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Developing and Evaluating a Desktop-Based Learning Management System

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In modern world, eLearning is widely used in a good number of educational institutes. Many educators emphasize that there are considerable benefits of using a Learning Management System to implement effective e-Learning courses. Another important aspect of an e-learning experience is the thriving interaction between the student and instructor. However, presently there is a lack of an inexpensive and flexible interactive Learning Management System to provide e-learning courses. This paper presents the design and implementation of a learning management tool and also the evaluation through an online survey to provide effective e-Learning courses. The proposed tool is flexible enough to customize and supports the most common features of an e-Learning such as view courses, view texts and videos, manage quizzes, display presentations and editing processes. The tool also supports to update the entire course information. The system was tested comprehensively by the real world students and instructors to ensure its effectiveness. The outcome of the survey ensures that the proposed system provides the satisfactory effectiveness to the end users.

Keywords: Learning Management System, Desktop, Tools, E-Learning.

1. Introduction

E-Learning is the most emerging frontier in terms of content and approach in modern education system. Recently, many universities have introduced and incorporated a number of e-Learning technologies to increase flexibility in course offerings and to enhance student learning experience. However, an affordable and easy to use learning management tool is still demanding to implement e-Learning courses in the educational environment.

One of the characteristics of online learning that initially caused a good deal of interest was its potential to teach large numbers of people. Whereas traditional education methods are limited by physical constraints, such as the size of any given lecture hall, the virtual world has no such limits. With sufficient server bandwidth, then any number of people can view a streamed video lecture at any time. For universities, training centers, or colleges struggling to cope with increased student numbers and rising real estate prices, scaling seems an attractive solution.

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The objective of this study is to design and implement an inexpensive, simple, and effective e-learning tool that can be customized by administrators/teachers to provide a more feasible service to students. The proposed tool provides effective support for the instructors to arrange the course material in a way that is secure and easy to access. The tool is developed by the popular computer languages C# and database management system MS SQL Server. It supports the tool to upload, download and update from both faculty and the students.

2. Literature Review

E-Learning is the delivery of a learning or education program by electronic means. E-Learning may involve the use of a computer or any electronic device such as a mobile phone. E-Learning can involve a greater variety of equipment than online training or education, for as the name implies, “online” involves using the internet or an intranet. CD-ROM and DVD can be used to provide learning materials. The changes we are seeing in society are converging at lighting speed with advancement in technology. E-Learning is an outgrowth of a far-reaching societal and technological changes that have been evolving over the last several years.

Interest on e-learning in academia increased significantly in early 2000s, particularly in the developed countries such as United States, Canada, and Australia. Studies of American students in virtual programs at both the elementary and secondary level led researchers to tout e-learning’s many benefits, including but not limited to its flexibility in geography and scheduling, its ability to address various learning styles, and its overall expansion of educational access to people in remote communities (Kellogg & Politoski, 2002). Not many works done on eLearning in academia in Bangladesh. However, Alam, Kabir & Elizabeth (2006) reports on e-learning initiative at Bangladesh University of Engineering and Technology (BUET). Their paper describes the constraints and design framework to overcome those obstacles. It also presents an evaluation of the pilot project and future plans in this regard. The introduction of web technologies like Java and HTML paved the way for a cost effective multi-dimensional learning environment. For the last decade, researchers and developers have studied different aspects of e-learning including delivery method (Aggarwal, 2003), learning management (Bender, 2003), Infrastructure and development (Pereira, 2003), tools and facilities (Bayross, 2000), implementation (Walther et al. 1999), application (Elmasri & Navathe, 2002), and strategy (Iverson, 2005). Most of today’s learning programs are delivered via the World Wide Web and involve using a web browser to access the material. A web based learning environment is created and accessed using either the internet or an intranet (Bender, 2003).

There are different tools which help prepare and uphold an attractive e-learning site (French et al. 1999). These tools include Listserv, Static Web pages, Interactive web pages, Webbased bulletin boards, Chat, and EPSS. The Electronic Performance Support System (EPSS) is a computer-based system

that receives, stores, and disseminates organizational knowledge and information on demand.

