# Usability Evaluation of Learning Management Systems (LMS) based on User Experience

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**Abstract:**
This study aims to explore and develop a novel approach to assess and evaluate the usability of Learning Management Systems as a case study for universities in Jordan during the COVID-19 pandemic. It also aims to provide recommendations for efficient and effective adoption of these systems. To achieve this goal, a conceptual framework was proposed, and a quantitative approach using questionnaires was designed. Students from different universities in Jordan participated in this study and all the questionnaires were collected and analysed in SPSS. The data analysis carried out in this study was based on three main criteria, namely properties that are not backed up, usability issues, and proposed design improvements. Interestingly, the results reveal that the value of Sig for each criterion was .000, which is less than α (0.05) with different mean values. As a result, there are statistically significant differences among the e-learning systems that are being used by the universities in Jordan.
**Keywords:** Software Usability, Learning Management Systems, End-User Satisfaction.

## 1. Introduction

The outbreak of the COVID-19 pandemic has forced countries around the world to close down educational institutions at all levels. Jordan was one of the first countries in the region to respond to the crisis; in the middle of March 2020, the government took the precautionary measure of closing all educational institutions across the kingdom and the country was immediately placed under lockdown. The Ministry of Higher Education adopted distance learning to sustain the learning process during the pandemic in addition to offering support to university lecturers in implementing new interventions to facilitate the transition to distance learning, by providing training courses using distance learning tools, blended learning, and educational technology. This was driven by the desire to leave no one behind, and to help contain and mitigate the impact of the pandemic on higher education. The use of distance learning tools has helped to reduce the impact of the disruption. E-learning is an advanced educational system that combines the concept of distance learning and traditional learning. It can support and manage the learning process remotely without students being present on campus. E-learning systems provide both students and instructors with tremendous tools that facilitate the learning and teaching process [1]. These systems provide students with educational services such as granting them access to the academic materials that are provided as online materials (i.e., slides, supporting documents). Students can download previously recorded lectures. Moreover, the e-learning system allows students to communicate with each other and with the instructor through the academic forums and chat tools ([15], [16]).

The concept of e-learning is completely adopted using different e-learning systems such as Blackboard and Moodle. In addition, other systems such as Zoom, and Microsoft Teams are used to give full interactive lectures and meetings. Final exams may be held at examination centers determined by the university at the end of each semester, or through online examination systems that are supposed to allow remote monitoring through digital cameras, with specific criteria and conditions ([17], [18]). Universities play a critical role in monitoring and enhancing students' engagement in digital learning materials. However, some universities in Jordan are not yet fully prepared to continue to offer virtual lessons and to provide students with individual support. Less than half of the universities have the professional resources needed by lecturers to make optimum use of digital materials. Also, some lecturers and professors lack the technical and pedagogical skills necessary to integrate digital resources

into their teaching. It creates an environment that stimulates the development of skills in the use of educational technology solutions accordingly, and it ensures that all students can benefit effectively from distance learning opportunities. Despite limited clarity on the impact of distance learning on educational performance, this pandemic provides an opportunity to bridge the digital gap.

Many higher education institutions have been able to adapt to the new situation and are currently continuing to provide education to their students remotely, but they vary in capabilities. The correct model that universities are supposed to provide is the existence of a learning management system directly linked to the student's information system and the registration system. Ideally, student and teacher can meet in an online space that provides all the necessary tools to ensure the continuation of the educational process. The choice of systems that support e-learning must be determined by two factors: the possibility of integration and linking it with learning management systems, and its ability to withstand the great pressure resulting from the simultaneous entry of large numbers of students. Thus, this study comes to examine the novel approach for evaluating the usability of the Learning Management System platforms as a case study of Jordanian universities during the COVID-19 pandemic.

