita.edu/bitstream/handle/10057/1184/t07060.pdf?sequence=1

Zanjani, N., Nykvist, S. S., & Geva, S. (2012, November). *Do students and lecturers actively use collaboration tools in learning management systems?* In G. Biswas, L-H. Wong, T. Hirashima, & W. Chen. (Eds.), *Proceedings of 20th International Conference on Computers in Education (ICCE 2012)* (pp. 698–705). Singapore: National Institute of Education, Nanyang Technological University. Retrieved from http://eprints.qut.edu.au/55728/2/55728.pdf

Corresponding author: Nastaran Zanjani, nastaran.zanjani@gmail.com