The interface delivers the content designed, which in turn is supported by the infrastructure of the e-learning environment. The content is designed similar to that of a traditional learning situation. The interface delivers the content and acts as a medium between the instructor and the learner, while the infrastructure layer supports the interface. The main objective of the learning environment is to have the interface and infrastructure stay in the background so the learner can concentrate on the content.

3. Methodology

Effective design of e-learning materials relies on instructional design processes that reflect the absence of face-to-face instruction. This change in learning context is an important factor for distinguishing online or e-learning from traditional instruction, and requires different educational design considerations.

3.1 E-learning Interface Description

The aim of developing this learning management tool is to provide the users with an attractive, user-friendly, secure, and comprehensive interactive interface with easy-to-use facility. The following figure shows the overview of interface unit and system operations list. The user enters into the system in two different ways—either as a student or as an administrator (faculty member). The username and password are matched with those already present in the database and the access is granted accordingly. Each account has its own personalized sub menu page and appearance.

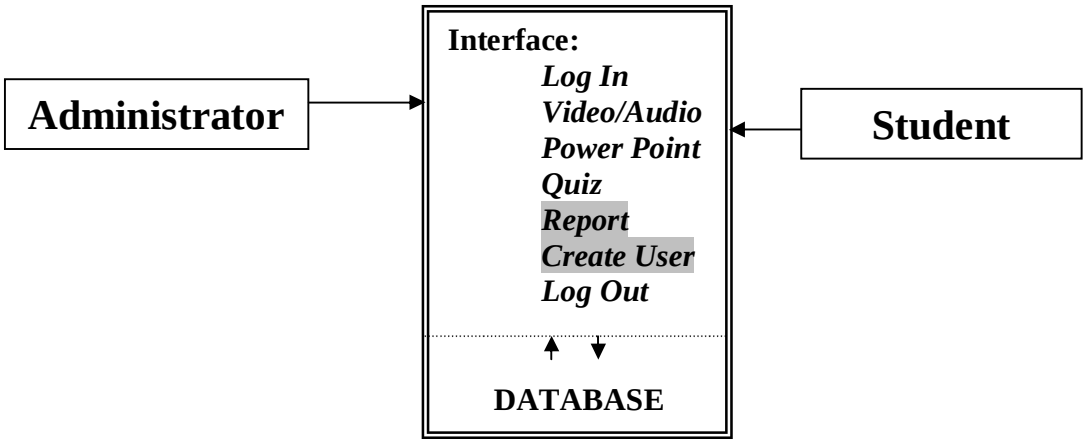

Figure 1: Overview of the Interface

3.2. Student as a User

When a student enters into his/her login, all helpful links such as Video/Audio, Power Point, Quiz and Logout are present. Each link has a specific importance and all these links appear in every page the user is exploring. This gives the user the advantage of switching to another desired link quickly without going back.

3.3. Administrator/ Faculty as a User

The structure of faculty interface process is similar to the student interface process which includes two additional link Report and Create user. However, each link performs in this account are different from the student account. Faculty members can view the courses, upload assignments, and view the names of students who have given tests, upload PowerPoint presentations, and can also update the list of students by adding new students.

4. Implementation

Understanding where system is being deployed, who uses it, how it needs to integrate with existing and future systems, and what specific educational tasks should be automated are keys to deploying a successful system.

The system should accept information from the user and respond according to the user's request. Here, the users are both faculty and students. Depending on the type of user, the system generates different kinds of interactive submenu pages that are readily accessible. Using this e-learning tool, faculty can add and update test or assignments, view submitted test or assignments, add new students to courses, add presentations. Students can access their courses, view assignments, submit completed assignments, view interactive presentations etc. This can reduce the gap between students and their teachers' communications.

4.1 System Operations

The design and usage of the proposed learning management tool is described using some figures and snapshots of the system operations. The users can login either as a student or as an administrator. Once the username and passwords are entered, pressing the submit button leads them to their corresponding information page.

The common features of the tool are login/logout, listening audio or view video tutorial, view power point slides, set the quiz question (for administrator only)/ perform the quiz, create user (for administrator only) and view the report of all participants (for administrator only).

