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Selecting a learning management system (LMS) in developing countries: instructors' evaluation

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Learning management systems (LMSs) contain hidden costs, unclear user environments, bulky developer and administration manuals, and limitations with regard to interoperability, integration, localization, and bandwidth requirements. Careful evaluation is required in selecting the most appropriate LMS for use, and this is a general problem in web-based education. One possibility is to automate this evaluation process using computer-aided techniques. In this article, the researcher has focused on the idea of automating the evaluation process and has developed a computer-aided system named *Easy Way to Evaluate LMSs* (*EW-LMS*), for the quick and efficient evaluation of LMSs, especially for developing countries, where the idea of using an LMS may be relatively new. The investigation described in this article was carried out with 88 voluntary higher education instructors to test the usefulness of the developed system. Two types of quantitative questionnaires were used during the study. The results obtained indicate that the instructors were highly satisfied using the developed system, and the EW-LMS is technically sound and well developed. The evaluation system can help instructors to select the best LMS appropriate to their educational needs and their type of usage in the shortest possible time, with little effort, without any specialized technical knowledge/training and by following simple, user-friendly steps. The system is oriented to anyone interested in evaluating and using an LMS in web-based education. Those individuals who may be interested in using this software are instructors, students, or anyone else who may have an interest in LMSs, and educational organizations such as universities, schools, and institutes.

Keywords: learning management system (LMS); selection of LMSs; Moodle; educational tool; distributed learning environments; instructors' evaluation

1. Introduction

Like so many other sectors, the education sector is experiencing rapid internationalization (Bennell & Pearce, 2003). The globalization of education goes hand in hand with an increase in the availability of distance learning programs, supported by a rising utilization of Internet-based electronic learning (e-learning) systems (van Raaij & Schepers, 2008). E-learning systems, or virtual learning systems, are rapidly becoming an integral part of the teaching and *learning* process (Pituch & Lee, 2006)

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because e-learning systems help educational programs cross borders of time and space. E-learning, referring to learning via the Internet, has become a major phenomenon in recent years (Wang, Wang, & Shee, 2007). Effective and efficient learning methods are in great demand on the part of educational institutions to ensure that students and instructors are suitably equipped with the latest information and the most advanced skills. The following points, however, should be observed: the effective use of technology in the organizational setting of the educational institution is directly associated with the intertwining of technical and social elements (Senteni, 2006). The importance of creating time for, and encouraging, self-reflection with regard to the learning process, is well documented by constructivists (Gunstone, 1994; Hewson, 1996; Posner, Strike, Hewson, & Gertzog, 1982). Constructive learning is based on the idea that people learn by constructing new ideas based on their current and past knowledge (Cavus & Ibrahim, 2009). A learning management system (LMS) provides the platform for this type of learning environment by enabling the management, delivery, tracking of learning, testing, communication, the registration process, and scheduling (Cavus, Uzunboylu, & Ibrahim, 2007). The typical LMS offers instructors a suite of flexible tools (Grabe & Christopherson, 2008). With the help of such software, instructors and learners no longer have to be physically present at the same location (Cavus, 2009a).

West, Waddoups, and Graham (2007) has pointed out that LMSs include a number of time-saving features that offer convenience to instructors. On the other hand, the new educational reform and the implementation of information communications technology is also a major driving force for teaching staff to alter their approaches and enter the new teaching and learning environment. Frey (2005) stressed that an LMS should be a means of helping instructors and learners to achieve their instructional goals through the use of problem-solving teams, question and answer sessions, or online simulations, rather than be just another tool that merely provides users with the convenience of sending e-mail, distributing handouts, or keeping an online grade book. Furthermore, Naidu (2006) reported that LMSs comprise a suite of tools for learning and teaching online. LMSs offer their greatest value to educational institutions by providing a means to sequence content and to create a manageable structure for instructors. Thus, LMSs have become the default starting point of technology-enabled learning in an environment that largely omits the educational institute and the learner (Siemens, 2006). There is an increasing interest among educators and other professionals in the application of these tools in online courses (Hanna, 2003; Moore, 2003). Morgan's (2003a,b) study of more than 700 university faculty members who used a LMS determined that nearly 70% used an LMS to supplement their lectures. In 2005, 95% of all higher education institutions in the UK were using LMSs (Browne, Jenkins, & Walker, 2006). A study carried out by Garrote and Pettersson (2007) showed that Swedish academics believe that they could benefit from using an LMS in their future course offerings. As reported by Keegan (2002), in the UK and Ireland, there are very extensive implementations with regard to e-learning via LMSs. In addition, many universities and colleges seem to have purchased and be effectively using an LMS. In a study reported by Falvo and Johnson (2007), it was found that the most popular LMS used at colleges and universities in the US was Blackboard, and the second most-used system was WebCT. Their study also noted that many educational institutions clearly indicated their online offering on their institution website and how courses are delivered. It is apparent that LMS usage is increasing day by day.

