Evaluation of Learning Management Systems

A Comparative Study Between Blackboard and Brightspace

Hanaa A. Yamani[1], Ahmed D. Alharthi[2,3], Lassaad K. Smirani[3,4(✉)]
[1] College of Computer and Information Systems, Umm Al-Qura University KSA, Mecca, Saudi Arabia
[2] Software Engineering, Umm Al-Qura University KSA, Mecca, Saudi Arabia
[3] Deanship of Elearning and Distance Education, Umm Al-Qura University KSA, Mecca, Saudi Arabia
[4] InnoV'Com Lab, University of Carthage, Tunis, Tunisia
`lksmirani@uqu.edu.sa`

Abstract—This study examined through analysis and comparison two Learning Management Systems (LMS): Blackboard and Brightspace. The field research sample consisted of 513 students from Umm Al-Qura University. The study attempted to answer key questions related to the evaluation level of Umm Al-Qura University students for the features of these two LMS. The study concludes that most of the students agree with the advantages of Blackboard and Brightspace and that the most common advantages of these LMS are the following: help in accessing shared data and files, record and monitor the learner's performance, help in controlling and adjusting the educational process, facilitating the sharing of experiences and scientific concepts with others, the stable interface in controlling and moving between other components, facilitating the discussion with the teacher and with the students, and the easy to understand and learn interface. The study found that there is a statistically significant difference between the mean scores of students using the Blackboard system and students using the Brightspace system in the overall rating of the features of the e-learning system in favour of the students using the Brightspace system. This means that students using the Brightspace system are more sensitive to the benefits of an e-learning system than students using the Blackboard system. The findings can be used to help educators develop the best process for implementing open and distance learning. The appropriate techniques must be chosen to ensure that no student is left behind and that the teaching and learning process works with sustainability.

Keywords—eLearning, distance education, learning management systems, evaluation of learning management systems, higher education

1 Introduction

Learning methods have completely changed. New forms of education, new roles for teachers and more sophisticated learning materials have emerged [1]. This digital revolution has changed the roles of all players in the learning scene. Traditional methods of teaching will no longer give satisfactory results [2]. It is always essential to improve the education system more effectively by taking advantage of current habits [3]. The concept of eLearning and distance education is still the subject of several scientific discussions. In the literature there are many different definitions of eLearning but there is agreement that eLearning is based on using Information and Communication Technologies (ICT) to enhance the educational operation. E-learning is the use of new multimedia technologies and the Internet, to improve the quality of learning by facilitating access to resources and services, as well as exchanges and collaboration remotely [4], E-learning refers to anything that uses a local or wide area network or the internet to broadcast, interact or communicate, which includes distance learning, in a distributed environment, access to sources by downloading or in consultation on the internet. It can involve synchronous or asynchronous, tutored systems, self-study-based systems, or a combination of the elements mentioned. E-learning therefore results from the combination of interactive and multimedia content, distribution media (PC, Internet, Intranet, Extranet), a set of software tools that allow the management of online training and training creation tools interactive. The access to resources is thus considerably extended, also the possibilities for collaboration and interactivity [5]. E-learning results from the association of interactive and multimedia content with intranet/internet distribution media and a set of software tools for managing online training and tools for creating interactive training. E-learning has grown a lot in recent years and is the subject of several challenges. We can retain issues related to the efficiency and adaptability of learning processes; access to knowledge; learner autonomy; support for the learner; the new roles of the teacher and the development of educational technologies [6].

To meet these needs, e-learning platforms integrate design tools to produce diversified educational resources like courses, quizzes, discussions, exercises, media…The evolution of ICT brings more organizational and pedagogical value to distance education by allowing access to remote content and allowing fluid exchanges between the different actors [7]. The Learning Management System is a software for creating and managing educational content and support materials for actors intended for three types of users: the teacher, the learner and the administrator. LMS brings together the tools necessary for the three types of stakeholders allowing the incorporation of multimedia educational resources, participation in activities and to carry out the educational and administrative follow-up of the learners [8].

In an E-learning platform, the teacher creates standard courses, incorporates multimedia educational resources and tracks activities learners. The learner consults online or downloads the educational content that are recommended, organize and have a view of the progress of their work, perform exercises, self-assessments, and submits work to be corrected. Groups of teachers and learners communicate individually or in groups, create discussion topics and collaborate on joint work. The administrator maintains the system, manages the accounts and user rights, creates links with external information

systems (files administrative, catalogs, educational resources, etc.) [9]. Around these first purposes, other functionalities and other roles can be added. A platform could thus include functionalities relating to training standards. and skills management, training product catalogs, management administration, management of teaching resources, management of the quality of training [10]. LMS can be defined as a web-based course management system that allows learners, through a browser, to access courses made available by teachers. Blackboard, Brightspace, Moodle are examples from LMS [21].

In view of the above mentioned, LMS plays a very important role in the online education and blended learning systems. The evaluation of LMS is an operation which has been the subject of many studies and research. The evaluation can be in a global way which affects the whole functioning of the system and can also be in a specific way and relates to case studies. The evaluation can focus on the integration of the functionalities of the LMS. A platform is useful if it eliminates the need for its users to resort to several separate tools. This type of software brings together the tools necessary for the three main users (teacher, learner, administrator) of a system whose primary purposes are the management of distance learning content, individualization of learning and tutoring [22,23,24,25,26].