For a successful login, a user must be a valid user according to the relevant database. Which means, the user name and password must be exists in the

database before trying to log in to the system. Otherwise, the user cannot enter into the system.

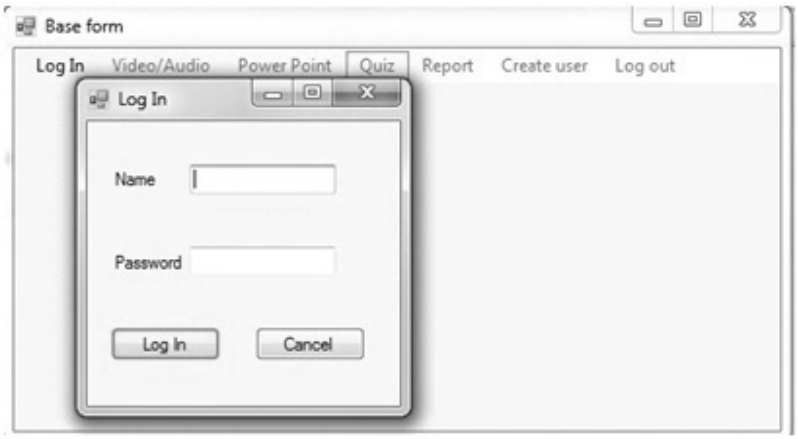

Figure 2: Log in Screen

There are also some validations like if the textboxes are empty or not before checking with the database. If the user is valid then appropriate options of the base form will be active otherwise the options will not be available.

For a valid user login option will not be available until he/she is logged out. Whenever a user is logged in a user activity with null values will be created in the database. User's activity information will be change according to user's activity to the options of the base form.

After login according to the user type the options of the base form will be active. If the user is an administrator type user then the "report" and "create user" will be available for the user otherwise they will remain dimmed.

Figure 3: Logged in as an Administrator (A) and as a Student (B)

For audio/Video option, "DXSDK" is used to integrate the audio/video player in the software. By clicking the Audio/video option, there will be form to let the user see the tutorial audio or video. User can load a file from a specific folder. When the user clicks the play button the time starts and clicking the stop button will calculate the elapsed time. This time is the property of the user – how many minutes user see/hear the tutorial

and also updated the user activity row in the database.

Figure 4: Submenu for Playing Video/Audio

In the power point showing form, a web browser is used to show a converted *.ppt file. After clicking the play button, a specific ppt file will be converted and shown in the browser. Here also user activity row of the database will be updated. If the user closes the form then the converted html file will be deleted.

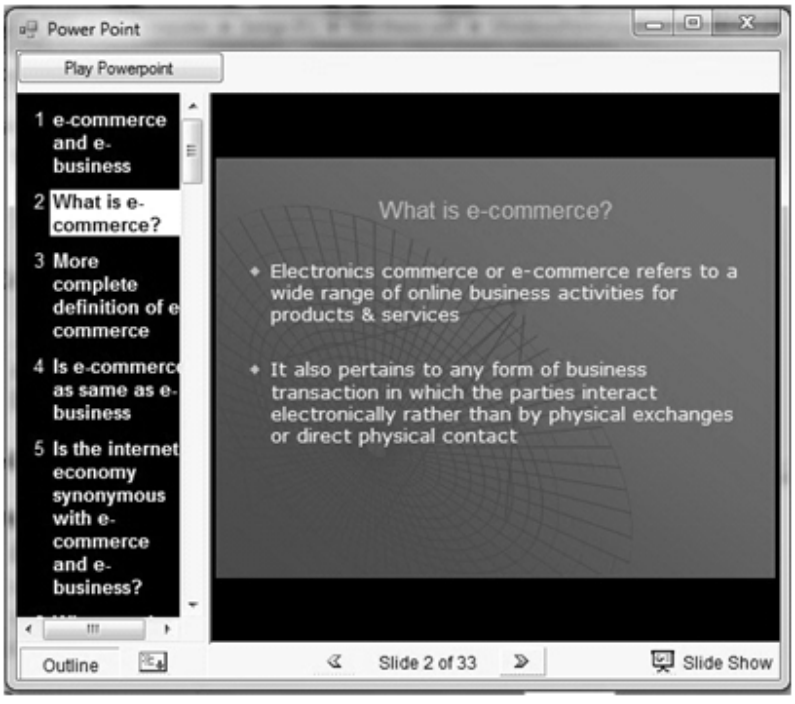

Figure 5: Submenu for Viewing Power Point Slides or Presentations

For the quiz option there are two forms- one for the administrator and the other is for the user. If the user is admin type, the software will let the user to set some