## 2. Background

A large body of existing research has examined the concepts of usability and user satisfaction ([2], [3], [5], [9]). These concepts refer to the evaluation of end-user's responses and interactions with implemented systems, such as ("satisfaction, interest, value, effectiveness, advantages, and dissatisfaction"). Additionally, usability is one of the most substantial concepts in Human Computer Interaction (HCI) research. It commonly includes the evaluation of "ease of use" and "effectiveness". Similarly, usability points to the "effectiveness, efficiency and satisfaction" with a particular goal in the specific term of ease of use [7]. Usability indicates the simplicity of understanding e-learning systems, the ease of comprehension, the speed of locating the content, navigation, and the ability of learners to manage their progress [6].

E-learning systems provide students with many educational features, the most important features are accessing course materials, slides, files, and any other electronic content. E-learning systems enable students to download and watch the recorded lectures and provide methods to communicate with teachers through direct messaging and interactive discussions forums ([15], [16], [20]). Furthermore, E-learning systems provide students with many educational services, technical support, and assistance. Accordingly, teaching progress takes place off-campus [21]. Usability and accessibility are vital, and they are at the forefront of software developers' minds when they consider which system designs to adopt. Websites are not the only online space where usability is of crucial importance; it is also involved in the vast array of software applications available to Smartphone users [10]. Usability is a key factor in the software which impacts the satisfaction of the end-user's experience with the application over time. For software to be considered highly usable, one must be able to navigate the website or application using prior experiences that have been "received" and "learned" and "stored", without the need to learn something new [8]. Software designers should adopt usability properties when they are developing and designing new e-learning systems since usable e-learning systems have been assured to produce great benefits.

The assessment of the usability and accessibility of current e-learning systems is crucial. Usability can be defined as an integration of quality components where these components exemplify the ease level of the operative products or services [4]. Furthermore, the accessibility concept is associated with usability; it is considered as an assistive characteristic that e-learning systems utilize to help people with disabilities (i.e., text-to-speech, closed-captioning, and keyboard shortcuts) [14]. For a great deal of success, e-learning systems must be accessible and easy to use; this has become a crucial principle of integrated systems. Most of the current platforms have become more sophisticated in their content and services since they have been developed using the concept of "user-based" design. Specifically, the concept of user-based design is concerned with the fact that the designed software primarily achieves the goals and requirements of the users and ensures that both the services and functions of the software can be operated easily and quickly.

The researcher is convinced that this research examination may assist both academics and practitioners' comprehension of the research area. Academics can benefit from it because it contributes to the literature review by developing a novel approach for evaluating the usability of the Learning Management System platforms in use in Jordan. The study adds to the existing knowledge and understanding of the elements that affect the evaluation of the usability of Learning Management System platforms, and further information can be obtained from it regarding the factors that evaluate the usability of Learning Management System platforms. As a result, the study could assist universities to ameliorate those elements that currently hinder the usability of Learning Management System platforms.

## 3. Related Work

Abuhlfaia and Quincey's [10] study described a methodical mapping study that scrutinized five electronic libraries to distinguish usability issues and methods that have been applied to evaluate e-learning platforms. Sixty-one papers were chosen and analyzed, with the plurality of studies utilizing a simple research design depending on surveys. Moreover, the mapping research provides a clear idea of the usability of e-learning to direct future research in this area.

A study by Alturki and Al Draiweesh [11] aimed to find answers to the research questions on the accessibility and usability of the Blackboard view, e-learning software and the partition of user experiments when reacting with Blackboard. The study was based on the hypothesis that the Blackboard LMS is very accessible and applicable by lecturers in the King Saud University. The elements that were adopted by the survey for examination included the user interface, navigational characteristics, and ease of use.

Research carried out by Juárez Santiago et al. [12] aimed to evaluate a model that required an architectural design, configuration, metadata, and statistical coefficients using four Learning Management Systems. The study was conducted over one year in nine sets. The outcomes from an LMS Classroom, architecturally and configuration-wise, had the highest level of performance, with an average of 73% when estimated using statistical coefficients. The LMS Classroom had good widespread acceptance and a greater impact: System Factors 82%, Anxiety–Innovation 80%, and Virtual Library 43%, while out of the seven factors, those with the most significant effect on educational competence were Tools Learning 80%, Virtual Library 82%, and Mobile Use 85%.

