Explore the Major Characteristics of Learning Management Systems and their Impact on e-Learning Success

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***Abstract*—Today, there are many educational institutions and organizations around the world, especially the universities have adopted the e-learning and learning management system concepts because they want to enhance and support their educational process since the number of students who would like to attend universities and educational institutions is increasing. This paper has many objectives, the first one is comparing between different types of most popular learning management system (LMS) software such as Moodle and Blackboard based on their uniqueness features. The second objective is presenting the learning management systems and their benefits in e-learning. Finally, this research paper presents a proposed model, which consists of six independent variables (application and integration, communication, assessment, content, cost, and security), and one dependent variable which is e-learning success. A questionnaire has been developed and distributed to 450 respondents, and then data was collected from 418 valid questionnaires. The result showed that there is a statistically significant impact of learning management system major characteristics on e-learning success.**

Keywords*—Learning management system; e-learning; educational process; Moodle; educational institutions

I. Introduction

Many people in the world would like to continue their learning or training but for many reasons they cannot do that, therefore it becomes like a problem for them, so the idea of e-learning become as a solution for their problem [1], [2].

Many researchers and authors have defined e-learning as the online delivery of information and knowledge to the people who need it for purposes of education or training. These days e-learning is applied using websites through internet.

There are many benefits of e-learning, the most popular benefits are time and cost reduction, which means that the student or employee can save cost and time via e-learning especially for those who need to travel to other countries for learning, so travelling and accommodation expenses can saved. Large volume that means a large number of students from different cultural, educational level, and different location can register in the same online course [1]. Higher content retention that means the content could preserved for a long time and the course become more effective for the learner because it contains not only text and pictures but also contains animation, audio, and video. Flexibility, which considered as one of the most important advantages of e-learning because the learner or student can study a particular subject or topic many times without affecting the other students so the student can access the content anytime from his convenient place [3]. Consistent and updated material that means the content and material are always updated and consistent because it is not expensive to update the online material and it can be done instantly. Finally the fear free environment because students can interact with other students or with their instructor virtually [5].

Although there are many advantages of e-learning but it has a few challenges and draw backs such as: need for instructor retraining [6], equipment needs and support services which are expensive especially on the short term [1], assessment which is one of main challenges in e-learning systems, lack of face-to-face interaction and campus life, and computer literacy[7].

A successful e-learning system needs an effective learning management system (LMS), which can be defined as a software that is used in many educational institutions, such as schools, colleges, and universities in order to support and enhance their general way of learning process. It can used by offering different assessment types, communication tools, and content to develop high skilled and knowledgeable people [8], [9].

II. Literature Review

E-learning refers to any form of learning that can be accessed through web technology; it enables people to learn at their own time and at a place convenient to them [10]. The major characteristics of e-learning summarized as follows [11]-[13]:

- Every e-learning course is created because there is a learning need.
- An e-learning course is designed with one or more learning objectives in mind.
- An e-learning course is created with a particular audience and its need in mind.
- E-learning is created with the help of subject matter experts.
- E-learning is self-paced and reaches a wider audience.
- E-learning is connected to electronic media.

- E-learning courses always have assessments.
- The development of e-learning follows a streamlined process.

LMS can be considered as a part of content management system which manages learning and teaching environment, it includes a set of web based tools to support many activities and learning management techniques to enhance learning management process [14], [19].

The author concludes from the different definitions of LMS that there are two major communications and interactions in LMS [15]. The first one is the interaction between instructor and student; the second one is the interaction between students themselves in order to share knowledge among them.

There are many types of LMS. Table 1 shows the most popular LMS software of 2018 and their uniqueness features [18].

Each LMS has many characteristics and some of them have its own features, according to previous studies [2], [4], [5], [16], [17] the author summarizes the main characteristics based on components of LMS as shown in Table 2.