quiz questions. User can save three questions at a time. User can merge the current questions to the previous questions or delete the previous questions before saving the current questions. User must provide the right answer as well. Here, validation checks the right answer which must be the one of the previously provided correct answer. If the right answer will not be the same with one of the options the software will not save the question.

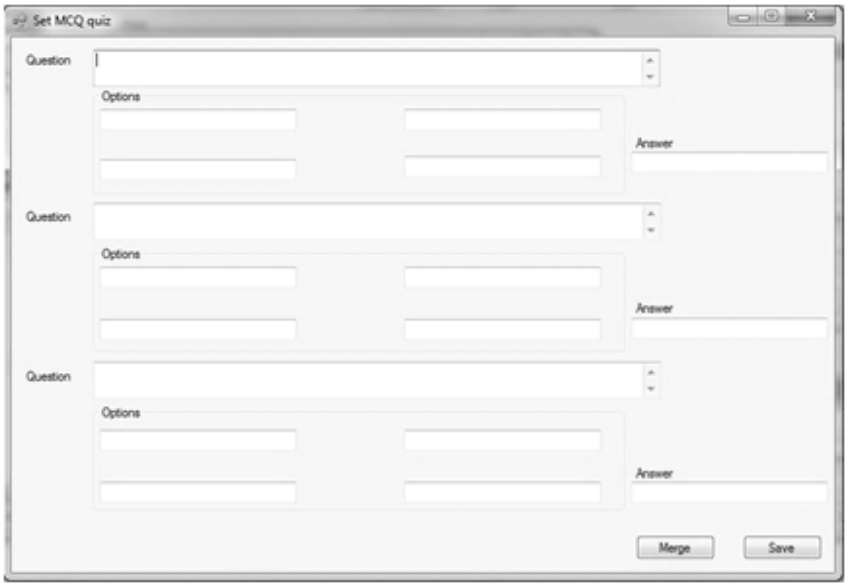

Figure 6: Screen for Setting MCQ Quizzes

While the user is just trainee or student type, the software will let the user to choose the quiz according to its date or name and click to load the appropriate questions. Here, the questions will load dynamically with a submit button. After choosing the options from the MCQ questions user must click the submit button. Clicking the submit button the software will calculate the right answers and the user's mark accordingly. Calculated marks will be saved in the database with its user name.

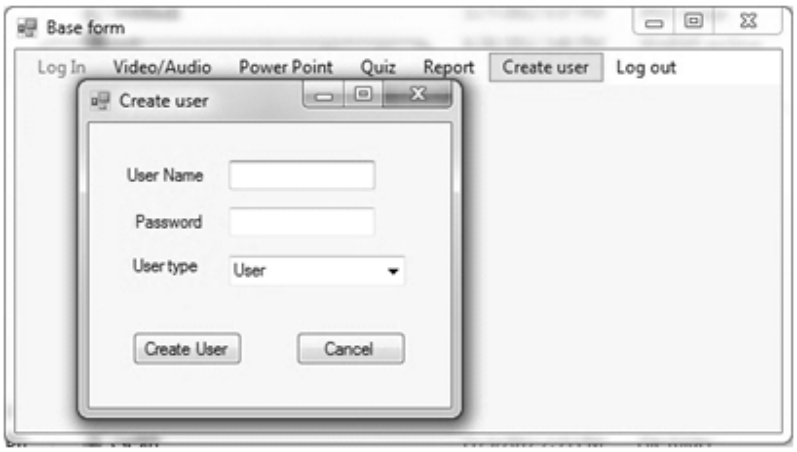

Figure 7: New User Creation Screen

The create user and the see report option is only for the admin type users. While creating a user there are some validations like the text boxes must not be empty, user name will not be the same with any of the existing user name and also user type must be mentioned. After all these validations checked user info will be saved in the database.