The principal aim of this work is to ask evaluation questions and find the appropriate answers to improve the eLearning environment in Saudi Arabia. In fact, the last few years have seen different types of e-learning programs attract enthusiastic supporters' groups. In using the available programs, teachers encountered difficulties, credible evidence that they led to a high success rate in teaching. Among the objectives of this work is to suggest strategies for evaluating e-learning systems in order to avoid gaps and obtain defensible evidence on the effectiveness of e-learning [27].

This field study carried out during the academic year 2019-2020 at Umm al-Qura university. It concerned the characteristics of Blackboard and Brightspace according to the students' opinion. In order to compare their characteristics, three questions were chosen in this work:

— Question 1: What is the evaluation level of Umm Al-Qura University students for the Blackboard e-learning system characteristics?
— Question 2: What is the evaluation level of Umm Al-Qura University students for the Brightspace e-learning system characteristics?
— Question 3: Does Umm Al-Qura University students' evaluation for the characteristics of the e-learning system differ according to the used system (Blackboard - Brightspace)?

This study was divided into four parts: The first part reserved for a literature review, the second part dealt with both the methodology and the study research problem adopted in this work. The third part dealt with the results obtained and the analyzes carried out. Finally, the fourth part dealt with the discussion of the obtained results.

2   Literature review

In a very short period, the world of education has changed. Educational techniques, methods of evaluation and students' behavior had developed. Educational institutions are actively seeking to advance the educational process to its highest levels, and for this purpose, all educational strategies and methods are used to advance the educational process to the best state [28].

In the era of information and communication technology, the teacher has become a builder of knowledge, a guide to thought, a facilitator of student activities, and a rectifier of their level of achievement depending on the latest technologies. Consequently, continuous efforts must be made to improve the distance education system. The aim of technology evaluation is to offer for a set of potential uses, a larger view of potential impact and utility of a class of technology [29]. Evaluating an information system is a process by which we judge the usefulness of something for the purpose of making decisions [30]. This assessment involves many modes of analysis and measurement strategies that help us to make judgments about the e-learning process and distance education programs. We try to be clear about the types of questions that allow the assessment of e-learning based on the needs of the students and their community. The questions that arise about e-learning and its assessment instruments will necessarily focus on certain parameters and leave others in the dark. These evaluation questions implicitly convey assumptions and beliefs about the weight of different parameters and their impact on the desired results [31].

In recent years, a radical change has been observed in the behavior and habits of students in higher education. This change is justified in part by the development of networks and the proliferation of intelligent devices which have enlarged the information society and facilitate digitization [32]. The world is also experiencing a significant development of hardware and software systems and sophisticated processing systems and efficient storage solutions that have fostered digital advancement and technological developments in all sectors and especially in education where we have seen the birth of many eLearning platforms and user-friendly teaching and learning-oriented mobile applications. This multiplicative and radical change has brought about new ways and recent educational methodologies and these factors have made the use of eLearning systems essential in education. The author [33] studied a version of the TAM model (Technological Acceptance Model), he focused his research on the motivation and intention to use eLearning systems, and highlights aspects of digital learning and uses of the Hungarian Environment smart tools. The contribution of this work is to present the evaluation of external factors that illustrates the behavior of students, when using eLearning systems.

In another hand, considering the demand imposed by the digital world, virtual learning environments proliferated. These environments have become more common worldwide as is the case in Saudi Arabia where most educational institutions use e-learning technologies and distance education services represented in the Learning Management System (LMS) and Virtual Learning Environment (VLE). These are often used as an environment to collaborate, extend discussions and characterized by constructivist pedagogical principles. Faced to the increasing demand of elearning, many researchers

conducted comparative studies in order to analyze and explore the right decision regarding choosing the appropriate Virtual Learning Environment (VLE) platform, similar to the researcher [34] from Qassim University, who conducted a comparative study between Moodle and other VLE systems to meet the requirements of Qassim University. The study result considers Moodle the best option for insuring eLearning process for higher education in general and for Qassim University in particular. The study considered that Moodle provides an excellent set of tools that can be used to improve traditional classroom teaching. And according to the results of the study, it is possible for Moodle to accommodate the class to more than 50 thousand students.

Communication tools are one of the most important features of e-learning platforms, they are an essential part of education. In order to search for an appropriate system that meets the needs of staff members and facilitate their task when choosing a virtual work environment, the researcher [35] conducted a comparative study of communication tools for six open source Learning Management Systems. Communication tools are Video, Discussion Forums, File Sharing, Internal Mail, Online Journal Mail, Chat Features and Whiteboard Services. Focuses on six open source Learning Management Systems, ATutor, Claroline, Dokeos, Ilias, Moodle and Sakai, they show that Moodle and ATutor have the best communication tools with an easy-to-use interface. The study concludes that these two systems provide easily available information and have an easy-to-use interface and accessible.