Leslie (2004) identified more than 50 LMSs based on open-source software, and the researcher agrees with this finding. There are many LMSs on the Internet that can be obtained for free (e.g. Moodle, Claroline, ATutor, etc.) or through payment (e.g. Blackboard, WebCT, and many others). Because of the huge number of e-learning systems, and the availability of a large number of LMSs, one needs a systematic way, or a tool for evaluating the quality, efficiency, and the performance of LMSs in order to make a selection that will satisfy the majority or all of one's requirements (Cavus & Momani, 2009). In terms of teaching and learning, having a usable LMS means potentially reducing instructor time as a result of investing in the setting up and managing of the course and improving the students' learning experience – instructors and learners do not need to learn difficult technologies but can focus on content (Inversini, Botturi, & Triacca, 2006). Any LMS selection process should involve matching functionality with the organization's definition of teaching and learning. However, not all LMSs are equally efficient. Many contain hidden costs, unclear user, developer and administration manuals, and limitations with regard to interoperability, integration, localization, and bandwidth requirements. Careful evaluation is required in selecting the most appropriate LMS for use. LMSs usually have a large number of features and it has become a tedious task to undertake a manual selection. In the literature, studies show that the various LMS features are grouped differently depending on the person classifying them, and also the classification of the importance of a feature also differs. Common features in LMSs include content areas, discussion boards, chat rooms, assignment, drop boxes, quizzes and surveys, and white boards (Ioannou & Hannafin, 2008). Also, Morgan (2003a, b) underlined that communication, grade keeping (gradebook), assessment and evaluation, and class management were the most important features of an LMS. Woods, Baker, and Hopper (2004) stressed that the classroom management function of LMS is valuable. Malikowski, Thompson, and Theis (2006) reported that content files, grade book, asynchronous discussions, drop box, and type of quiz questions are the most used features of an LMS. Another research from Harrington, Staffo, and Wright (2006) had established that discussion boards and student tracking may be the most important feature of an LMS. In general, the features of an LMS consist of pedagogical factors, learner environment, instructor tools, course and curriculum design, administrator tools, and technical specifications. The pedagogical factors include course objectives and activities, where a learner can view what the course objectives are and what learning activities to do to reach these objectives. Learner environment is about the communication among the users of the LMS (learner-to-instructor and learner-to-learner), such as synchronous (real-time chat room, audio/video conferencing, whiteboard) and asynchronous (discussion forums, file sharing, internal e-mail). In addition, learners can for example enter a keyword and find material matching and describing that keyword. Calendar is also part of the learner environment that can be used as a progress review and reminder tool, enabling learners to update their activities, for example, during the preparation of assignments. On the other hand, learners can download course content to their local computers or take print out and work offline. Instructor tools are course development tools such as online quiz editor, online editor for course organization, and grade distribution. These tools enable instructors to create and support dynamic learning communities, consistent with social constractivist perspective (Ioannou & Hannafin, 2008). Course and curriculum design includes curriculum management, online grading, customized look and feel, automated glossary, automated testing,

and course templates. Course templates are artifacts of particular pedagogical approaches to instructional content and process. In addition, these features provide learners and instructor with customized learning environment, programs or activities based on prerequisites, prior work, results of testing etc. Administrator tools are about authentication, course and web-site back-up, course authorization, registration, course creation/duplication/deletion, statistics (learners' achievement, number of users, access date, etc.), and student transcripts. Finally, technical specifications are about instructors' and learners' technical support, help desk, multi-language support, database requirements, costs, and so on.

The evaluation process is in general costly, time consuming, and needs a great deal of effort to evaluate a given set of LMSs (Cavus, 2009b). One possibility is to automate this evaluation process using computer-aided techniques. The reality is that a literature search carried out by the researcher showed that there is not enough material for the selection of an LMS. Hanson and Robson (2003) reported that most selection reviews focus on comparisons of feature checklists and costs which can often be defined as license fees. The EDUCAUSE Center for Applied Research presented several guidelines, or steps, for selecting a learning management system: determining process benefits, assigning value to products and features, and assigning costs (Hanson & Robson, 2003). Studies have also been presented for the comparison of various LMSs. 3Waynet Inc. (2004), Arh and Blažič (2007), Catalyst IT Limited (2003), Commonwealth of Learning (2003), Graf and List (2004), Hultin (2004), Kljun, Vicic, Kavsek, & Kavcic (2007), LMS Strategic Review Committee (2005), and Wyles (2004) have all proposed systems for the evaluation of LMSs. Siemens (2006) highlighted the limited feature sets, limited ease of use, the open source movement being still in its infancy, and the lack of confidence in product support by LMS vendors. The selection and adoption of an LMS by a teaching institution such as a university follows the analysis of some basic parameters, usually including technical features (e.g. programming language used or required hardware infrastructure, etc.), available functions (e.g. discussion forums, integrated streaming services, etc.), supported formats (e.g. HTML, PDF, different video encoding, etc.), and learning technology standards compliance (e.g. SCORM). Software tools such as CVS, FNL, and Edutools are mostly system-oriented (Inversini et al., 2006). Moreover, LMS evaluation systems such as OutStart-Evolution LMS, Learning Management Suite, LMS Evaluation Committee, TEC LMS Software Evaluations & Comparisons, etc. are available on the Internet. But the majority of such systems don't satisfy all the requirements of users.

In this article, the researcher has focused on the idea of automating the evaluation process and has developed a computer-aided system entitled *Easy Way to Evaluate LMSs* (*EW-LMS*) for the quick and efficient evaluation of LMSs, especially for developing countries, such as Cyprus. Vrasidas (2002) and Eteokleous (2008) examined computer technology integration in Cyprus educational system in all levels; primary, secondary, and higher education, and LMS usage in Cyprus was not mentioned in their research. This could be because of barriers such as lack of skills and cost. Instructors may think that a good LMS is expensive, but in reality some of the powerful LMSs are open source (e.g. Moodle, Sakai, Olat, ATutor and so on) and are available free of charge. As financial factor was taken into account in the EW-LMS, many researchers agree that open source LMSs, especially Moodle, can be classified to be at the same level, if not better, than the commercial LMSs (El Harrassi & Labour, 2010; Feldstein, 2008; Itmazi & Megías, 2005; Winter, 2006).

