April 2016

Quality Management of Learning Management Systems: A User Experience Perspective

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CURRENT ISSUES IN EMERGING ELEARNING

Volume 3, Issue 1

Special Issue on MOOC Design and Delivery: Opportunities and Challenges

Available online at: http://scholarworks.umb.edu/ciee/

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Abstract

Learning Management Systems (LMS) have been the main vehicle for delivering and managing e-learning courses in educational, business, governmental and vocational learning settings. Since the mid-nineties there is a plethora of LMS in the market with a vast array of features. The increasing complexity of these platforms makes LMS evaluation a hard and demanding process that requires a lot of knowledge, time, and effort. Nearly 50% of respondents in recent surveys have indicated they seek to change their existing LMS primarily due to user experience issues. Yet the vast majority of the extant literature focuses only on LMS capabilities in relation to administration and management of teaching and learning processes. In this study the authors try to build a conceptual framework and evaluation model of LMS through the lens of User Experience (UX) research and practice, an epistemology that is quite important but currently neglected in the e-learning domain. They conducted an online survey with 446 learning professionals, and from the results, developed a new UX-oriented evaluation model with four dimensions: pragmatic quality, authentic learning, motivation and engagement, and autonomy and relatedness. Their discussion on findings includes some ideas for future research.

Keywords: Learning management systems, User Centered Design, User Experience, Evaluation model.

QUALITY MANAGEMENT OF LEARNING MANAGEMENT SYSTEMS: A USER EXPERIENCE PERSPECTIVE

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THROUGH USERS' EYES: EVALUATING LEARNING MANAGEMENT SYSTEMS

Since the early days of the rapid expansion of e-learning, the need for a virtual place that connects users (learners and instructors) with courses and a variety of learning content has become evident. Course Management Systems (CMS) and then Learning Management Systems (LMS) have been developed to address such a need. Added to the abundance of terms are Virtual Learning Environments (VLE) and, more recently, Personal Learning Environments (PLE). We, the authors, focus in this paper on Learning Management Systems: well-known software platforms for the administration, documentation, tracking, reporting, and delivery of e-learning education courses or training programs. According to Kurilovas (2009), LMSs are considered to be specific information systems that provide the possibility to create and use different learning scenarios and methods. Most of the definitions in the literature have been influenced by developments in the industry that emphasize the administrative capabilities of LMS. For instance, Alias and Zainuddin (2005) defined a learning management system (LMS) as "a software application or Web-based technology used to plan, implement, and assess a specific learning process" (p. 28) while Mohawk College (2009) suggested an "LMS can be broadly described as a web-accessible platform for the 'anytime' delivery, tracking and management of education and training." In most definitions and approaches, the focus is on the administration and management of the teaching and learning processes.

The evolution of LMSs was swift: Many vendors developed and offered their solutions in a rapidly growing market. There was huge interest by the educational institutions and the companies that wanted to invest in new learning technologies; consequently, adoption was widespread. Since there is a plethora of LMSs in the market and each LMS is a complex system that incorporates a vast array of features, the selection and evaluation of an LMS is a complex and demanding process that requires a lot of knowledge, time, and effort. Although there is some limited research work on the issue, it still remains an open and

multifaceted problem as the technology evolves over time along with the maturity of e-learning users. In this study, we try to investigate the issue of LMS evaluation through the lens of User Experience (UX) research and practice, which is quite important but also neglected in the e-learning domain. We propose a new UX-oriented evaluation model with four main dimensions. We expect that this model will help e-learning designers as well as usability and UX practitioners make an alternative evaluation of LMS platforms. Next sections present related work and describe the method of this study, including data analysis and results, followed by discussion and future research ideas.

RELATED WORK

The vast majority of the extant literature regarding LMSs relates to the issue of LMS adoption and acceptance. LMS evaluation to date has been examined from various perspectives, including those of administrators (Naveh, Tubin, & Pliskin, 2010), faculty members (Almarashdeh, Sahari, Zin, & Alsmadi, 2011) and learners/students (Naveh, Tubin, & Pliskin, 2012).