Despite users mainly influence the adoption of information systems, it is not considered, according to many views, their attitudes towards this system pivotal. It has been observed that most e-learning systems are adopted by decision-makers from the point of view of technology developers [36]. In this context the researchers propose a multi-criteria methodology from a learner satisfaction perspective to support this assessment - based on the activities taking place in the pre- and post-approval phases of the WELS life cycle. In another way of evaluation, the researchers [37] recommend the use of the Analytical Hierarchy Process (AHP) results within the organization to derive the structure of users' preferences. The researchers also used Multiple-Criteria Decision-Making (MCDM) to reach a higher level of e-learner satisfaction, increase in system acceptance level process and continued use. They investigated the learners' perceptions of the relative importance of decision criteria. They found that learners view the learner interface as the most important dimension of decision criteria.

The evaluation study conducted by the researchers [41] on distance education in Saudi Arabia aimed to prioritize the factors of violation of academic integrity within Saudi universities by using the process (AHP). They choose twelve major factors related to the e-Learning environment, awareness of academic integrity and the guiding principles of e-learning, among all the factors identified. They conclude in two main factors, the first is the inappropriate guidelines provided to students as the most contributing factor, and the second factor is lack of feedback which is the least contributing factor.

In [11], the authors investigated the impact of LMS on students' performance in a learning context and assessment course. The population consisted of all undergraduate students at Imo State University in Nigeria. A survey of 232 students was purposefully chosen. For data collection, the "Measurement and evaluation Achievement Test

(MEAT)" instrument was used. The survey's findings indicated that teachers who were educated using an LMS (Moodle) gave better results than those who were revealed to the CAI4ME Package. It was also discovered that female students performed better than male students in both approaches, despite the fact that male students had a higher gain score. In [18], The study examines the factors that influence students' satisfaction with the Moodle LMS at Palestine Technical University-Khadoury. There were six potential factors used: perceived ease of use, perceived usefulness, information quality, system quality, service quality, and computer self-efficacy. 372 questionnaires were analyzed using simple and multiple regression. The findings revealed that all of the investigated predictors had a significant influence on students' satisfaction with LMS use. The authors suggested to incorporate the LMS with social media sites and designed to function adequately on smart phones. In [19], a questionnaire was carried out to determine the students' preferences for ease in the adoption of online learning. For data analysis, a descriptive approach was considered. The survey found that Google Classroom was the most popular LMS used by educators (97.3 %), followed by their university LMS (uFuture/iLearn, Blackboard, Spectrum), Schoology, Edmodo, Flipgrid, Edpuzzle, Moodle, Quizziz, Kahoot, Padlet, and Jamboard.

These types of studies are very beneficial to universities decision makers and to the educators. Their findings can be used as a guide for educators to develop the best tools for implementing Open and Distance Learning. The selection of appropriate tools is critical in order to ensure that no student falls behind and that the teaching and learning process is successful.

In this context, we planned this study to highlight the positive aspects of the two LMSs (Blackboard and Brightspace) while also identifying the aspects that do not satisfy students. According to our knowledge, no comparative study in this field has been conducted in Saudi universities.

3   Research methodology and procedures

In this section, the approach description was presented, also the research methodology, the research community, the research sample and the research tool.

3.1   The research methodology

The descriptive and analytical approach was used. This approach aims to study scientific phenomena and problems by describing them in a realistic manner and analyzing them in a scientific way, in order to answer research questions related to comparing students' evaluation of the two e-learning systems (Blackboard –Brightspace) according to their distinctive characteristics.

3.2   The research community

The research community consisted of all students of Umm Al-Qura University in the Kingdom of Saudi Arabia for the academic year 2019/2020.

3.3 The research sample

The field research sample consisted of 513 students at Umm Al-Qura University, and Table 1 and Figure 1 show the distribution of the sample members:
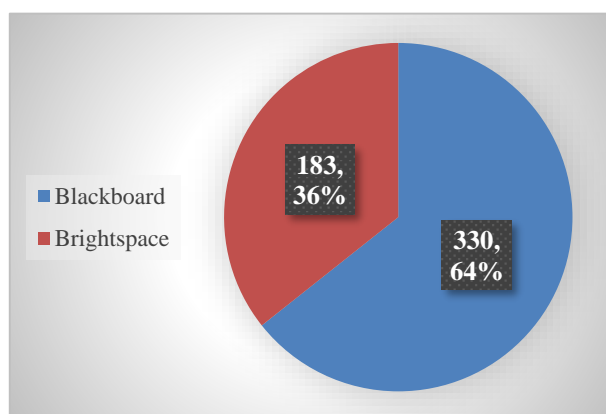

Fig. 1. The distribution of the sample members

3.4 The research tool

The research tool is represented in a questionnaire to identify the students' evaluation of the characteristics of the two e-learning systems (Blackboard -Brightspace). The questionnaire consisted, in its initial form, of (11 items). The used five-point gradient of Likert relied on answering the questionnaire's axes, so that the grades are assigned to them upon correction (1/2/3/4/5). In order to verify the validity and reliability of the questionnaire, the above steps were followed:

Questionnaire validity. The validity of the questionnaire was verified in two ways.

The validity of the arbitrators. The items of the questionnaire were presented, in its initial form, to specialized arbitrators. This is to judge the appropriateness of the questionnaire axes, the items clarity and its linguistic formulation appropriateness. According to the arbitrators' directives, the wording of some of the questionnaire items was modified, and the arbitrators' agreement on the questionnaire's items was 100%. Therefore, no item was deleted from the questionnaire items.