The superiority of the developed system is that it is basically a web-based decision support system used to evaluate LMSs by using a flexible and smart algorithm. The evaluation system may help instructors to select the best LMS, depending on their needs and their type of usage. The main goal of the developed system is to provide a web-based system for the evaluation of LMSs in the shortest possible time and with the least effort, and by following simple, user-friendly steps. One of the most important features of the developed system is that it can be used without the need for any special technical skills. Moreover, the article has both practical and theoretical significance and contribution. The practical significance of this article lies in the fact that it can provide guidelines and recommendations to instructors, especially in developing countries, who are interested or planning to implement e-learning with LMS. The practical value of this article goes beyond the borders of Cyprus where the research was conducted, since it aims to develop software for the selection of the favorable LMS for the instructors' needs in any educational system. More specifically, this article is of value for selecting an LMS and start integration in developing countries, such as Cyprus, where the technological infrastructure exists, although lacking experience on this kind of integration.

2. Research questions

The aim of this study has been to identify the benefits of using the EW-LMS for the selection of the best LMS in terms of the instructor's educational needs and type of usage. Furthermore, an investigation has been carried out to find out the opinions of instructors about the usefulness of the developed system.

In order to achieve this aim, the researcher has sought answers to the following questions:

RQ1: What are the opinions of instructors about the usefulness of the EW-LMS?
RQ2: Is the EW-LMS an efficient tool for selecting the most suitable LMS?
RQ3: What are the instructors' suggestions for the development of the EW-LMS?
RQ4: Which is the best LMS for instructors' needs?
RQ5: How satisfied are instructors with their selection?

3. Method

3.1. Settings

This study and the investigation were carried out at the Near East University in Cyprus during the Spring semester of 2008. In order to select a suitable LMS, a web-based program has been developed by the researcher on a Personal Computer Server. It is entitled the *Easy Way to Evaluate Learning Management Systems* (*EW-LMS*).

3.2. Participants

The investigation was carried out with 92 volunteer higher education instructors from four different science departments within different institutes of higher education in Cyprus. They were randomly selected and willing to participate in the study. A total of 23 volunteer instructors with no previous knowledge or experience of an LMS attended the study from the mathematics, science, English,

and history departments. Four instructors did not complete the questionnaire, and thus they have not been included in the study, making a total of 88 respondents.

3.3. Developed software

The EW-LMS was developed and programmed using Visual Basic.Net, ADO.Net, ASP.Net., while its database was designed using MS-SQL Server. Furthermore, the system was developed as a web-based decision support system to evaluate LMSs in the shortest possible time and with least effort over the Web by using a flexible and smart algorithm with simple, user-friendly steps. Decision making involves the task of selecting a particular option from a set of possibilities, with the aim of satisfying the aims or goals of the decision maker (Efstathiou & Mamdani, 1986; Rajkovič, Bohanec, & Batagelj, 1988). There are many decision making algorithms in the literature, but one of the well known approaches to decision making in practice is known as the multi-attribute decision making (Chankong & Haimes, 1983; Keeney & Raiffa, 1976). The developed algorithm uses the well known mathematical theory of multi-attribute decision making. This theory offers a base for the development of a model, in which the main criteria are the assessment and evaluation of a decision based on a number of previously defined attributes (Bohanec & Rajkovič, 1995; Chankong & Haimes, 1983). Anderson (1990) proposed five models for software selection, one of them is the Linear Weighted Attribute Model. In this model, each attribute used is given a performance rating, or weight. These weights are assigned to the attributes which represent the compensatory nature of this model. The other important variable is the rank, which is the degree of frequency of a specific attribute of one element from the evaluation members.

The evaluation system was developed according to a standard user interface which was based on a specific standard and this proved to be a constraint on the system. The English language was used as the language of interaction in all steps of the system. It contains some links to connect the instructor with the main parts of the system. e.g. the LMS evaluation part, the products comparison part, and the products information part (Figures 1 and 2).

Logically, the evaluation operation consists of a number of sequential steps and user should follow these steps to get the correct results. One of the advantages of the developed system is that the evaluation process consists of only five steps. Some of these steps are used to insert the entries needed into the algorithm to get a result that refers to the most suitable LMS satisfying the specified requirements (Figure 3).