TABLE I. MOST POPULAR LEARNING MANAGEMENT SYSTEMS OF 2018

LMS Type	**Uniqueness Features**	**LMS Type**	**Uniqueness Features**
Litmos	• Extremely scalable • Wide integration options • Reliable support • Personalized learning paths	Bridge	• Feedback and analytics • User-friendly content creation • Categorize contacts
Talent	• Blended learning • eCommerce • Enterprise-grade • Homepage builder	Brightspace	• MOOC support • Flexible learning environments • Predictive modelling
Docebo	• Coach and Share • Scalable • Multiple admin • eCommerce	Blackboard	• Flexible learning environment • Group management • Social learning
eFront	• Flexible learning • A new-age: gamification • Content interoperability • Branding and control	Moodle	• On-premise • Open source • Community
eCoach	• Affordability • Content authoring • Fully SCORM/LTI compliant • Automation and integrations	Geenio	• PPT, PDF conversion • Multi-tenant structure • Templates and course samples
iSpring	• Rich authoring tool • Unlimited storage space • Live webinars • Offline mobile access	Absorb	• HTML5-based • Cloud and on-premise options • Ecommerce integrated with payment gateways
Edmodo	• Shared resources • Google Apps integration • Unlimited storage	Grovo	• Video-based • Micro learning methodology • Action-based learning paths
Schoology	• Assessment Management Platform • Automated grading system • Flexible learning management	SmarterU	• Executive dashboards • Wide array of file formats • Automated enrollment to completion process
Canvas	• Pedagogical structure • Open source • Peak demand scalability	Looop	• Induction • Best practices • Automated survey-based reports
ProProfs	• Vast library of resources • Feature-complete LMS • Configurable	Sakai	• Free open-source • Active community • Highly collaborative

TABLE II. MAJOR CHARACTERISTICS OF LMS

Characteristic	Description
Application and Integration	• Run cross different platforms with acceptable requirements. • Provide user friendly interface. • Availability of Multilanguage interfaces in e-learning system. • Can be integrated with existing systems. • System response time is acceptable. • Provide training or help documentation for users.
Communication	• Announcement and messages are shown throughout the semester. • Offer discussion groups and forums for students. • Provide direct chatting between students and instructor and between students themselves. • Provide email services. • Presents warnings for academic behavior and absence. • Live events and video conferences can be done.
Assessment	• Quizzes, home works, and exams can be conducted. • Grades are shown for students during the semester. • Support auto correction for assessment and exams. • Assessment questions are generated according to student behavior throughout the exam time and the semester. • Feedback and survey are offered by the e-learning system. • Support some tools to evaluate individual and team works. • Attendance and absence can be taken using system.
Content	• Provide syllabuses and course outlines for each course. • Offer lecture notes and slides. • Support interactive resources such as video files. • Presents links to scholarly information. • Offers animated case studies and experiments. • Dynamic, consistent, and updated content. • Resources can be accessed anytime/anywhere.
Cost	• Cost should be reasonable if it is not an open source software. • Cost should not exceed the software benefits on the long term.
Security	• System should be secured. • Authorized user can only access the system. • Provide two authentication factor for uploading student marks.

III. OBJECTIVES OF THE STUDY

This study aims to explore the uniqueness features of most popular LMS of 2018 and compare between them. It also investigates the major characteristics of LMS, finds the impact of application and integration, communication, assessment, content, cost, and security on e-learning success.

IV. STUDY HYPOTHESES

This study will test six hypotheses according to the objectives of the study:

Main Hypothesis:

$H_0$1: There is no statistically significant impact of LMS major characteristics on e-Learning success at ($\alpha \leq 0.05$)

This hypothesis consists of the following sub hypotheses:

$H_0$1.1: There is no statistically significant impact of application and Integration on e-Learning success at ($\alpha \leq 0.05$)

$H_0$1.2: There is no statistically significant impact of communication on e-Learning success at ($\alpha \leq 0.05$)

$H_0$1.3: There is no statistically significant impact of assessment on e-Learning success at ($\alpha \leq 0.05$)

$H_0$1.4: There is no statistically significant impact of content on e-Learning success at ($\alpha \leq 0.05$)

$H_0$1.5: There is no statistically significant impact of cost on e-Learning success at ($\alpha \leq 0.05$)

$H_0$1.6: There is no statistically significant impact of security on e-Learning success at ($\alpha \leq 0.05$)

V. STUDY MODEL

Based on many previous researches and studies [2], [7], [12], [13], [15] the author has proposed and adopted the research model in order to realize the main objective of this study which is the investigation of major characteristics of LMS and their impact on e-learning success. The proposed model includes the independent variable (LMS major characteristics) which includes application and integration, communication, assessment, content, cost, and security that previously described in Table 2. The proposed model also includes the dependent variable, which is the e-learning success as shown in Fig. 1.