For instance, Al-Busaidi and Al-Shihi (2010) developed a theoretical framework for evaluating instructors' acceptance of LMSs based on the Technology Acceptance Model. They examined the main critical factors that influence the instructors' perception of ease of use and perception of the usefulness of LMSs. These factors focus on the instructors, organization, and technology:

- Instructor factors include attributes such as perceptions of self-efficacy, attitudes toward LMS, experience, teaching style, and personal innovativeness.
- Organization factors include motivators, technology alignment, organizational support, technical support, and training.
- Technology factors include system quality, information quality, and service quality.

Emelyanova and Voronina (2014) investigated stakeholders' perceptions of the LMS's convenience, effectiveness, and usefulness. These scholars emphasized the human factor perspective as they asserted that this is a vital prerequisite for the success of the LMS. They also highlighted that a lot of learners perceive that there is a problem with usability of LMSs. In addition they found that, for some students, the perceived ease of use of LMS does not necessarily imply its usefulness as a learning tool.

On the other hand, there are very few studies that have investigated the complex decision-making problem of evaluation and selection of an LMS. Focusing on this issue, Pipan et al. (2010) proposed the Evaluation Cycle Management (ECM) methodology. This methodology is based on two evaluation phases: a) multi-attribute decision making (criteria evaluation) and b) usability testing (usability evaluation).

Multi-attribute decision making refers to the development of a qualitative hierarchical decision model based on *Decision EXpert* (DEX), an expert system shell for multi-attribute decision support. The criteria for the first phase of evaluation are divided into three main scopes, specifically *student's learning environment; system, technology, and standards;* and *tutoring and didactics*.

- The first category, "student's learning environment," is composed of four basic attributes: ease of use, communication, functional environment, and help.
- The "system, technology and standards" category comprises the basic attributes of *technological independence, security and privacy, licensing and hosting,* and *standards support*. Technological independence relates to the evaluation of accessibility of an LMS. Security and privacy focuses on security and privacy of users and of an LMS.
- "Tutoring and didactics" relates to instructional issues such as course development, activity tracking, and assessment criteria.

The second phase of the evaluation according to Pipan et al. (2010) aims at usability evaluation, but the authors seem to take the traditional approach to usability, focusing mainly on the three traditional usability dimensions: effectiveness, efficiency, and satisfaction. Although this comprehensive framework emphasizes the user, at the same time it neglects other important aspects of interaction such as emotional, experiential, and other issues that define the so-called user experience (UX).

In the same vein, Orfanou et al. (2015) conducted a usability evaluation study of two well-known LMS platforms employing the System Usability Scale (SUS). These scholars try to further validate the use of SUS in the context of e-learning systems; however, while SUS is a very well established and validated instrument, it is quite generic and requires customization when applied to e-learning. In addition, as an instrument oriented toward usability measurement, it omits some other aspects that relate to the holistic view of UX.

Other scholars focus mainly on technical aspects of LMSs. For instance Kurilovas (2009) elaborated on a methodology that expands on a subset of the criteria, mainly focusing on the technical aspects of LMSs such as the following:

1. Overall architecture and implementation issues, such as scalability of the system, modularity and extensibility, and security
2. Interoperability
3. Cost of ownership
4. Issues that refer to the strength of the development community for open source products, such as the longevity of installed base and, documentation, the open development process, and the commercial support community
5. Licensing
6. Internationalization and localization issues
7. Accessibility
8. Document transformation

Kim and Lee (2007) developed their study around these instruction-related and e-learning-related criteria: instructional management, interaction, evaluation, information guidance, screen design, technology, and organizational demand.

The first four of these criteria directly relate to instructional issues, whereas screen design, technology, and organizational demand support instructional activities specific to e-learning. In Kim and Lee's framework, many elements relate to the interaction of users with an LMS; its primary focus, however, is on the functional requirements and usability issues. For instance, screen design evaluation centers on usability issues such as visual design, clarity of directions, consistency, readability, ease of navigation, learner control, appropriateness of multimedia, and so forth.