Figure 8: Screen for Participating Quizzes

Report option is for showing the admin type user the activity of the users. In this form there is a combo box which will show the user list. User will select a user from the list and clicking the show button will show the specific user's all activity in a grid view of the form. There is also a show all button which will show all user's all activity in the grid.

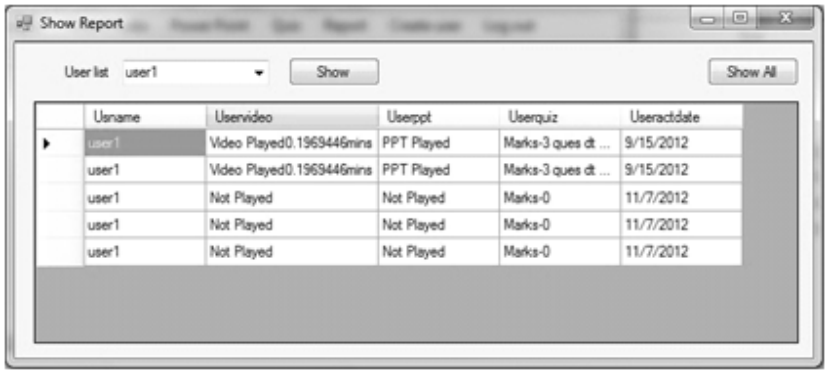

Figure 9: Viewing Reports as an Administrator

The log out option will allow the user to log out and all other options of the base form will be dimmed except login option. In this e-Learning tool, the admin type user can provide the contents to students, track the users' activity and evaluate the user accordingly.

The students can interact with the software without going to the class room; user can see the course materials sitting at home. This will make user feel easier to learn and also in some situations trainee will overcome the complications of going class room to learn.

To implement this software intended user must install DXSDK incorporated with this software's exe, SQL db to attach the db file of software.

4.2. Operational Testing

Testing of the system operations is done by entering data for students and faculty and accessing all the links in the interface. It is tested for its accuracy and effectiveness. The effectiveness and correctness of the system can be determined by testing it for various users. As the data increases, there should not be any change in the system response time.

5. Evaluation

To evaluate (Batchelor & Maxwell, 1987, Nouwens & Robinson, 1991) the effectiveness of our proposed learning system, we have conducted an online survey. The details of the survey are described briefly in this section.

5.1 Study objective

The major objective of this survey is to collect information about the user's view regarding the impact of a LMS in our education system. In this survey the questioner to obtain information about two main sub-topics listed below:

- *Acceptance and impact of using LMS in education sectors*
- *The basic intended features of users of Bangladesh in a LMS*

5.2 Study design

An online survey methodology was chosen in order to maximize the geographical spread of respondents, speed of data collection and anonymity of participants. The survey was designed by using *freeonlinesurveys.com* and it contained 20 questions. The questions were developed based on key issues in the academic and lay literatures and experimental knowledge. Questionnaire is a standard and structured instrument of a survey [9]. Often they are the only feasible way to reach a number of respondents large enough to allow statistically analysis of the result. While designing the questionnaire, it should be focused on appropriate closed ended questions and administered in a standard way. When fairly straightforward information is required and focused on "what" occurs rather than "why" or "how", questionnaire has its best use in such a situation. The main objective of this survey was to find the impact of a learning management system on our education system. For this reason, survey questionnaire has designed with clear, simple and precise closed ended questions to obtain the straightforward information with predetermined responses about the users' opinion. One has to aware that sometimes it is difficult to capture the richness of meaning in survey questions. That's why the design of the questionnaire must be self-explanatory statements, such as "assume that an unknown automobile expert A and one of your friends B who is not expert about cars is available for recommendation when you are going to buy a car. Which recommendation will you prefer?" In the first sentence, try to present the situation clearly so that it would be easier for the respondents to capture the scenario. In the second sentence, the actual question of which is interested in is asked. The question must be closed ended. For example, "if you could rate your online friends, would you be bothered doing so?" The answer options were, "Yes, I would", "No, I wouldn't" or "Don't care". Moreover, an introductory statement has been given with the study title, its organization and aims of the survey. Consistent and clear instructions have also been given throughout the questionnaire. The general steps to design and administer a questionnaire:

- Defining the objective of the survey
- Determining the sampling group
- Writing the questionnaire
- Administering the questionnaire and
- Interpretation of the results.