Internal consistency. The correlation coefficient between the degree of each item of the questionnaire and the total score of the axis to which it belongs, was calculated on a sample of (95) male and female students at Umm Al-Qura University, and the results were as shown in the Table 2.

From Table 2, we can observe that the correlation coefficients are statistically significant at (0.01) level; the values of the correlation coefficients ranged from 0.49 to 0.85; and the internal consistency did not result in deleting any items.

Questionnaire reliability. The reliability was calculated by Cronbach's Alpha method, whereby the Cronbach's alpha coefficient was calculated for the questionnaire

before deleting the individual score and after deleting it, on a sample of (95) students at Umm Al-Qura University, and the results were as shown in the Table 3.

The values of the reliability coefficients by the Cronbach alpha method are acceptable (Table 3), and that the Cronbach alpha values obtained when deleting the items reduce the questionnaire reliability coefficient. From the foregoing, we deduce that the search tool has validity and reliability. It consists in its final form of (11) items for evaluating the characteristics of the two e-learning systems (Blackboard -Brightspace).

4   Results

In this paragraph we will present the research results. The first question states: "What is the level of evaluation by Umm Al-Qura University students for the characteristics of the Blackboard e-learning system?". To answer this question, the Chi-Square Test was used to identify the significance of the differences between the responses frequencies of the sample members with regard to the items of evaluating the characteristics of the blackboard e-learning system, in addition to calculating the arithmetic averages and the agreement percentages of the sample members responses, and the results were as shown in the Table 4.

As shown in Table 4, there are statistically significant differences among the responses frequencies of the sample members to the items evaluating the characteristics of the Blackboard e-learning system in favor of the response (agree), except for the two items (4, 10) that came in favor of the response (neutral). The Chi- Square ranges between (37.7 to 187.9), and these values are indicative at the level of (0.01). The mean values ranged between (3.06 to 3.55); and the agreement percentages for items ranged between (61.2% to 71%) and for the full evaluation (67%). It is evident from the previous presentation that the highest percentage of students generally agree that there are advantages to the Blackboard e-learning system. The characteristics of this system can be arranged according to agreement ratios as follows: The system helps to access shared data and files; record and monitor the learner's performance; the system content is constantly updated; sufficient educational content is provided in the system; the system interface is characterized by being easy to understand and learn; the system helps to control and customize the educational process; the system interface is easy to use; the system facilitates the exchange of experiences and scientific concepts with others; the system interface is characterized by being stable in controlling and moving among other components and interfaces; the system facilitates discussion with the teacher; and the system facilitates discussion with other students.

Concerning the second question, it states: "What is the level of evaluation by Umm Al-Qura University students for the characteristics of the Brightspace e-learning system?". The Chi-Square Test was used to identify the significance of the differences among the responses frequencies of the sample members with regard to the items of evaluating the characteristics of the Brightspace e-learning system, in addition to calculating the arithmetic averages and agreement ratios for the responses of the sample members, and the results were as shown in Table 5.

From Table 5, we observe that there are statistically significant differences among the responses frequencies of the sample members to the items evaluating the characteristics of the Brightspace e-learning system in favor of the response (agree), except for item (2) the differences came in favor of the response (strongly agree). For the two items (4, 7), the differences came in favor of the response (neutral). The Chi-Square values ranged between (29.3 to 115.1); these values were function at the level of (0.01). The mean values ranged between (3.11 to 4.02); and the agreement ratios for the items ranged between (62.2% to 80.4%) and for the full evaluation (72.4%).

It is evident from the previous presentation that the highest percentage of students generally agree that there are advantages to the Brightspace e-learning system. The characteristics of this system can be arranged according to the agreement ratios as follows: The system interface is characterized by being easy to use; the system interface is characterized by being easy to understand and learn; the system helps to access the shared data and files; the system interface is characterized by being stable in controlling and moving between components and other interfaces; sufficient educational content is provided in the system; the system content is constantly updated; the system helps to control and customize the educational process; the system helps to record and monitor the learning performance; the system facilitates Discussion with the teacher; the system facilitates discussion with other students; and the system facilitates the exchange of scientific experiences and concepts with others.

The third question states: "Does the evaluation of Umm Al-Qura University students for the characteristics of the e-learning system differ according to the used system (Blackboard-Brightspace)?"

To answer this question, the Chi-Square Test was used to identify the significance of the differences among the responses frequencies of the sample members according to the used system variable (Blackboard/Brightspace) regarding the items of the e-learning system characteristics. The results were as shown in Table 6.

According to the results shown in Table 6, we can deduce that:

1. There were no statistically significant differences between the responses frequencies of the students' group who use the Blackboard system and the responses frequencies of the students' group who use the Brightspace system with regard to the items of evaluating the e-learning system characteristics No. (4, 5, 7, 11). The Chi-Square values were not statistically significant, indicating the convergence of the frequencies of students' group responses who use the Blackboard system and students' group who use the Brightspace system in terms of agreement and disagreement of four characteristics when evaluating the e-learning system, which is that the e-learning system: facilitates discussion with other students, facilitates discussion with the teacher, facilitates the exchange of scientific experiences and concepts with others and helps to record and monitor the learner performance.