There are a total of 52 features in the system, and instructors should know that they have to choose the required group of features. On the other hand, the total number of LMSs included in the web-based evaluation system is 43. The system will select the LMS that best satisfies the requirements of the instructor. The context data flow diagram of the developed system is shown in Figure 2. The steps are easy for the novice instructor, and no special skills or specialized technical knowledge is needed to use the system. The success of the system was highly dependent on the proper design of a good interface. In general, users can be divided into three categories according to their experiences in using LMSs:

(1) Novice (e.g. normal user)
(2) Intermittent (e.g. instructor, student)
(3) Professional (e.g. an LMS administrator)

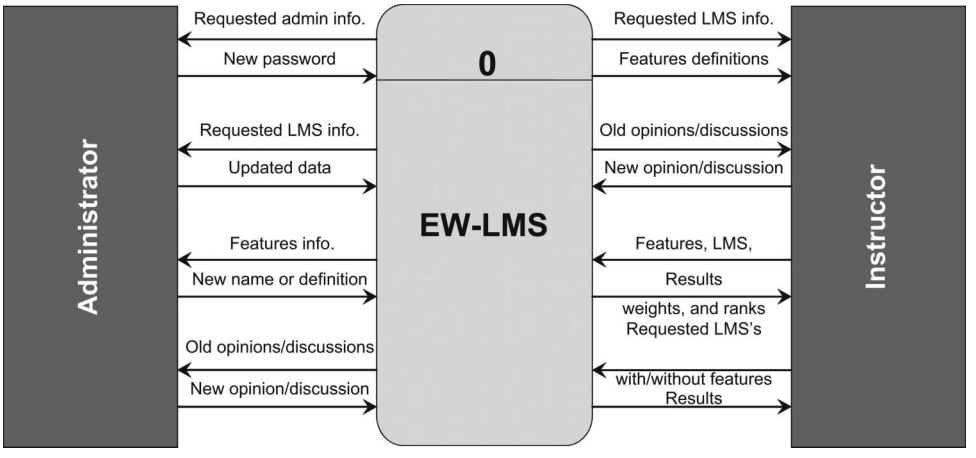

Figure 1. The context data flow diagram of the EW-LMS.

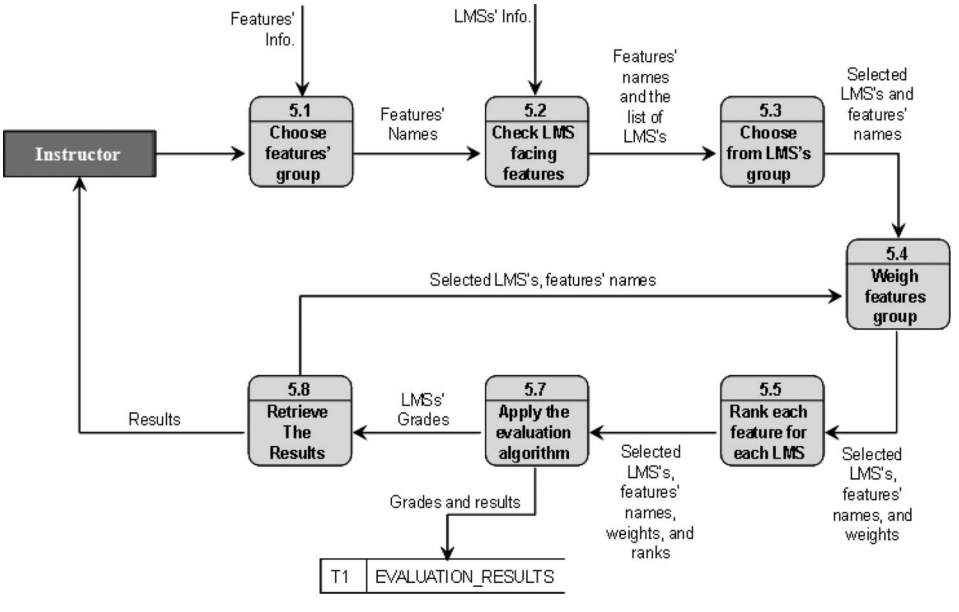

Figure 2. Data flow diagram of the evaluation process.

3.4. Measures

"*The Scale of Instructors' Opinions about the Usefulness of the EW-LMS*" was prepared by the researcher in the form of a questionnaire, to find out whether or not the EW-LMS was useful. Also, "*The Scale of Instructors' Satisfaction with the Selection*" was prepared as a questionnaire to find out whether or not the selected LMS satisfied the needs of the instructor. The content and validity of both questionnaires were investigated by 15 experts in this field (experts in educational technology, assessment and measurement, computer programming, and systems

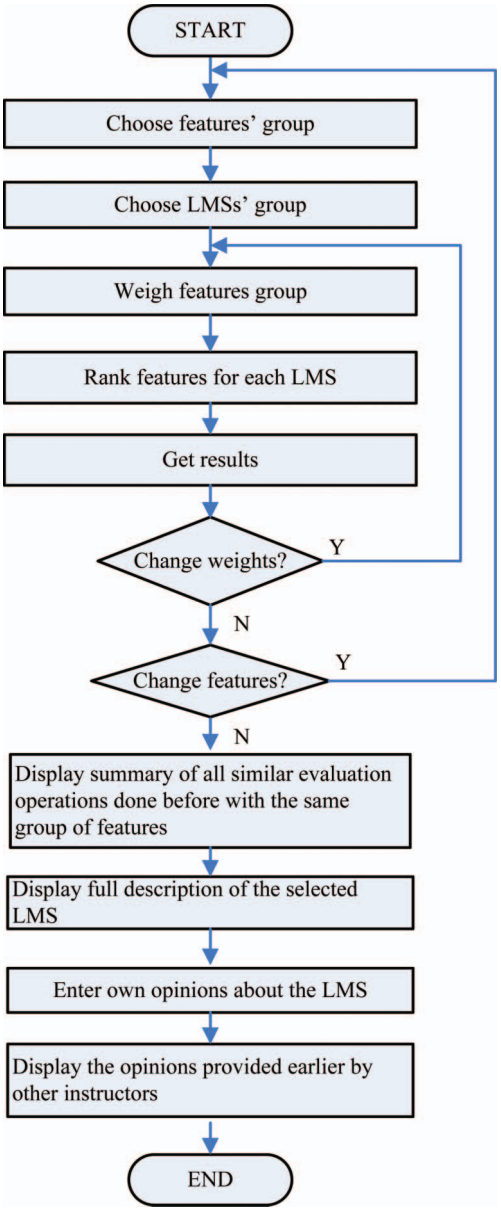

Figure 3. The evaluation process-flow graph.