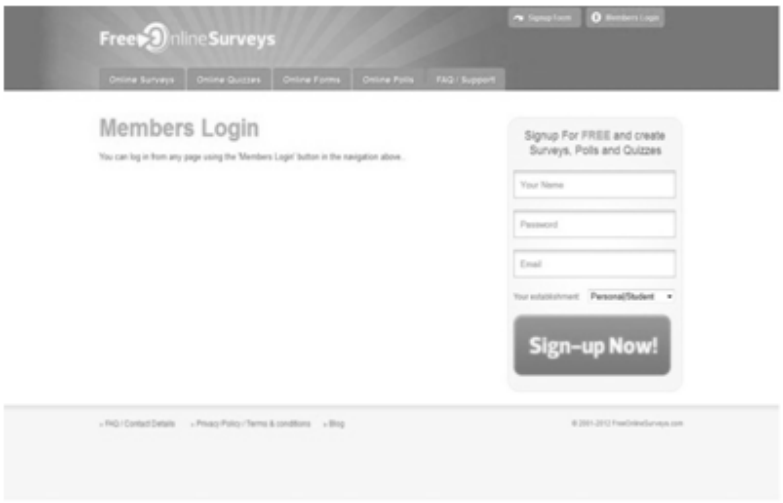

Figure 10: A Screen Shot of Used Online Survey Tool

In creating a survey, the investigator only should ask what is necessary and what might be interesting. Trying to answer too many things usually means none of them are answered well. For this reason, the questions were kept to a minimum number, It was stated in the introductory information that the study focused on automated recommendation particularly in the online environment. It also stated that "You will remain anonymous and any identifiable information you provide will changed. Information you provide will be held on freeonlinesurvey's server, however, freeonlinesurvey guarantees that the data will be kept private and confidential". The survey was piloted and refined before going live.

5.3 Recruitment and Data Collection

Respondents were recruited using strategic opportunistic sampling. Email was sent to the supervisor. The study was also published through the social network Facebook. Data were collected between December, 2012 and February, 2013. Due to the lack of available time; the survey was limited to specific people only. The time limitation of this survey also limits the number of respondents.

5.4 Respondents

A total of 310 respondents, from different universities of Bangladesh participated in the study collected online. Though there was not specific user for the survey, the invitation email to participate in the online survey was sent to only university students and teachers. Respondents included both male and female online users of different age groups.

5.5 Results

Respondents included students who have used online educational tools and family members of such students as well as teachers and university faculty who

had substantial experience and expertise with such online tools. Each of these respondents willingly shared their stories and, in doing so, helped inform the findings included in this special report.

This developed software was only very common features of a LMS, other popular features like email, chat, online resources, link, and messenger service and so on are not available in the software. There were total 310 persons as the respondents of this survey through freeonlinesurvey.com within the allocated time period. The participants have to answer all the questions.

Acceptance and impact of using LMS in education sectors

At first I want to know trainers view on the way of learning using the question- "Which way of learning do you prefer?" Among the respondents 10% likes conventional (full class room – teacher based), 60% likes partly conventional-partly machine dependent and the rest 30% likes full machine dependent (like Learning Management System)