2. There were statistically significant differences between the responses frequencies of the students' group who use the Blackboard system and the responses frequencies of the students' group who use the Brightspace system with regard to the items of evaluating the e-learning system characteristics No. (1, 2, 3, 6, 8, 9, 10). The Chi-Square values ranged from 11.94 to 52.83, which are statistically significant values at the

level (0.05, 0.01). Looking at the percentages, we find that the source of the statistically significant differences is the response (strongly agree) in favor of the students' group who use the Brightspace system. This indicates the high sense of students' group who use the Brightspace system of the e-learning system characteristics, which are that the system: interface is easy to use, easy to understand and learn, and stable in controlling and moving between components and other interfaces. Moreover, the system facilitates access to shared data and files; the system content is constantly updated; sufficient educational content is provided in the system; and it helps the system to control and customize the educational process.

To find out the significance of the difference between the average grades of the students who use the Blackboard system and the students who use the Brightspace system in the overall score to evaluate the e-learning system characteristics, Independent Samples T-Test was used to calculate the significance of the differences between two independent samples, and the results were as shown in the Table 7.

According to the results mentioned in Table 7, there is a statistically significant difference between the mean scores of students who use the Blackboard system and students who use the Brightspace system in the overall score to evaluate the e-learning system characteristics in favor of students who use the Brightspace system (Figure 2).
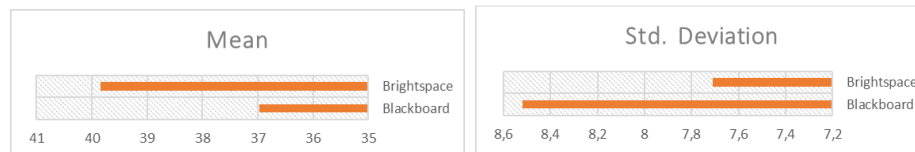
Fig. 2. The T-test for the e-learning system variable used in the overall score

According to the results mentioned in Table 7, there is a statistically significant difference between the mean scores of students who use the Blackboard system and students who use the Brightspace system in the overall score to evaluate the e-learning system characteristics in favor of students who use the Brightspace system. This means that students who use the Brightspace system are more sensitive to the advantages of an e-learning system compared to students who use the Blackboard system. This slight difference can be justified by the fact that Brightspace was the only LMS used at Umm Al-Qura University for 8 years and that the blackboard has just been introduced this academic year.

5 Conclusion

In order to offer students an attractive learning process, the use of the LMS is not in itself the only solution. This action must be accompanied by a learning strategy centered on the student and supported by a university policy providing the necessary means to support the change in teaching and the method of prior learning assessment. The present

study is a contribution to the evaluation of the LMS functionalities to ensure the immediate and personalized regulation of the achievements of the students, based on their degree of satisfaction. The results of the study show that students are satisfied with both LMSs (Blackboard and Brightspace) as a software capable of delivering course content to them anytime, anywhere. According to this study, the qualities of both LMSs are similar regarding several fundamental functionalities. There is a statistically significant difference between the average scores of students who use the Blackboard system and students who use the Brightspace system in the overall score to assess the characteristics of the e-learning system in favor of students who use the Brightspace system. This means that students who use the Brightspace system are more aware of the benefits of an online learning system than students who use the Blackboard system. This slight difference can be justified by the fact that Brightspace was the only LMS used at Umm Al-Qura University for 8 years and that the blackboard has just been introduced this academic year. Finally, a well-designed LMS can give the user the ability to teach or take lessons in a pleasant and easy-to-use environment, without having to worry about form.

This study is particularly valuable to university decision-makers and education professionals. The study results can be used to help educators build the perfect tools for implementing Open and Distance Learning. The selection of appropriate tools is critical to ensuring that no student falls behind and that the teaching and learning process runs smoothly.

6   Acknowledgment

7   References

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8   Authors

Dr. Hanaa A. Yamani Received PhD degree in the field of Computer Science (E-learning) from La Trobe University University, Australia, in 2014. Since then she works in E-learning and Distance Education Deanship as a Vice-Dean, Umm Al-Qura University. Dr Yamani is currently an associate professor of e- learning in E-Learning at Information Science Department at Umm Al-Qura University. She published many studies in the field of Digital transformation, e-Learning, Digital learning, Distance education instruction technology and Digital competencies. Her current research interests include Computer assisted instruction, Online courses Design, e-learning environment design, digital transformation in education, distance learning enhancement.

Dr Ahmed D. Alharthi, He works in E-learning and Distance Education Deanship as a Vice-Dean, Umm Al-Qura University (ORCID: https://orcid.org/0000-0002-4024-8284).