analysis) and were found to be satisfactory. The internal consistency of the questionnaires was found to be 0.92 and 0.89, respectively, using Cronbach alpha. In each questionnaire, the questions were phrased in such a way as to determine whether or not there was a positive response to the EW-LMS and the chosen LMS. Questionnaires make use of 5-point Likert scale type questions. The first questionnaire consists of 13 items and the second one, 10 items, with a score of 5 representing *Strongly Agree* and 1 representing *Strongly Disagree*. Each question was phrased so that *Strongly Agree* represented a positive reaction to the study.

3.5. Interview

At the end of the study, the researcher had face-to-face interviews with all the instructors participating in the study, and asked their opinions of the EW-LMS. The interview lasted for 15 min with each instructor at the educational institute where the instructor was employed. The opinions of the instructors were recorded on a laptop using the necessary audio equipment. In total, the interviews took about a week to complete. At the end of the interview session, the researcher listened to and analyzed the recordings, and prepared reports based on the results of the interviews.

3.6. Statistical analyzes

The data obtained by the survey were commented upon using the SPSS program and descriptive statistical analysis techniques.

4. Application

First of all, the necessary permissions were obtained from the Ministry of Higher Education so that the study could be carried out at the institutes of higher education in Cyprus. Then the e-mails of potential participant instructors were obtained from the Ministry. They were informed about the nature of the study and were asked whether or not they would consider taking part in the study on a voluntary basis. A meeting was held with the instructors who showed an interest and were willing to help. Detailed information and a seminar were given to these instructors about the study, about distance learning, and about LMSs in general, and also about their involvement as participants. Then, the EW-LMS developed by the researcher was introduced, and its operation explained in detail, with examples (a live demonstration was done). Instructors were asked to use the web-based EW-LMS at their places of work, and to find out the LMS that might best suit their needs.

The evaluation process is explained below in detail (see Figure 3):

STEP [1]: Instructors choose the group of features which are classified in terms of six main factors: pedagogical factors (5 items), learner environment (13 items), instructor tools (4 items), course and curriculum design (6 items), administrator tools (9 items), and technical specifications (15 items), all of which are included in the evaluation process.

STEP [2]: The system checked all of the LMSs stored in its database (43 LMS, such as Moodle, Blackboard, WebCT, etc) and retrieved the LMSs that matched the group of features chosen in Step 1. The instructors' job at this point was to select the LMS to be included in the evaluation process.

STEP [3]: This step is to weigh each feature inserted in the features group that were chosen in the first step. The weights given here will depend on the educational needs. The weighing method used the values ''Zero'' to ''One''. ''One'' is for the most important feature, and ''Zero'' is for an unimportant feature.

STEP [4]: This step is to rank each feature of each LMS, depending on the features' description given by the system. Here again, the values from ''Zero'' to ''One'' have been used.

STEP [5]: This is the results step, where all the mathematical evaluation operations have been made, and the system selects an LMS. In addition to the best LMS, the system provides information on:

(a) The LMS which scores best.
(b) If the instructor wants to repeat the evaluation after changing the weightings he/she can go back to Step 3; or Step 1 to change the features. In this way, they can see how the result is changing in relation to these factors.
(c) A summary of all similar evaluation operations done before, with the same group of features. Furthermore, the instructor can also see the opinions provided earlier by his/her colleagues at the same University. This is useful as it gives the instructor the mechanism to compare his/her results with those of his/her colleagues as it is unlikely to have several LMS to fit each instructor's needs. Moreover, instructors can feed back their opinions back to the EW-LMS after experimenting with the selected LMS so that EW-LMS keeps collecting valuable opinions of the instructors.
(d) A full description of all LMSs included in the process.

After the LMS selection process, the instructors were asked to provide the name and version number of their selected LMS from the ones stored in the program database to the researcher by e-mail. The researcher then sent them the questionnaire entitled "*The Scale of Instructors' Opinion about the Usefulness of the EW-LMS*" and requested them to complete it. The completed questionnaires were sent back to the researcher by e-mail. The researcher then installed the selected LMSs on to a server. Then, the researcher organized a meeting with each instructor to collect data/information about their courses. The following course material and related information was prepared by instructors and sent to the researcher by e-mail:

- Online course materials (powerpoint, audio/video, flash etc.)
- Offline course materials (e.g. pdf)
- Quiz and self-test details (e.g. questions, answer(s), kind of question, grading, start/terminate date and time)
- Assignment(s) details (e.g. submitted date, reminders)
- Plan of communication with learners (e.g. date, time, type (synchronous/asynchronous)
- Calendar for learning activities
- Announcements (e.g. date, time, subject)
- Course format (e.g. weekly)
- Course objectives and activities

As above, all needed data/information was uploaded to the selected LMS to create the new course environment by the author. After the crucial part, the instructors were given a tutorial, lasting for about 14 h (2 days), only on the use of their selected LMS and for their specific courses.