Work by Ivanović et al. [13] aimed at measuring and contrasting several aspects of the usability and quality of a wide range of e-learning systems by focusing mainly on the communication interfaces of such systems. The results clearly showed that the evaluation of the usability of e-learning environments and systems is critical for attaining the best use, ease of use, and more user-friendly interfaces and communication in these systems, from both the learners' and teachers' points of view. Further-more, a significant input to the e-learning plan comes from evaluating the learners. Instructors need to devise new forms of questions and quizzes to be used through the medium of e-learning systems in order to raise the learners' motivation. Nowadays, the proposed usability evaluation tools can point to specific usability problems within any targeted e-learning system.

## 4. Problem Statement and Research Question

Without prior warning, higher education institutions in Jordan found themselves in a race against time to switch to an e-learning model imposed by the circumstances created by the COVID-19 pandemic. These institutions responded disproportionately and satisfactorily to this challenge. However, the need has become urgent to review the foundations of e-learning on the part of the Higher Education Accreditation Commission (HEAC). These foundations, while surely facing challenges, may contribute to improving the quality of higher education in Jordan. The current blended education foundations are tipped to be the key to the solution to the current crisis and the basis for improving the quality of higher education. Furthermore, with the significant increase in demand for broadband services and data during the outbreak in Jordan, network congestion during the COVID-19 outbreak has been a major concern for many users. Some students have encountered difficulty accessing platforms and e-learning systems for many educational institutions, especially with the increased demand for video conferencing applications, cloud services, and distance learning for all students of different age groups. The Jordanian government

responded quickly, improving broadband networks, and boosting internet services by providing greater spectrum for telecom companies.

Higher education institutions that succeeded in providing all of the above conditions faced a new challenge in the form of the inability of many of their students to purchase sufficient internet packages at reasonable prices to meet the high internet consumption associated with the use of e-learning platforms. On the other hand, there are many cases of defeat and disappointment linked with the use of e-learning in most educational institutions, including poor characteristics and poor pedagogical guidance [11]. Past studies on e-learning applications used in higher institutions in Jordan have at most concentrated on the set issues concerning technical advantages and matters. This means that there is a lack of studies that focus on evaluating the usability of Learning Management System platforms. Thus, this study comes to expand a new approach for evaluating the usability of the Learning Management System platforms as a case study of the universities in Jordan during the COVID-19 pandemic. Through this research paper, the following questions will be answered:

(1) What are the properties that the Learning Management System (LMS) platforms do not support in the universities in Jordan?
(2) What are the problems of ease of use of Learning Management System (LMS) platforms in the universities in Jordan?
(3) What are the ideas proposed for improving the design of the Learning Management System (LMS) platforms in the universities in Jordan?

## 5. Methodology

This research aims to develop a novel approach to evaluate the usability of Learning Management System platforms as a case study for universities in Jordan during the COVID-19 pandemic. The research also aims to provide recommendations about how Jordanian universities can benefit from the Learning Management System platforms and offers ideas on how to improve the usability of their online platform sites. Accordingly, the current research will follow the descriptive and analytical approaches, and the quantitative approach will be adopted as the basic method of data collection. Quantitative research uses proportionate data to formulate facts and display the research model, and quantitative data have been collected using online surveys.

### 5.1 Data Collection

Universities began giving online classes from mid-March 2020 to the time of conducting this study (a period of approximately 12 months). After this period, an online survey was conducted to gather information. The survey was distributed using Google Forms. Given the current situation of the COVID-19 pandemic prevailing worldwide, it is important to assess the usability of the Learning Management System platforms of the tools used in order to assess e-learning and education. Thus, the usability of learning tools has become an important aspect to ensure that the e-learning provided through the Learning Management Systems in universities in Jordan is effective and beneficial to both students and instructors. Besides, there is the problem of the digital divide, especially in the developing countries. In fact, there is a gap between people in different countries in the ability to connect to modern communication and information technology in spite of the fact that most application developers are focusing these days on developing applications for both mobile phones and the web environment. Another aspect of assessing usability is the large number of different methods and techniques being used. This paper also aims to investigate the properties that are not backed up by the Learning Management System platforms and to provide suggestions for their design improvement. The current research sample was chosen to represent the Jordanian universities community. This research considers end-users as the primary stakeholders in the ease and usability, accessibility, success, and failure of the university Learning Management System platforms. Hence, the research looks at this area from the perspective of end-users.