Dr Eng. Lassaad K. Smirani was born in Tunisia, in 1969. He received the B.S. degree in electrical and electronic engineering from MANAR University in 1992, and M.S. degree in telecommunications from Sup'Com in 1994, and master's degree in networks and PhD in telecommunications and computer sciences from ENIT. In 1994, he joined "Tunisia Telecom" company: the historical telecoms operator in Tunisia. He held several positions of responsibility. In parallel he has held the mission of technology expert at Carthage University, and has taught for 13 years (2000-2013) at computer sciences Department -Faculty of Sciences of Bizerta- and he worked in many other Tunisian University like "ESPRIT". Dr Smirani joined UQU University (Deanship of

eLearning and Distance Education) in 2013 and he holds the position of Educational Advisor, Trainer and Assistant Professor. He is now responsible for the studies and research department and he is an eLearning trainer on Leaning Management Systems certified by blackboard. He had many publications in the field of Artificial Intelligence, e-Learning, Digital learning, Distance education, and Networks. His current research interests include the application of Artificial Neural Networks on Adaptive learning, also he actually conducts many field studies to improve educational outcomes. From 2011 until now he is a scientific council member of the Innov'Com scientific research laboratory.

9 Appendix

Table 1. Description of the research sample

The Variable		Frequency	Percent
Learning Management System	Blackboard	330	64.3 %
	Brightspace	183	35.7 %

Table 2. The values of the correlation coefficients of each item score with the total degree of the questionnaire

Evaluation of the Blackboard system characteristics (n=50)		Evaluation of the Brightspace system characteristics (n=43)	
Item	Correlation Coefficient	Item	Correlation Coefficient
1	0.76**	1	0.69**
2	0.74**	2	0.65**
3	0.81**	3	0.78**
4	0.57**	4	0.69**
5	0.85**	5	0.49**
6	0.75**	6	0.73**
7	0.83**	7	0.73**
8	0.73**	8	0.69**
9	0.84**	9	0.67**
10	0.77**	10	0.75**
11	0.78**	11	0.66**

Table 3. The questionnaire reliability coefficients values

E-learning System Evaluation	Nbr of items	Cronbach's Alpha	Cronbach's Alpha if Item Deleted
Blackboard (n=50)	11	0.93	From 0.91 To 0.93
Brightspace (n=43)	11	0.88	From 0.86 To 0.88

Table 4. Frequencies, percentages, chi-square values, averages, and agreement percentages for the blackboard e-learning system characteristics evaluation items

Item No.	Students' evaluation items for the characteristics of the Blackboard system		Responses					Chi-Square	Sig.	Mean	Agreement percentage %
			Strongly Disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*				
1	The Blackboard system interface is easy to use	Frequency	36	43	71	138	42	109.3	0.000	3.32	66.4
		Percent	10.9	13.0	21.5	41.8	12.7				
2	The Blackboard system interface is easy to understand and learn	Frequency	29	54	54	141	52	113.3	0.000	3.40	68.0
		Percent	8.8	16.4	16.4	42.7	15.8				
3	The Blackboard system interface is stable in controlling and navigating other components and interfaces	Frequency	39	56	62	135	38	96.8	0.000	3.23	64.6
		Percent	11.8	17.0	18.8	40.9	11.5				
4	The Blackboard system facilitates discussion with other students	Frequency	39	71	91	88	41	37.7	0.000	3.06	61.2
		Percent	11.8	21.5	27.6	26.7	12.4				
5	The Blackboard system facilitates discussion with the teacher	Frequency	31	61	92	100	46	52.8	0.000	3.21	64.2
		Percent	9.4	18.5	27.9	30.3	13.9				
6	The Blackboard system makes it easy to access shared data and files	Frequency	24	36	66	142	62	128.1	0.000	3.55	71.0
		Percent	7.3	10.9	20.0	43.0	18.8				
7	The Blackboard system facilitates the exchange of scientific experiences and concepts with others	Frequency	31	50	98	109	42	74.7	0.000	3.25	65.0
		Percent	9.4	15.2	29.7	33.0	12.7				
8	The Blackboard system content is constantly updated	Frequency	22	36	76	145	51	142.5	0.000	3.51	70.2
		Percent	6.7	10.9	23.0	43.9	15.5				
9	Sufficient educational content is provided in the Blackboard system	Frequency	15	54	86	125	50	104.3	0.000	3.43	68.6
		Percent	4.5	16.4	26.1	37.9	15.2				
10	The Blackboard system helps to control and customize the learning process	Frequency	20	30	124	122	34	165.7	0.000	3.36	67.2
		Percent	6.1	9.1	37.6	37.0	10.3				
11	The Blackboard system helps to record and monitor the learner performance	Frequency	18	29	84	155	44	187.9	0.000	3.54	70.8
		Percent	5.5	8.8	25.5	47.0	13.3				
Total evaluation of Blackboard e-learning system characteristics										36.87	67.0

Table 5. Frequencies, percentages, chi-square values, averages, and agreement percentages for the brightspace e-learning system characteristics evaluation items