First day (6 h, 2 sessions):

- Logging in to the LMS,
- Entering profile information to the LMS,
- Demonstrating how course objectives and activities can be shown to their learners,
- Demonstrating how course material (online/offline) can be accessed by instructor and learner,

- Showing how assignments can be accessed by learners and how the instructor can send feedback to them,
- Demonstrating quiz and self-tests, and how results can be accessed by the instructor,
- Practicing on how the instructor can use communication tools such as chat, forum, internal e-mail and so on.

Second day (8 h):

- Instructors were grouped by their subjects (four groups). Then, a workshop was setup to show how they can use the selected LMS in their courses. The initial demonstrations were done using the computers at the department where the researcher was employed. This demonstration took 2 h per group.

After the workshop, instructors were given Web addresses and authorization information so that they could access and use the system at their universities. During 4 weeks, instructors used the LMS only in two chapters of their choice. Student activities, such as their attention to lessons and their interests were examined closely. In addition, instructors had the opportunities to evaluate themselves and find out whether or not they had enough knowledge and skills to use the LMS system. After 4 weeks of usage, the researcher requested the instructors to complete the questionnaire "*Scale of Instructors' Satisfaction with the Selection*". After collecting the survey results, the researcher carried out interviews in her office with the instructors at pre-arranged dates and times. Instructors' opinions with regard to the improvement of the EW-LMS were collected.

5. Results

5.1. Instructors' opinions about the usefulness of the EW-LMS

The means of the opinion scores and the standard deviations of instructors' survey responses are given in Table 1.

According to these results, the mean of all the items in the questionnaire responded to by the instructors was over 4.5. The reason for the positive attitudes could be explained because, on a general level, instructors expressed themselves positively with regard to the EW-LMS. At a glance, the results suggest that instructors had a highly positive opinion of the EW-LMS. The explanation of some of the results are as follows: Item 7 "*I recommend the use of EW-LMS to other instructors*" ($M = 4.88$, $SD = 0.33$), item 2 "*I think all my colleagues who used the EW-LMS are happy with it*" ($M = 4.84$, $SD = 0.37$), and item 10 "*I really enjoyed the EW-LMS, which m*et al*l my educational needs*" ($M = 4.76$, $SD = 0.43$). One of the reasons for this is that because the instructors were content with using the EW-LMS, they were willing to recommend it to their colleagues.

5.2. Instructors' opinions about the EW-LMS

Item 3 "*Any special skills or specialized technical knowledge are not needed to use the system*" ($M = 4.75$, $SD = 0.55$), item 4 "*I found the EW-LMS user friendly*" ($M = 4.60$, $SD = 0.63$), item 6 "*The interface of the EW-LMS is simple and understandable*" ($M = 4.66$, $SD = 0.54$), and item 12 "*The EW-LMS was flexible*"

Table 1. The scale of instructors' opinions about the usefulness of the EW-LMS.

Survey items (N=88)	Mean	Standard deviation
(1) I found the EW-LMS enjoyable.	4.51	0.64
(2) I think all my colleagues who used the EW-LMS are happy with it.	4.84	0.37
(3) Any special skills or specialized technical knowledge are not needed to use the system.	4.75	0.55
(4) I found the EW-LMS user friendly.	4.60	0.63
(5) All the features I needed were in the EW-LMS.	4.58	0.77
(6) The interface of the EW-LMS is simple and understandable.	4.66	0.54
(7) I recommend the use of the EW-LMS to other instructors.	4.88	0.33
(8) The selection of an LMS using the EW-LMS did not take much of my time.	4.60	0.65
(9) I found the use of the EW-LMS easier than other systems I found on the Internet for the selection of LMS.	4.67	0.62
(10) I really enjoyed the EW-LMS which met all my educational needs.	4.76	0.43
(11) I hope the EW-LMS can be kept.	4.73	0.52
(12) The EW-LMS was flexible.	4.68	0.49
(13) The EW-LMS was easy to use.	4.67	0.52

Note: Scoring: 5 = Strongly agree, 1 = Strongly disagree.

($M = 4.68$, SD = 0.49). It is the researcher's conclusion that since the mean of the instructors' opinions is high, this means that the EW-LMS is technically sound and well developed. Another important result of the survey is the response to the 11th item ("*I hope the EW-LMS can be kept*" $M = 4.73$, SD = 0.52). According to this result, one can say that the EW-LMS has been successful. i.e. the system developed by the researcher can be used to help instructors choose a suitable LMS to satisfy their needs. It is also very interesting to note that the means for item 9 "*I found the use of the EW-LMS easier than other systems I found on the Internet for the selection of LMS*" and item 13 "*The EW-LMS was easy to use*" are same ($M = 4.67$). This brings to light that the instructors had no difficulty using the EW-LMS when compared to other systems on the Internet. This is another significant conclusion that the instructors were satisfied with the system.