It is evident that all the above frameworks take a traditional managerial approach and investigate LMS through the lens of administrative activities. In addition, some of the more recent works acknowledge the importance of human factors and usability, but they do not take an open and holistic UX-oriented view. To this end, we argue that these frameworks require enhancements to address the ever-increasing demands of the users and the new trends in LMS design and implementation. It is of high importance that we underscore the emergence of UX and identify its critical elements so as to help e-learning designers and practitioners build effective and motivational learning experiences.

RECENT TRENDS AND THE EMERGENCE OF UX

Recent surveys (Spiro, 2014) on LMS satisfaction and spending trends found that almost 50% of the respondents are looking to change their existing learning management system (LMS) due to problems such as these:

1. Lack of mobile features
2. Dated appearance and user experience
3. Difficulty of use
4. Poor reporting features
5. Poor customer support
6. Inability to adapt to changing needs

Of the problems noted above, most relate to two kinds of issues: design issues that directly affect the user (aka customer) experience, such as poor usability, poor visual design, and lack of responsive design, and managerial issues, such as reporting capabilities and adjustments to organizational needs. In addition to focusing on administrative and managerial issues, it is imperative that vendors and developers incorporate human-centered design dimensions in their practices and apply a UX-driven philosophy and practices in the LMS development and implementation process.

UX focuses on the investigation of the feelings and thoughts of humans about an interactive product or system or application. UX, established and widely

acknowledged as one of the most important quality parameters, involves mainly two sub-qualities: traditional usability or pragmatic quality and hedonic, beauty, experiential, and affective factors (Hassenzahl & Tractinsky, 2006). It seems that the increasing importance of UX comes as the main answer to the shift in user expectations and growing demands. The pervasiveness of technological innovations has combined with the massive and heterogeneous user population to set new standards for humans' interaction with systems and interactive products. Multi-modal design, social networking, and gamification techniques are just a few of the major recent developments that can be aligned with the so-called UX process design. To this end, hundreds of companies have incorporated UX practices and methods in business strategy and development as a crucial parameter for delivering great customer experiences (Gribbons, 2013).

New trends in LMS platforms can help to overcome the aforementioned challenges. The following summarizes some of the most popular trends in designing the new generation of LMSs (Gautam, 2012):

1. Cloud-based LMS: Cloud-based LMSs have the capacity to bring down the cost of ownership, very important especially for small and medium enterprises.

2. Personal Learning Environment: The PLE involves the smooth integration of web 2.0 services. For instance, it is important for users to have several functionalities related to social networks in one place for viewing. In addition it is important to incorporate a semantic search function to enhance the user experience. Platforms with a semantic search function understand and track the user's search intention and context. In the same vein, a modern LMS must be able to assess learners' interests and gaps in knowledge and skills and proactively suggest new information, courses, social communities, and networks for consideration. In addition LMSs must provide a facility for user-based content generation.

3. A user experience that enhances learners' motivation and engagement: LMSs can employ new techniques such as gamification characteristics or APIs that support the incorporation of game mechanics.

In addition, when referring to UX issues in the context of e-learning technologies and platforms, it is important to emphasize learners' control and autonomy. An abundance of new technologies give learners the power to take control of their own learning: MOOCs, wikis, blogs, virtual worlds and games, social networks, and so on. On the other hand, learners are becoming more mature users of technology and they have greater expectations. It is evident that learning is becoming a more "pull" and less "push" process. To this end there is a greater need than ever for personalized learning experiences. LMSs need to offer

personalized learning paths based on the outcome of previous learners' activities. LMS developers must place greater emphasis on self-directed learning in response to changing learner expectations, including the increased need to feel autonomous and in control of one's own learning.