### 6. Results

In this research, the survey targeted students currently studying in the 24 public and private universities located throughout Jordan. The study sample was randomly selected from all the universities in Jordan that offer Learning Management System platforms. A questionnaire was designed to achieve the research objectives, and it was distributed online. The questionnaires were retrieved, and those not seriously or neutrally answered were excluded. The research sample included 350 participants from

students in Jordanian universities. Of the respondents, 200 were female (57.1%) and 150 (42.9%) were male. A large majority of the respondents (205), representing 58.6%, were students in their second year of study. Table (1) shows the socio-demographic characteristics of the participants.

**Table 1.** Demographic characteristics of the participants

| Variable | | Frequency | Percentage % |
|---|---|---|---|
| **Gender** | Male | 150 | 42.9 |
| | Female | 200 | 57.1 |
| | **Total** | 350 | 100% |
| **Educational level** | First year | 42 | 12.0 |
| | Second year | 205 | 58.6 |
| | Third year | 72 | 20.6 |
| | Fourth year and above | 31 | 8.9 |
| | **Total** | 350 | 100% |

### 6.1 Descriptive Statistics

This section presents a descriptive analysis that shows the sample's views and agreement with the statements. A five-point scale was used in this study for rating the frequency of statements. This scale is divided into levels according to questionnaire weights in regard to Sekaran [19]:

- Weak agreement is shown to be 1 to 2.33.
- Good agreement is shown to be 2.34 to 3.66.
- Strong agreement is shown to be 3.67 to 5.00.

#### 6.1.1  Respondents' perspectives regarding properties not backed up.

In this section, the participants' level of agreement with the following statements about your properties not backed up by Learning Management System platforms in your university; it is presented in Table (2). Table (2) clearly shows that the general mean of all the statements related to properties not backed up by Learning Management System platforms in your university was (2.96), which reflects a good agreement. Moreover, the standard deviation value was (.70), which is normal and reflects convergence on the response of the sample. The highest mean was (4.40) for statement 9: " My university's LMS platform has the ability to allow the students to modify the uploaded assignments, such as updating/deleting." which reflects high agreement, while the lowest mean was (1.40) for statement 4: " My university's LMS platform gives the students the chance to review the videos of the instructors' recorded lectures.", which reflects weak agreement. In general, the sample attitude toward the statements reflected good agreement to some level of statements about properties not backed up by Learning Management System platforms in the universities.

**Table 2.** Analysis of respondents' perspectives regarding properties not backed up by LMS platforms

| Statements | Mean | SD |
|---|---|---|
| My university's LMS platform enables the instructors of the registered courses and students to hold group chats. | 3.40 | 1.34 |
| My university's LMS platform can hold online meetings with instructors who teach the registered courses. | 3.20 | .837 |
| My university's LMS platform offers the students the opportunity to get acquainted with the nature of exams' questions through reviewing old exam forms. | 2.20 | .447 |
| My university's LMS platform gives the students the chance to review the videos of the instructors' recorded lectures. | 1.40 | .548 |
| My university's LMS platform has the ability to display the study the outline and syllabus for all courses. | 2.40 | .894 |

| | | |
|---|---|---|
| My university's LMS platform has the ability to display department announcements, world news, and the university news. | 2.40 | .548 |
| My university's LMS platform gives the user feedback on the students' interaction with the system. | 4.4 | .548 |
| My university's LMS platform allows the students to make proposals, comments, or feedback. | 4.00 | .707 |
| My university's LMS platform has the ability to allow the students to modify the uploaded assignments, such as updating/deleting. | 4.40 | .548 |
| My university's LMS platform has the ability to alert the students via email or mobile phones when uploading new material or assignments. | 2.20 | .447 |
| My university's LMS platform has the ability to remind the students to turn in assignments or material before the deadline. | 2.60 | .894 |
| **Total Mean and Standard Deviation** | 2. 96 | .70 |