Item No.	Students' evaluation items for the characteristics of the Brightspace system		Responses					Chi-Square	Sig.	Mean	Agreement percentage %
			Strongly Disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*				
1	The Brightspace system interface is easy to use	Frequency	9	8	23	74	69	115.1	0.000	4.02	80.4
		Percent	4.9	4.4	12.6	40.4	37.7				
2	The Brightspace system interface is easy to understand and learn	Frequency	8	15	19	68	73	106.7	0.000	4.00	80.0
		Percent	4.4	8.2	10.4	37.2	39.9				
3	The Brightspace system interface is stable in controlling and moving between components and other interfaces	Frequency	10	11	32	79	51	92.6	0.000	3.82	76.4
		Percent	5.5	6.0	17.5	43.2	27.9				
4	The Brightspace system facilitates discussion with other students	Frequency	15	42	52	51	23	30.7	0.000	3.14	62.8
		Percent	8.2	23.0	28.4	27.9	12.6				
5	The Brightspace system facilitates discussion with the teacher	Frequency	15	41	49	54	24	30.1	0.000	3.17	63.4
		Percent	8.2	22.4	26.8	29.5	13.1				
6	The Brightspace system makes its easy to access shared data and files	Frequency	8	9	28	72	66	103.0	0.000	3.98	79.6
		Percent	4.4	4.9	15.3	39.3	36.1				
7	The Brightspace system facilitates the exchange of scientific experiences and concepts with others	Frequency	18	37	61	41	26	29.3	0.000	3.11	62.2
		Percent	9.8	20.2	33.3	22.4	14.2				
8	The Brightspace content is constantly updated	Frequency	7	21	38	67	50	60.8	0.000	3.72	74.4
		Percent	3.8	11.5	20.8	36.6	27.3				
9	Sufficient educational content is provided in the Brightspace system	Frequency	8	14	44	63	54	65.1	0.000	3.77	75.4
		Percent	4.4	7.7	24.0	34.4	29.5				
10	The Brightspace system helps to control and customize the learning process	Frequency	4	23	54	70	32	73.4	0.000	3.57	71.4
		Percent	2.2	12.6	29.5	38.3	17.5				
11		Frequency	8	22	47	72	34	65.6	0.000	3.56	71.2

	The Brightspace system helps to record and monitor the learner performance	Percent	4.4	12.0	25.7	39.3	18.6				
Total evaluation of Brightspace e-learning system characteristics										39.84	72.4

Table 6. Chi-Square Test Results for the Items of the E-learning System Characteristics according to the Used System (Blackboard /Brightspace)

Item No.	Students' evaluation items for the e-learning system characteristics	The used e-learning system		Responses					Total	Chi-Square	Sig.
				Strongly Disagree	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*			
1	The system interface is easy to use	Blackboard	Count	36	43	71	138	42	330	52.83	0.000
			System within %	10.9%	13.0%	21.5%	41.8%	12.7%	100.0%		
			Item within%	80.0%	84.3%	75.5%	65.1%	37.8%	64.3%		
			of Total %	7.0%	8.4%	13.8%	26.9%	8.2%	64.3%		
		Brightspace	Count	9	8	23	74	69	183		
			System within %	4.9%	4.4%	12.6%	40.4%	37.7%	100.0%		
			Item within%	20.0%	15.7%	24.5%	34.9%	62.2%	35.7%		
			of Total %	1.8%	1.6%	4.5%	14.4%	13.5%	35.7%		
2	The system interface is easy to understand and learn	Blackboard	Count	29	54	54	141	52	330	41.01	0.000
			System within %	8.8%	16.4%	16.4%	42.7%	15.8%	100.0%		
			Item within%	78.4%	78.3%	74.0%	67.5%	41.6%	64.3%		
			of Total %	5.7%	10.5%	10.5%	27.5%	10.1%	64.3%		
		Brightspace	Count	8	15	19	68	73	183		
			System within %	4.4%	8.2%	10.4%	37.2%	39.9%	100.0%		
			Item within%	21.6%	21.7%	26.0%	32.5%	58.4%	35.7%		
			of Total %	1.6%	2.9%	3.7%	13.3%	14.2%	35.7%		
3	The system interface is stable in controlling and navigating other components and interfaces	Blackboard	Count	39	56	62	135	38	330	34.20	0.000
			System within %	11.8%	17.0%	18.8%	40.9%	11.5%	100.0%		
			Item within%	79.6%	83.6%	66.0%	63.1%	42.7%	64.3%		
			of Total %	7.6%	10.9%	12.1%	26.3%	7.4%	64.3%		
		Brightspace	Count	10	11	32	79	51	183		
			System within %	5.5%	6.0%	17.5%	43.2%	27.9%	100.0%		
			Item within%	20.4%	16.4%	34.0%	36.9%	57.3%	35.7%		
			of Total %	1.9%	2.1%	6.2%	15.4%	9.9%	35.7%		
4			Count	39	71	91	88	41	330	1.67	0.79