We should note a related phenomenon: The job of learning professionals (e.g., instructors/trainers, instructional designers and e-learning designers, HRD managers) is rapidly changing. It is no longer enough to create e-learning courses and schedule learning and training events. Learning professionals need to be supported in a new role involving the collection and combination of various information and learner-generated content. Learning professionals must be able to provide holistic learning experiences that target both learners' cognitive and emotional needs. To this end we assert that there is a need for a shift in the new evaluation frameworks for LMSs in the following dimensions:

- From evaluation of the administration and management experience to evaluation of the user experience.

- From evaluation based on an instructor-centered model to evaluation based on customer-centered development (with 'customer' comprising instructors, learners, and other stakeholders).

- From the LMS as the locus for a closed, formal learning experience to a platform supporting learners' need to interact through social networks and other collaborative informal learning spaces.

- In accordance with the above analysis, we attempt to formulate a new conceptual model and a related survey tool for the evaluation of LMSs guided by the UX perspective. Next sections present our method and the empirical work we have accomplished, along with data analysis, preliminary results, and discussion.

METHOD

DESIGN OF THE SURVEY

The underlying theoretical background for the design and setup of our survey tool for the evaluation of LMSs follows the tradition of UX research and Self-Determination Theory (SDT). One of the most influential models in UX literature is the one proposed by Hassenzahl (2003); according to this model each interactive product or system has both a pragmatic and hedonic quality, each of which contributes to the UX. SDT, which fosters relatedness, competence, and autonomy, is one of the most well researched psychological theories of intrinsic motivation (Deci and Ryan, 1985):

- Relatedness refers to the universal need to interact and be connected with others.
- Competence refers to the universal need to be effective and master a problem in a given environment.
- Autonomy refers to the universal need to control one's own life.

We combined Hassenzahl's model and SDT to provide an interpretation framework for our empirical work on the new LMS evaluation model we propose.

SURVEY INSTRUMENT AND DATA COLLECTION

A key aspect of our research involved developing a survey instrument to measure specific dimensions of UX in the context of LMS. In order to improve the process of the instrument development, we conducted a content validity check and a small pilot study. For content validity purposes we asked three experts in UX research and e-learning design to review the instrument we had developed. Experts gave feedback on the main measurement dimensions and the number of items. We conducted a parallel pilot study with 10 e-learning professionals (designers, educators, LMS administrators) and gathered feedback primarily on the wording of some items in the questionnaire. Based on the responses from experts and e-learning professionals, we developed a revised version of the questionnaire; some items were deleted, some others were merged and reworded. The final version contained the main part, with 48 items for gathering UX responses, and a second part, with questions designed to gather demographic information (see Appendix).

STUDY PARTICIPANTS

We sent out the survey instrument to more than 1,000 learning professionals through a well-known industrial e-learning portal, elearningindustry.com. The LMS roles of the participants broke down as follows: Almost 33% of the study participants were learners, 25% were LMS administrators, while 42% were professors and trainers (though most in this last group have LMS administrator rights as well).

The online survey lasted one and a half months. We received responses from 808 participants overall[1]; however, 362 responses showed incomplete data and missing values and were thus deleted from the dataset. The majority of the respondents self-identified as male (64%) and 36% as female. All respondents reported high proficiency in computer and Internet usage.

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[1] The authors would like to thank all the participants who answered the online survey providing data for this study.

Data analysis and results

We used several statistical methods to examine the data. Descriptive statistics were run to analyze the collected data; we also performed an exploratory factor analysis to condense a large set of variables down to a smaller number of dimensions or factors. As a main tool for performing the statistical analyses we used the Statistical Package for the Social Sciences (SPSS) 17.0. In order to validate the identified factor structure, we performed reliability tests by assessing the internal consistency of the items using Cronbach's alpha coefficient.