In order to obtain the unbiased opinions of instructors about the EW-LMS, face-to-face interviews were held with the instructors in addition to the questionnaire. The question "What is your personal opinion about the strongest and weakest points of the EW-LMS?" was posed to instructors. They replied that the EW-LMS was easy to use, fast, and the results were highly successful. They said that although there are many free (open-source) LMSs on the Internet, they had difficulty in making a decision about the best one to satisfy their needs. The instructors also remarked that technical information technology knowledge was required to download and install the LMSs found on the Internet, and they had difficulty in this respect. In addition, technical support was costly and it was a laborious and a time consuming task to install them all, try them, and then select the best one. However, using the EW-LMS, the selection process could be done in a matter of seconds and without any

specialized technical knowledge or training. In addition to this, the interface used by the EW-LMS is simple and understandable.

5.3. Instructors' opinions with regard to the improvement of the EW-LMS

The researcher asked the question "What are your suggestions for making this LMS evaluation system, EW-LMS, more effective?" in order to find out the opinions of the instructors who used the system. The instructors said that it would be useful if the EW-LMS was put on the Internet as an open-source application, so that anyone interested can access it easily and free of charge. As a result, it is inevitable that more instructors will have the chance to evaluate LMSs, and this will increase LMS's usage, and hence the quality of distance education. In addition, the instructors requested the use of different languages in the EW-LMS. In particular, they said that the inclusion of their own language, Turkish, would be very important for them. The use of the system would be easier since their mother tongue is Turkish.

5.4. The most suitable LMS for instructors' needs

When the instructors entered their specific educational needs into the EW-LMS, the following results (see Figure 4) were obtained from the system: 39.47% Moodle 1.9, 31.40% WebCT 4.0, 27.35% Blackboard 6.0, and 1.78% others. But if we consider that there are 43 LMSs in the system, we can easily say that the effect of 40 LMSs (1.78%) is negligible on the overall LMS usage. The results are no surprise to the researcher. Looking at the literature, similar results have been obtained by other researchers (Catalyst IT Limited, 2003; Cavus & Momani, 2009; Graf & List, 2004; Hotrum, Ludwig, & Baggaley, 2005; Winter, 2006; Wyles, 2004). Unlike the results from the Itmazi and Megías (2005) survey, WebCT was the most recommended

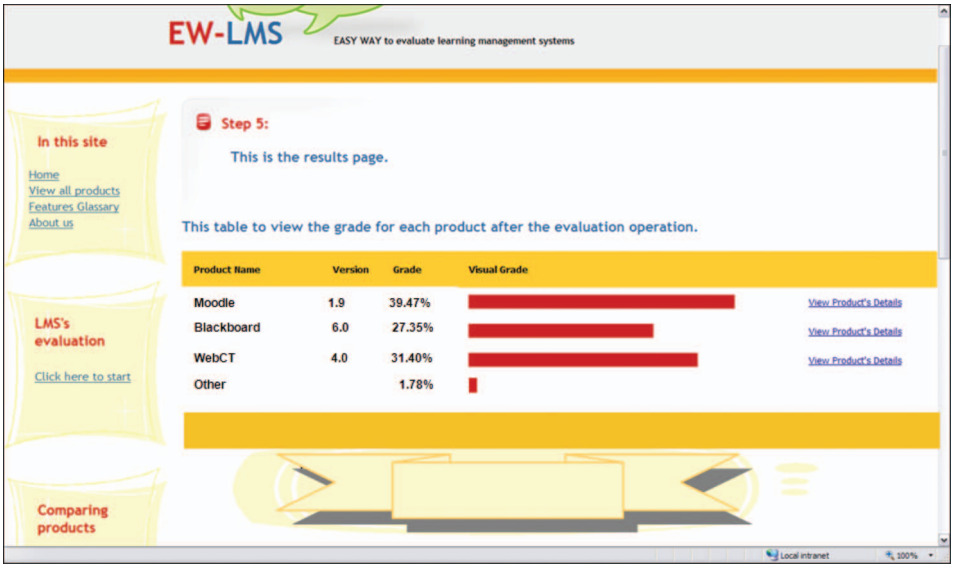

Figure 4. Snapshot of selecting an LMS.

Table 2. The scale of instructors' satisfaction with the selection.

Survey items ($N = 88$)	Mean	Standard deviation
(1) I think all my students who used the selected LMS are happy about it.	4.85	0.36
(2) I communicated easily with my students with the selected LMS.	4.75	0.55
(3) I sent the lecture notes I prepared in different formats easily to all the students.	4.84	0.37
(4) I have done all my quizzes easily with the selected LMS.	4.93	0.25
(5) I sent the home works to students easily with the selected LMS.	4.90	0.30
(6) I have easily done self-test at the end of each topic and sent feedback to my students with the selected LMS.	4.92	0.27
(7) I can say that the selected LMS satisfied all of my educational needs.	4.97	0.18
(8) I have done all my activities that I could have done using classical methods with the selected LMS.	4.94	0.23
(9) The selected LMS fitted my teaching style.	4.91	0.29
(10) The selected LMS helped me reach my teaching goals.	4.95	0.21

Note: Scoring: 5, Strongly agree; 1, Strongly disagree.

package, while Blackboard occupied the second, and Moodle the third. Another study by the LMS Strategic Review Committee (2005) that conducted a LMS review of six LMSs, led to WebCT Vista being ultimately selected.

5.5. The satisfaction of instructors with the selection

The satisfaction on the part of the instructors as shown by their mean scores and standard deviations in terms of their responses are given in Table 2.