#	Item	System	Statistic							χ²	p
	The system facilitates discussion with other students	Black-board	System within %	11.8%	21.5%	27.6%	26.7%	12.4%	100.0%		
			Item within%	72.2%	62.8%	63.6%	63.3%	64.1%	64.3%		
			of Total %	7.6%	13.8%	17.7%	17.2%	8.0%	64.3%		
		Bright-space	Count	15	42	52	51	23	183		
			System within %	8.2%	23.0%	28.4%	27.9%	12.6%	100.0%		
			Item within%	27.8%	37.2%	36.4%	36.7%	35.9%	35.7%		
			of Total %	2.9%	8.2%	10.1%	9.9%	4.5%	35.7%		
5	The system facilitates discussion with the teacher	Black-board	Count	31	61	92	100	46	330	1.23	0.87
			System within %	9.4%	18.5%	27.9%	30.3%	13.9%	100.0%		
			Item within%	67.4%	59.8%	65.2%	64.9%	65.7%	64.3%		
			of Total %	6.0%	11.9%	17.9%	19.5%	9.0%	64.3%		
		Bright-space	Count	15	41	49	54	24	183		
			System within %	8.2%	22.4%	26.8%	29.5%	13.1%	100.0%		
			Item within%	32.6%	40.2%	34.8%	35.1%	34.3%	35.7%		
			of Total %	2.9%	8.0%	9.6%	10.5%	4.7%	35.7%		
6	The system makes it easy to access shared data and files	Black-board	Count	24	36	66	142	62	330	22.29	0.000
			System within %	7.3%	10.9%	20.0%	43.0%	18.8%	100.0%		
			Item within%	75.0%	80.0%	70.2%	66.4%	48.4%	64.3%		
			of Total %	4.7%	7.0%	12.9%	27.7%	12.1%	64.3%		
		Bright-space	Count	8	9	28	72	66	183		
			System within %	4.4%	4.9%	15.3%	39.3%	36.1%	100.0%		
			Item within%	25.0%	20.0%	29.8%	33.6%	51.6%	35.7%		
			of Total %	1.6%	1.8%	5.5%	14.0%	12.9%	35.7%		
7	The system facilitates the exchange of scientific experiences and concepts with others	Black-board	Count	31	50	98	109	42	330	7.05	0.13
			System within %	9.4%	15.2%	29.7%	33.0%	12.7%	100.0%		
			Item within%	63.3%	57.5%	61.6%	72.7%	61.8%	64.3%		
			of Total %	6.0%	9.7%	19.1%	21.2%	8.2%	64.3%		
		Bright-space	Count	18	37	61	41	26	183		
			System within %	9.8%	20.2%	33.3%	22.4%	14.2%	100.0%		
			Item within%	36.7%	42.5%	38.4%	27.3%	38.2%	35.7%		
			of Total %	3.5%	7.2%	11.9%	8.0%	5.1%	35.7%		
8	The system content is constantly updated	Black-board	Count	22	36	76	145	51	330	11.94	0.02
			System within %	6.7%	10.9%	23.0%	43.9%	15.5%	100.0%		
			Item within%	75.9%	63.2%	66.7%	68.4%	50.5%	64.3%		
			of Total %	4.3%	7.0%	14.8%	28.3%	9.9%	64.3%		
			Count	7	21	38	67	50	183		

		Bright-space	System within %	3.8%	11.5%	20.8%	36.6%	27.3%	100.0%		
			Item within%	24.1%	36.8%	33.3%	31.6%	49.5%	35.7%		
			of Total %	1.4%	4.1%	7.4%	13.1%	9.7%	35.7%		
9	Sufficient educational content is provided in the system	Black-board	Count	15	54	86	125	50	330	19.29	0.001
			System within %	4.5%	16.4%	26.1%	37.9%	15.2%	100.0%		
			Item within%	65.2%	79.4%	66.2%	66.5%	48.1%	64.3%		
			of Total %	2.9%	10.5%	16.8%	24.4%	9.7%	64.3%		
		Bright-space	Count	8	14	44	63	54	183		
			System within %	4.4%	7.7%	24.0%	34.4%	29.5%	100.0%		
			Item within%	34.8%	20.6%	33.8%	33.5%	51.9%	35.7%		
			of Total %	1.6%	2.7%	8.6%	12.3%	10.5%	35.7%		
10	The system helps to control and customize the learning process	Black-board	Count	20	30	124	122	34	330	12.14	0.016
			System within %	6.1%	9.1%	37.6%	37.0%	10.3%	100.0%		
			Item within%	83.3%	56.6%	69.7%	63.5%	51.5%	64.3%		
			of Total %	3.9%	5.8%	24.2%	23.8%	6.6%	64.3%		
		Bright-space	Count	4	23	54	70	32	183		
			System within %	2.2%	12.6%	29.5%	38.3%	17.5%	100.0%		
			Item within%	16.7%	43.4%	30.3%	36.5%	48.5%	35.7%		
			of Total %	0.8%	4.5%	10.5%	13.6%	6.2%	35.7%		
11	The system helps to record and monitor the learner per-formance	Black-board	Count	18	29	84	155	44	330	5.19	0.268
			System within %	5.5%	8.8%	25.5%	47.0%	13.3%	100.0%		
			Item within%	69.2%	56.9%	64.1%	68.3%	56.4%	64.3%		
			of Total %	3.5%	5.7%	16.4%	30.2%	8.6%	64.3%		
		Bright-space	Count	8	22	47	72	34	183		
			System within %	4.4%	12.0%	25.7%	39.3%	18.6%	100.0%		
			Item within%	30.8%	43.1%	35.9%	31.7%	43.6%	35.7%		
			of Total %	1.6%	4.3%	9.2%	14.0%	6.6%	35.7%		

Table 7. The results of the T-test for the e-learning system variable used in the overall score to evaluate the e-learning system characteristics

The variable	Brightspace (n=183)		Blackboard (n=330)		T	Sig.
	Mean	*Std. Deviation*	*Mean*	*Std. Deviation*		
Evaluating the e-learning system characteristics	39.84	7.71	36.97	8.52	3.92	0.000