Factor analysis

Through explanatory factor analysis, we identified the underlying dimensions of LMS user experience as perceived by the respondents. The Kaiser-Mayer-Olkin (KMO) Measure of Sampling Adequacy (which indicates whether the sample size is adequate for performing factor analysis and varies from 0 to 1.0) was 0.969, comfortably higher than the recommended level of 0.6 (Hair et al., 1998). We applied the following rules to this factor analysis:

1. Used a principal components extraction (a method to extract factors generally used for data reduction) with Varimax rotation, the most common rotation method. (Rotation serves to make the output more understandable and is usually necessary to facilitate the interpretation of factors.)

2. Used a minimum eigenvalue (which represents the amount of variance accounted for by a factor) of one as a cutoff value for extraction.
3. Deleted items with factor loadings less than 0.32 on all factors or greater than 0.32 on two or more factors.

According to the above criteria, a solution with four factors was extracted explaining 62.648% of the variance (Table 1). This percentage is quite high, leading us to consider the survey instrument in this study to operate successfully. The whole process of interpretation of the factor analysis led to the refinement of the questionnaire and a more parsimonious solution, with four factors representing user experience parameters of LMS platforms as follows: Pragmatic Quality, Motivation and Engagement, Authentic Learning, Autonomy and Relatedness.

Items	Factor loadings	Factors	Total variance explained (%)
q13	.857	Pragmatic Quality	46.68
q17	.704		
q27	.699		
q12	.698		
q10	.690		
q14	.682		
q28	.673		
q16	.668		
q9	.645		
q8	.645		
q25	.643		
q15	.627		
q26	.601		
q11	.522		
q18	.425		
q19	.369		
q23	.356		
q7	.342		
q29	.321		
q53	.751	Motivation and Engagement	7.18
q52	.740		
q54	.715		
q43	.458		
q50	.420		
q49	.334		
q47	-.830	Authentic Learning	5.35
q46	-.743		
q44	-.580		
q48	-.525		
q45	-.436		
q41	-.307		
q35	-.715	Autonomy and Relatedness	3.43
q32	-.645		
q36	-.640		
q33	-.620		
q39	-.567		
q34	-.563		
q37	-.545		
q38	-.435		
q40	-.382		

Table 1: Factor solution

In addition, factor analyses led to a reduced set of variables (i.e., items in the questionnaire). The first version of the questionnaire contained 51 items (48 regarding the UX dimensions, and three questions about demographics). The second version of the questionnaire (after the factor analysis and the respective interpretation) contained 40 items representing four user experience constructs (the four factors extracted as already presented). Table 2 presents the main descriptive statistics of the four factors.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
PQ	421	1.00	5.00	3.7440	1.05683
Meng	454	1.00	5.00	3.3546	1.49151
AuL	460	1.00	5.00	3.8656	1.29576
AuTCom	450	1.00	5.00	3.188	1.15925
Valid N (listwise)	372				

Table 2: Descriptive statistics of the four factors

RELIABILITY AND VALIDITY

In order to determine the reliabilities of the factors and to assess the internal consistency of the factors, we used Cronbach's alpha. All the factors have high values of Cronbach's alpha, with each factor measuring above 0.8, thus close to one. The specific Cronbach alphas are presented in Table 3, below.

Factors	Cronbach alpha
Pragmatic Quality	α= .958
Motivation & Engagement	α= .891
Authentic Learning	α= .878
Autonomy & Relatedness	α= .903