It is obvious that the means in the above Table are high as they are all above 4.75. The conclusion that can be derived from these results is that the EW-LMS developed by the researcher has been an invaluable tool. This is particularly true of the items given the highest mean score, the 7th item ("*I can say that the selected LMS satisfied all of my educational needs*" $M = 4.97$), the 8th item ("*I have done all my activities that I could have done using classical methods with the selected LMS*" $M = 4.94$), and the 10th item ("*The selected LMS helped me reach my teaching goals*" $M = 4.95$). This indicates that the LMS offered to them has satisfied most of their needs. Furthermore, looking at Table 2, we can say that items 2, 3, 4, 5, and 6 have given high results, thus it can also be said that the selected LMS was the correct one.

6. Discussion and conclusion

Learning management systems offer instructors powerful tools that can be applied in a variety of ways (Grabe & Christopherson, 2008). The present research summarizes descriptive and numerical data on instructors' selection of a useful LMS or their courses. The literature search reveals that different researchers have used different methods for the evaluation and selection of LMSs. Uzunboylu, Ozdamli, and Ozcinar (2006) evaluated six LMSs by being members of websites, using demo programs and by using the features provided by the Internet websites. Bednarik,

Gerdt, Miraftabi, and Tukiainen (2004) aimed to develop a model to evaluate educational software using non-professional evaluators. 3Waynet Inc. (2004) contains four parts, namely LMS registry, criteria, features, and results, to evaluate LMSs. Hultin's (2004) study is about LMSs and how to evaluate them, depending on the learning environment and the users' needs with regard to LMSs. Arh and Blažič (2007) developed new models depending on complex and multi-attribute decision making for the evaluation of LMSs. The fundamental difference of this study from previous ones is that the choice is made depending on the individual educational requirements of the users. From this point of view, it is hoped that this study will contribute to the existing literature. Although the fields of the study are different from those dealt with above, the teaching and learning methods are all similar and, as a result, Moodle was chosen as the common preferred LMS system as was the case with Feldstein (2008), Itmazi and Megías (2005), Winter (2006), and so on. When the instructors entered their specific educational needs to the EW-LMS, WebCT was in second place, while Blackboard was third. An interesting and pleasant aspect of the study is that the results confirm that the EW-LMS developed by the researcher has been an invaluable tool for instructors. The reason for the positive attitudes could be explained in terms of the fact that, on a general level, instructors expressed themselves positively about the EW-LMS. The results obtained indicate that, since the mean of instructors' opinions was high, the EW-LMS is technically sound and well developed. In addition to this, the interface of the EW-LMS is simple and easily understood. A conclusion with regard to using the EW-LMS in the selection process is that the process should be done quickly, and without much specialized technical knowledge or training. Consequently, the study stimulated instructors who wanted to integrate LMS in most of their courses. Besides this, studies regarding the full-armed virtual learning environment integration are still rare in Cyprus. Also, this work will contribute mostly to countries which still lack behind e-learning, but are willing to use this virtual learning environment for delivering education to today's learners via LMS. Finally, the developed software should help developing countries to adapt a suitable LMS in their education system, hopefully cheaply and with little effort.

The system is oriented to anyone interested in evaluating and using an LMS in web-based education. The individuals who may be interested in using this software are instructors, students or anyone else who may have an interest in LMSs, and any educational organizations such as universities and other institutes of higher education.

7. Limitations and future research

As in every study, there are a number of limitations attached to this research. The first limitation relates to the sample size used in the study. However, previous studies, especially in the area of technology acceptance, have used only 44 and found stable results (Cool, Dierickx, & Jemison, 1989; Kahai & Cooper, 2003; So & Bolloju, 2005; Venkatesh & Davis, 2000; Yoo & Alavi, 2001). Nevertheless, it is the researcher's suggestion that any future research in this area should strive for larger sample sizes, so that more elaborate analyzes can be performed. Because of the rather small sample size, it was decided not to perform moderator analysis but, as previous studies have shown (e.g. Venkatesh, Morris, Davis, & Davis, 2003), moderators can add significant explanatory power to the main relationships in

technology acceptance models. The other limitation of the study was the fact that it was tried only with higher education instructors. It is recommended by the researcher that future studies in this field should concentrate on all levels of education and by instructors specialized in different fields, preferably in different developing countries. This is because every country has its own culture, its own education system, and different requirements and expectations of their educational establishments. In addition, future study will be on investigating which LMS satisfies the requirements of an institution, rather than the requirements of individual instructors (as was the case in this study). Also, future studies might productively combine quantitative data that establishes patterns in terms of a greater selection of student opinions about the selected LMS using the EW-LMS evaluation system. Such a study could be carried out using interviews and/or questionnaire items, allowing students to explain their opinions about the selection. Furthermore, student satisfaction is also important, and it can be assessed in terms of the LMS selected by the EW-LMS. This is because teaching has two dimensions: the instructor and the student. Also, a long tradition of research on technology acceptance has established that the (potential) user's perceived ease of use and the system's perceived usefulness are central factors in explaining the acceptance and use of new technologies. Prior research into the acceptance of e-learning systems has confirmed that these factors are indeed significant predictors of student acceptance of such systems (Martins & Kellermanns, 2004; Ong, Lai, & Wang, 2004; Selim, 2003). On the other hand, it will be interesting to see if there are any marked changes of opinions if the system is tried by instructors who specialize in different fields. Finally, it was a limitation that the author couldn't collect opinions of the professionals users as there were only a few of such people around.

Notes on contributor

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