### 6.1.2    Respondents' perspectives toward Usability Problems

The results regarding the participants' level of agreement about usability problems of the LMS platforms are presented in Table (3). In Table (3), it appears that the general mean of all the statements related to usability problems of the management system platforms was (3.15), which reflects a good agreement. Moreover, the standard deviation value was (.83), which is normal and reflects convergence on the response of the sample. The highest mean was (4.80) for statement 9: "It is not easy to submit assignments through my university LMS platform." which reflects high agreement, while the lowest mean was (1.80) for statement 7: "In my university's LMS platform, course descriptive names are only launched in the Arabic language despite the considerable number of international students." which reflects weak agreement. In general, the sample attitude toward the statements reflected good agreement toward usability problems of the management system platforms.

**Table 3.** Analysis of participants' perspectives regarding usability problems

### 6.1.3    Proposed Improvements to the Design of LMS platforms

In Table (4), it appears that the general mean of all statements related to proposed improvements to the design of the Learning Management System platforms was (2.82), which reflects a good agreement. Moreover, the standard deviation value was (.43), which is normal and reflects convergence on the response of the sample. The highest mean was (3.80) for statement 3: " LMS platform needs to change the colours used on the pages to be consistent.", which reflects strong agreement, while the lowest mean was (1.80) for statement 4: "The design colours on LMS platform needs to be adjusted, for instance using the colour blue.", which reflects weak agreement. In general, the sample attitude toward the statements reflected good agreement toward disability to proposed improvements to the design of Learning Management System platform.

**Table 4.** Participants' perspectives toward disability to proposed improvements to the design of  LMS platforms

| Statement | Mean | SD |
|---|---|---|
| LMS platform needs to change the interface to support the Arabic language. | 3.00 | .000 |
| LMS platform needs to make the design of the pages more efficient. | 3.20 | .447 |

| Statements | Mean | SD |
|---|---|---|
| In my university's LMS platform, there is an inappropriate choice of colours. | 2.20 | .447 |
| In my university's LMS platform, there is an inappropriate choice of font size, small font size. | 2.20 | .447 |
| In my university's LMS platform, there is no link to the homepage of my university. | 3.40 | .894 |
| The login links are spotted clearly on my university LMS platform's homepage. | 3.00 | 1.41 |
| On my university's LMS platform's pages, the registration and homepage links are missing. | 3.00 | 1.87 |
| My university's LMS platform's navigation menu launches the courses by numbers not by descriptive names. | 3.20 | 1.09 |
| In my university's LMS platform, course descriptive names are only launched in the Arabic language despite the considerable number of international students. | 1.80 | .447 |
| In my university's LMS platform is easy to use, provides good speed, and supports internal search function. | 4.80 | .447 |
| It is not easy to submit assignments through my university LMS platform. | 4.80 | .447 |
| **Total Mean and Standard Deviation** | 3.15 | .83 |
| LMS platform needs to change the colours used on the pages to be consistent. | 3.80 | .447 |
| The design colours on LMS platform needs to be adjusted, for instance using the color blue. | 1.80 | .447 |
| The website font size on LMS platform needs to be adjusted (make the font size larger). | 2.60 | .894 |
| The size of LMS platform's pages needs to be automatically adjusted to fit the size of the mobile screen (free screen size). | 3.40 | .548 |

| | | |
|---|---|---|
| Links need to be placed at the top of the homepage and using a larger font size is more advisable. | 2.00 | .707 |
| LMS platform needs to improve the speed of downloading pages. | 2.40 | .894 |
| A link to the library system needs to be added to the LMS platform. | 3.00 | .000 |
| LMS platform needs to make it easier to use. | 3.00 | .000 |
| **Total Mean and Standard Deviation** | 2.82 | .43 |

### 6.2 Independent Samples T-Test

To test whether the differences between (properties that are not backed up by the Learning Management System platforms in the universities in Jordan and the usability of Learning Management System platform problems) were significant or not, an independent sample test was calculated. The following Table (5) displays the prediction values.