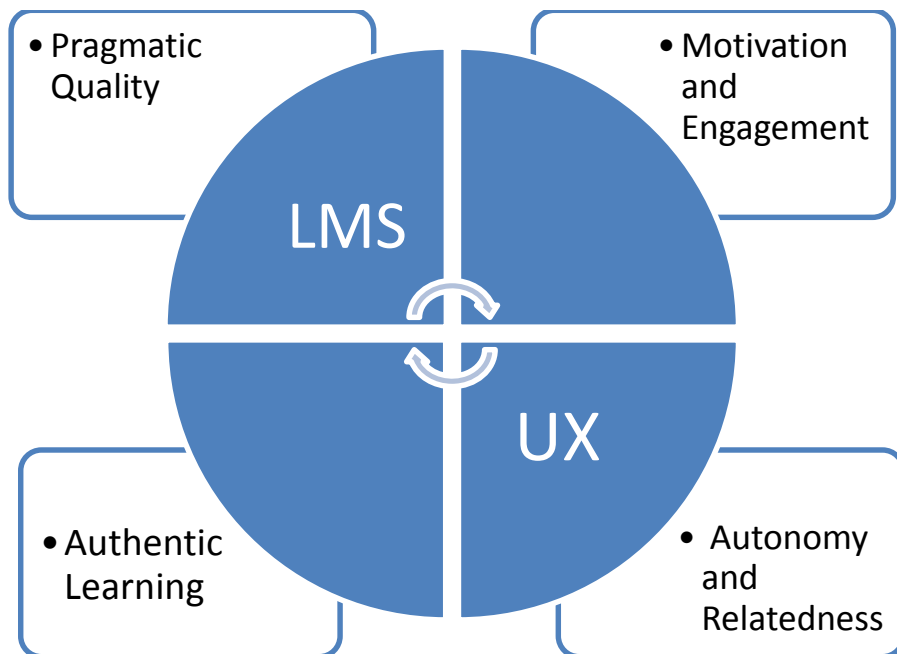**Table 3:** Internal consistency of the factors

Figure 1: UX evaluation dimensions for LMS

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INTERPRETATION OF FINDINGS AND FUTURE RESEARCH

The findings of the statistical analyses revealed four factors. We arrived at an interpretation based on Hassenzahl's model of UX and SDT, through which process we propose a new UX-driven evaluation model for contemporary LMS platforms. The figure above depicts the main evaluation dimensions.

PRAGMATIC QUALITY

All the interactive systems or applications have a pragmatic and hedonic quality that make up the user experience (Hassenzahl, 2003). The pragmatic quality is related to the users' need to achieve behavioral goals, the "do" goals. This in turn is related to the main aspects of usability of a system. Effectiveness, efficiency, and perceived satisfaction are the main archetypical usability dimensions for every interactive system. The e-learning context, however, requires additional dimensions for pragmatic quality. Several researchers (Lanzilotti et al., 2006; Zaharias, 2006, Nokelainen, 2006) have proposed that traditional usability parameters need to be augmented with design parameters from other fields such as learning design and instructional design. It seems that effectiveness and efficiency have a different meaning in the context of e-learning courses and platforms (Zaharias, 2009).

AUTHENTIC LEARNING

When dealing with the design of learning experiences, one of the most important elements is to create meaningful learning interactions that relate to real world situations. Authentic learning experiences typically relate to the real world and complex problems. Learning environments must provide affordances for effective integration of learning methods that go beyond the passive absorption of learning content. These can include role-playing exercises, problem-based activities, case studies, and participation in virtual communities of practice (Chang et al., 2010).

Design of these environments has to support a whole range of learners' needs. Learners seek opportunities to apply their knowledge to solve real problems; they want to be able to explore new contexts; they need to find connections and build communities of practice (Lombardi, 2007). Especially for building communities of practice, we see that key tenets of connectivism (Siemens, 2004) suggest meaning-making and forming connections between specialized communities are important activities. Emerging learning technologies such as MOOCs try to incorporate these kinds of opportunities in order to provide rich and meaningful learning experiences. We assert that modern LMS platforms also need to evolve towards these directions.

AUTONOMY AND RELATEDNESS

Autonomy can be defined as "the ability to take charge of one's own learning" (Holec, 1981). In the extant literature, autonomy has been approached as a psychological state (Little, 1991), as a situation (Dickinson, 1992) and as the right of learners (Benson, 2001).