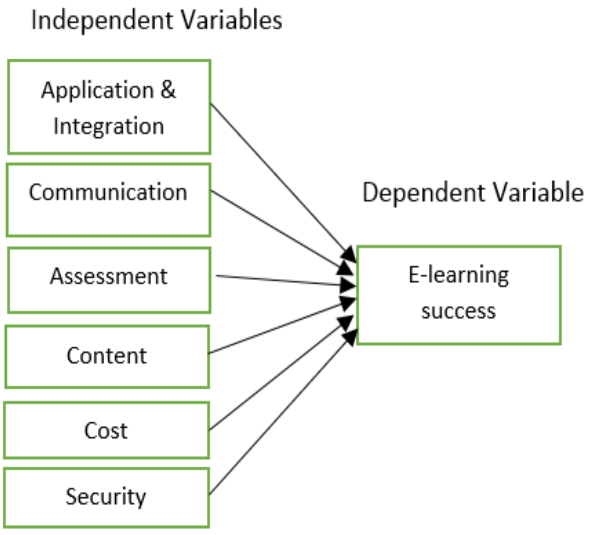

Fig. 1. Proposed Research Model.

VI. Study Population and Sample

The field of the study will be the Jordanian educational institutions especially the public and private universities that is using one of the types of LMS software; there is around 27 universities in Jordan.

This study based on a random sample for students, academic and administrative employees in the Jordanian universities that use LMS software in their educational process, according to [20] the study sample will be 450 respondents.

The researcher has devised a thirty-four-question questionnaire, questions were measured using a five-point Likert type scale (1=strongly disagree; 5=strongly agree). The researcher has collected 418 valid questionnaires.

VII. Reliability Analysis

In order to measure the internal consistency, that is how closely related, a set of items are as a group. A Cronbach's alpha was run on the collected 418 valid questionnaires; Note that a reliability coefficient of 0.70 or higher considered "acceptable" [20]. Table 3 shows the result of Cronbach's alpha analysis.

TABLE III. Cronbach's Alpha Analysis

Variable	No. of Items	Cronbach's Alpha
Integration & Application	6	0.913
Communication	6	0.907
Assessment	7	0.916
Content	7	0.921
Cost	4	0.896
Security	4	0.904

VIII. Hypotheses Testing and Results

SPSS application used to analyze the data that collected from 418 respondents who answered the questionnaire, the researcher applies linear regression to test the hypotheses, and the results were as follows:

Main Hypothesis:

$H_0$1: There is no statistically significant impact of LMS major characteristics on e-Learning success at ($\alpha \leq 0.05$)

This hypothesis is broken down to the following sub-hypotheses:

$H_0$1.1: There is no statistically significant impact of application and integration on e-Learning success at ($\alpha \leq 0.05$)

H_a1.1: There is statistically significant impact of application and integration on e-Learning success at ($\alpha \leq 0.05$)

Table 4 shows that the p-value was equal to 0.000, which is less than 5% (the significant level), so the null hypothesis is rejected, which means that there is a statistically significant impact of application and integration on e-Learning success at ($\alpha \leq 0.05$).

$H_0$1.2: There is no statistically significant impact of communication on e-Learning success at ($\alpha \leq 0.05$)

H_a1.2: There is statistically significant impact of communication on e-Learning success at ($\alpha \leq 0.05$)

TABLE IV. Linear Regression Results for the H_0.1.1 Hypothesis

Independ. Variable	β value	t value	Sig. t	F value	p-value Sig. F	Result
Application & Integration	0.315	6.928	0.000	47.992	0.000	Reject $H_0$1.1

According to Table 5 the p-value was equal to 0.000 which is less than 5% (the significant level), so the null hypothesis is rejected, that means there is a statistically significant impact of communication on e-Learning success at ($\alpha \leq 0.05$).

$H_0$1.3: There is no statistically significant impact of assessment on e-Learning success at ($\alpha \leq 0.05$)

H_a1.3: There is statistically significant impact of assessment on e-Learning success at ($\alpha \leq 0.05$)

TABLE V. Linear Regression Results for the H_0.1.2 Hypothesis

Independ.Variable	β value	t value	Sig. t	F value	p-value Sig. F	Result
Communi-cation	0.336	5.991	0.000	35.893	0.000	Reject $H_0$1.2

As shown in Table 6 There is a statistically significant impact of assessment on e-Learning success at ($\alpha \leq 0.05$), since the p-value was equal to 0.000 which is less than 5% (the significant level), so the null hypothesis will be rejected.