**Table 5.** An independent test form for the LMS platforms in the universities in Jordan

| | Sig. (2-tailed) | Mean (Learning Management System platforms) |
|---|---|---|
| **Properties that are not backed up** | .000 | 3.63 |
| **Usability problems** | .000 | 2. 96 |
| **Suggested improvements to the design** | .000 | 2.82 |

Based on the results shown in Table 5, there are statistically significant differences between the Learning Management System platforms in the universities in Jordan. The mean value was (3.63).

- The Sig value for (usability problems) was 0.000, that is, less than α (0.05), and therefore there are statistically significant differences between the Learning Management System platforms in the universities in Jordan. The mean value was (2.96).

- The value of Sig for (proposed improvements to the design) was .000, which is less than α (0.05), and therefore there are statistically significant differences between the Learning Management System platforms in the universities in Jordan. The mean value was (2.82).

### 6.3 Checklist Analysis

The checklist used in the current study to ensure usability and accessibility of Learning Management System platforms in the universities in Jordan. Therefore, three expert website designers have filled in three reference lists to ensure the usability and accessibility of the Learning Management System platforms sites in the universities in Jordan. After analysing these checklists, the results are presented in Table (6).

**Table 6.** An analysis of three experts' opinions on the usability and accessibility of LMS platforms sites used in Jordanian universities

| | Usability and accessibility dimensions | Yes | No | Not available N/A |
|---|---|---|---|---|
| **The Learning Management System platform sites used in Jordanian universities** | Security | 34% | 66% | 0% |
| | Satisfaction | 39.5% | 53.5% | 7% |
| | Disability to use | 76% | 15% | 9% |
| | Error prevention | 46% | 54% | 0% |
| | Efficiency | 45.5% | 49.5% | 5% |
| | Effectiveness | 52% | 44% | 4% |

Based on the results shown in Table (6), the following can be observed

- The availability of security properties in the Learning Management System platforms used in Jordanian universities (in the opinion of experts) was 34%.
- The availability of satisfaction properties in the Learning Management System platforms used in Jordanian universities (in the opinion of experts) was 39.5%.
- Availability of disability to use properties in the Learning Management System platforms used in Jordanian universities (in the opinion of experts) was 76%.
- The availability of error prevention properties in the Learning Management System platforms used in Jordanian universities (in the opinion of experts) was 46%.
- The percentage of availability of competency properties in the Learning Management System platforms used in Jordanian universities (in the opinion of experts) was 45.5%.
- The availability of the effectiveness properties in the Learning Management System platforms used in Jordanian universities (in the opinion of experts) was 52%.

It can be concluded that there are many defects and other key issues associated with the effectiveness of the Learning Management System platforms currently being used in Jordanian universities and their accessibility in terms of design, text, graphics, security, etc., but they can be improved and developed.

**7. Conclusions**

What can be concluded through this combination of results is that there are some properties not backed up by the Learning Management System platforms used in Jordanian universities, such as the ability to display recorded videos of lectures given by the course instructors. The usability problems of the management system platforms can be represented by the fact that course titles are displayed only in the Arabic language even though there are a lot of international students. Moreover, there are different suggestions for improvements to the design of the Learning Management System platform such as changing the colours used on the pages to be consistent. Accordingly, the page size can be adjusted automatically so that it fits the mobile screen (free screen size). The following results and findings of the study have been deduced as relevant to the process of the study and its direct application in use:

- Universities must support downloading learning resources that contain all course outlines, presentations, materials, and homework.
- Universities must support providing the users with feedback after working out any activity during their interaction with the platforms.
- Universities must work actively to provide the students with support and assistance.
- Universities must create suitable content for their homepage.

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