Learner autonomy is considered a very important type of self-directed learning in authentic learning environments (Ribbe and Bezanilla, 2013) where the learners take over the functions of the instructors in selecting content and methods and in guiding the whole learning process (Little, 2004 and 2012). In e-learning and blended learning environments, autonomy also reflects the challenges that learners face regarding the efficient use of the learning management system and the related learning activities. Some researchers assert that efficient use of the LMS is an individual skill of the learner that should be seen as separate from the actual learning goal (Little, 2004 and 2012), which makes the whole task of designing the e-learning experience even more challenging.

As already mentioned, this study has been influenced by the approach suggested by Deci and Ryan (1985) who define autonomy as a process of "self-determination" or "self-regulation." According to this perspective, learners feel that they are involved in authentic learning activities to the degree that they identify those activities as their own. In addition, autonomy is strongly associated with "relatedness," a term that refers to the learners' needs for contact, support, communication, and community-building with others. In keeping with the above premises, a modern LMS must provide affordances for "autonomous interdependence."

MOTIVATION AND ENGAGEMENT

Motivation and engagement are perhaps the most important elements of every form of learning experience. Motivation refers to the internal processes that give behavior its energy and direction (Reeve, 1996). Energy relates to the strength, intensity, and persistence of the behavior concerned. Direction gives the behavior a specific purpose. Behavior can be intrinsically and extrinsically motivated. Extrinsic motivation is grounded in external factors such as social approval/disapproval, rewards, or avoiding negative consequences. Intrinsic motivation can be characterized as the drive arising within the self to carry out an activity whose reward is derived from the enjoyment of the activity itself (Csikszentmihalyi, 1975).

Some sources associate motivation with learning effectiveness in several contexts and with media such as LMS, games, virtual worlds, and MOOCs (Papastergiou, 2009; Lopez-Morteo and Lopez, 2007; Kebritchi et al., 2010). Other scholars have investigated the relationship between usability design and

motivation to learn in e-learning contexts (Zaharias, 2006, 2009). One might argue that motivation is an absolutely essential requirement for every learning process and for every learning environment. It relates so closely to engagement that many prior empirical works use these terms interchangeably. The issue of learners' engagement has gained a lot of attention lately, especially in the context of new educational technologies such as MOOCs. Several scholars have asserted that there is a serious problem in learners' engagement and motivation, due in part to poor technology design and usability. New methodological and technological trends such as gamification practices and platforms aim to bring solutions to this complex problem. Modern LMS platforms follow these trends in order to provide motivating and engaging learning experiences.

FUTURE RESEARCH

In the near future, the main research efforts will aim to provide additional evidence for reliability and validity of the model. For instance, we may modify the second version of the questionnaire developed in this study and develop a new, more compact questionnaire by replacing and re-wording some of the few items that did not discriminate well. We may also use confirmatory factor analysis to determine convergent and discriminant (or divergent) validity (Wang, 2003). After further validating the instrument, we will design a protocol that includes a severity scale for prioritization of both usability and UX issues, and a scoring scheme for the evaluation dimensions. Toward this end, the proposed model and the related evaluation protocol can also provide benchmark information. The evaluation model will be used to assess numerous LMSs, which may lead to the development of a standardized benchmarking database that contains the UX quality profiles of commercial and open-source LMS platforms.

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APPENDIX

A. User experience of LMS

Please rate your experience with the LMS in your organization. IF an item does not apply, please choose the *Not Applicable* option (NA). Note that this evaluation is subjective in nature and there is no "right" or "wrong" answer.

Scale: *1=Strongly Disagree, 2=Disagree, 3= Neither agree or disagree (Neutral), 4=Agree, 5=Strongly Agree, NA= Not Applicable*

Criteria	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	NA
The LMS keeps the learner informed through constructive, appropriate and timely feedback.						
The LMS responds well to user-initiated actions. There are no surprise actions by the LMS or tedious data entry sequences.						
Language usage in terms of phrases, symbols, and concepts is similar to that of learners in their day-to-day environment.						
The same concepts, words, symbols, situations, or actions refer to the same thing.						
The LMS is compatible with common browsers on common hardware (pcs, mobile devices, tablets etc.)						