$H_0$1.4: There is no statistically significant impact of content on e-Learning success at ($\alpha \leq 0.05$)

H_a1.4: There is statistically significant impact of content on e-Learning success at ($\alpha \leq 0.05$)

TABLE VI. Linear Regression Results for the H_0.1.3 Hypothesis

Independ.Variable	β value	t value	Sig. t	F value	p-value Sig. F	Result
Assessment	0.381	5.054	0.000	25.547	0.000	Reject $H_0$1.3

TABLE VII. LINEAR REGRESSION RESULTS FOR THE H_0.1.4 HYPOTHESIS

Independ.Variable	β value	t value	Sig. t	F value	p-value Sig. F	Result
Content	0.444	12.243	0.000	149.89	0.000	Reject $H_0$1.4

Referred to Table 7, it was found that the p-value is equal to 0.000, which is less than 5% (the significant level), so there is a statistically significant impact of content on e-Learning success at ($\alpha \leq 0.05$) and the null hypothesis will be rejected.

$H_0$1.5: There is no statistically significant impact of cost on e-Learning success at ($\alpha \leq 0.05$)

H_a1.5: There is statistically significant impact of cost on e-Learning success at ($\alpha \leq 0.05$)

Table 8 shows that the p-value is equal to 0.000, which is less than 5% (the significant level), so the null hypothesis will be rejected, which means there is a statistically significant impact of cost on e-Learning success at ($\alpha \leq 0.05$).

$H_0$1.6: There is no statistically significant impact of security on e-Learning success at ($\alpha \leq 0.05$)

H_a1.6: There is statistically significant impact of security on e-Learning success at ($\alpha \leq 0.05$)

Based on Table 9 which shows that the p-value is equal to 0.000 which is less than 5% (the significant level), so the null hypothesis will be rejected (There is no statistically significant impact of security on e-Learning success at ($\alpha \leq 0.05$), which means there is a statistically significant impact of security on e-Learning success at ($\alpha \leq 0.05$).

Main Hypothesis:

$H_0$1: There is no statistically significant impact of LMS major characteristics (application and integration, communication, assessment, content, cost, security) on e-Learning success at ($\alpha \leq 0.05$)

H_a1: There is statistically significant impact of LMS major characteristics (application and integration, communication, assessment, content, cost, security) on e-Learning success at ($\alpha \leq 0.05$)

As shown in Table 10 there is a statistically significant impact of LMS major characteristics on e-Learning success at ($\alpha \leq 0.05$), because the p-value was equal to 0.000 which is less than 5% (the significant level), thus the null hypothesis (There is no statistically significant impact of LMS major characteristics on e-Learning success at ($\alpha \leq 0.05$) will be rejected.

TABLE VIII. LINEAR REGRESSION RESULTS FOR THE H_0.1.5 HYPOTHESIS

Independ.Variable	β value	t value	Sig. t	F value	p-value Sig. F	Result
Cost	0.214	7.234	0.000	45.741	0.000	Reject $H_0$1.5

TABLE IX. LINEAR REGRESSION RESULTS FOR THE H_0.1.6 HYPOTHESIS

Independ.Variable	β value	t value	Sig. t	F value	p-value Sig. F	Result
Security	0.362	6.154	0.000	46.627	0.000	Reject $H_0$1.6

TABLE X. LINEAR REGRESSION RESULTS FOR MAIN HYPOTHESIS $H_0$1

Independent Variables	F value	p-value Sig. F	Result
LMS Major Characteristics	43.944	0.000	Reject $H_0$1

IX. CONCLUSION AND RECOMMENDATIONS

The author has explained two major concepts (LMS and e-learning) which are supporting the educational process in many educational institutions and described their benefits to these institutions. The researcher also compared between different types of most popular LMS software according to their uniqueness attributes for each type, and then described main characteristics of LMS. The paper also examines the relationship between major characteristics of LMS and e-learning success.

The results show that there is a significant impact of LMS major characteristics on e-learning success, it also shows that there is a statistically significant impact of (application and integration, communication, assessment, content, cost, security) on e-learning success in the Jordanian educational institutions especially in the Jordanian public and private universities.

The results also indicate that most popular LMS that adopted by Jordanian universities is Moodle, since it is open source software with free cost.

Based on the study's results the researcher recommends that the companies, which develop LMS, should pay more attention to the characteristics of LMS since it has a significant impact on success of e-learning especially the cost. In addition, the researcher extremely recommends and encourages the educational institutions, which still do not have a LMS to adopt the e-learning concept and start using one of LMS types for their benefits and aids to their educational process.

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