LMS dialogues do not contain irrelevant or rarely needed information, which could distract users.					
The LMS is designed in such a way that the users cannot easily make serious errors.					
When a user makes an error, the LMS responds with an appropriate error message.					
LMS messages define problems precisely and give quick, simple, constructive, specific instructions for recovery.					
Objects to be manipulated, options for selection, and actions to be taken are visible.					
The user does not need to recall information from one part of the LMS to another.					
Instructions on how to use the LMS are visible or easily retrievable whenever appropriate.					
The LMS caters for different levels of users, from novice to expert.					
Shortcuts or accelerators, unseen by novice users, are provided to speed up interaction and task completion by frequent users.					
The LMS is flexible to enable users to adjust settings to suit themselves, i.e. to customize the interface.					

The LMS has a help facility and other documentation to support users' needs.					
Information in help facilities is easy to search, task-focused, and lists concrete steps to accomplish a task.					
The LMS provides a semantic search function that understands and tracks user's search intention and context.					
The LMS has a simple navigational structure.					
Users know where they are and have the option to select where to go next.					
The navigational options are limited, so as not to overwhelm the user.					
Related information is placed together.					
The LMS generates useful reports regarding the activities of learners and instructors in the courses, discussion forum, quizzes etc.					

Course analysis includes progress reports and consists of both the activities and timestamps of when the activity occurred.					
Learners' behavior tracking is integrated with gamification APIs and platforms.					
Facilities and activities are available that encourage learner-learner and learner-instructor interactions.					
Facilities are provided for both asynchronous and synchronous communication (such as e-mail, discussion forums etc.).					
Learners have some freedom to direct their learning.					
Instructors can customize learning artifacts to the individual learner (e.g. tests and performance evaluations can be customized to the learner's ability).					
LMS provides the possibility to import tests and quizzes from other sources.					

Where appropriate, learners can take the initiative regarding the content and sequence of learning.						
There are multiple representations and varying views of learning artifacts and tasks.						
The LMS supports different strategies for learning.						
The LMS can be easily integrated with other media (blogs, YouTube, Twitter feeds, LinkedIn forms) to support learning.						
Metacognition (the ability of a learner to plan, monitor and evaluate his/her own cognitive skills) is encouraged.						
Learners are able to tag learning components.						
Learners give and receive prompt and frequent feedback about their activities and the knowledge being constructed.						
Learners are guided as they perform tasks.						
Quantitative feedback, e.g. grading of learners' activities, is given, so that learners are aware of their level of performance.						

Authentic, contextualized tasks are undertaken rather than abstract instruction.					
Learning occurs in a context of use so that knowledge and skills are transferable to similar contexts.					
The representations are understandable and meaningful, ensuring that symbols, icons and names used are intuitive within the context of the learning task.					
The LMS incorporates interactive features that attract and motivate learners.					
The LMS incorporates game mechanics (e.g. points, badges, leaderboards, levels etc.) to further engage the learners.					
Gamification elements (when available) are easy to use by the instructors to further develop their learning environment.					
The LMS provides features to assess learners' interests.					
The LMS provides features to assess learners' gaps in knowledge and skills.					
The LMS proactively suggests new sources (e.g. information, courses, social communities and networks) to learners for consideration.					

B. Demographics

1. What is your age?

   ☐   18-24

   ☐   25-34

   ☐   35-44

   ☐   45 -54

   ☐   55 – 64

   ☐   65 +

2. What is your LMS role?

   ☐   Learner / Student

   ☐   Facilitator / Instructor / Professor

   ☐   Administrator

3. What is your role in the organization?

   ☐   Senior management (C-level, president, principal, or director)

   ☐   Manager or supervisor

   ☐   Faculty, professor, or instructor

   ☐   Instructional designer or developer

   ☐   Graphics, video, multimedia, or web developer

   ☐   Training or L&D practitioner

   ☐   HR practitioner

   ☐   Intern, Student

   ☐   Consultant

   ☐   Other

AUTHOR BIOS

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