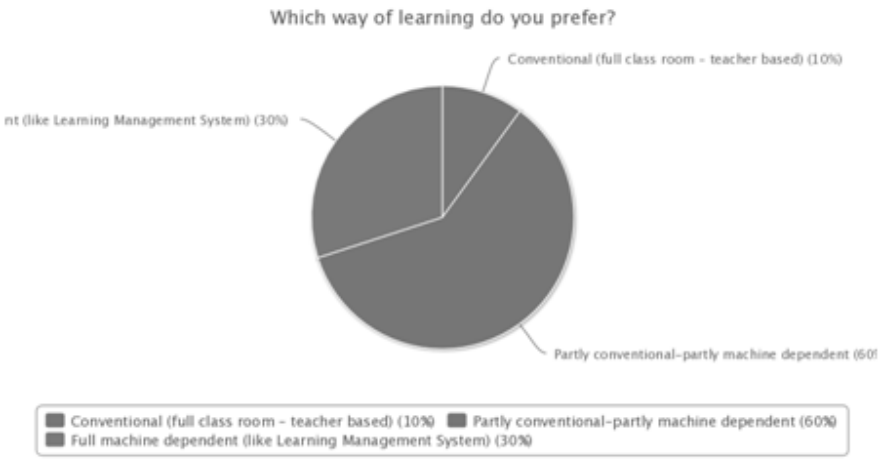

Figure 11: Way of Learning Preference

Before going further through the survey user must has knowledge about learning management system. The ratio of having knowledge about LMS is 50%-50%.

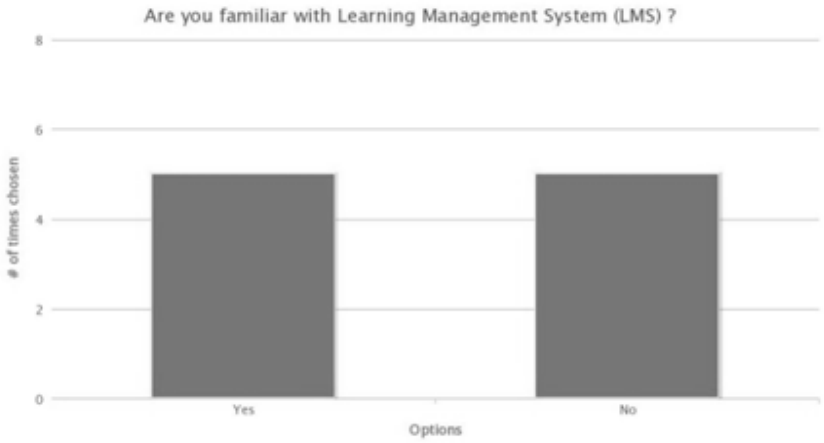

Figure 12: LMS Familiarity

About 9.09% users was trainer, 72.73% users was trainee and 18.18% among users was admin type user of this survey respondents.

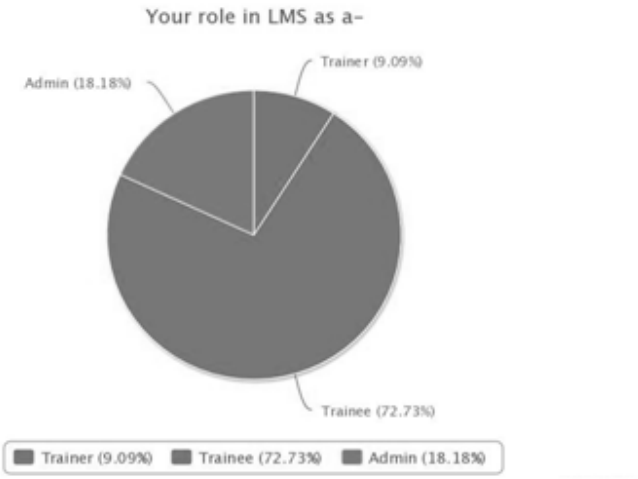

Figure 13: Role in LMS

Almost 63.64% users were working and 36.36% users were non-working. More than 45% users uses Moodle, 36.36% users use BlackBoard, less than 10% users uses Canvas LMS. Little more than 80% users have had a positive overall experience with learning management system.

The basic intended features of users of Bangladesh in a LMS

Most of the user among survey respondents response that used LMS must be so easy to use. According to that EduLearn LMS (my proposed learning management system) is very easy to use to 18.18% users, a little bit easy to 81.82% users.

27.27% users strongly agreed that EduLearn LMS increase the interactivity and improve learning and rest 72.73% users agreed that EduLearn LMS increase the interactivity and improve learning. 72.73% users think that “User activity tracking” is more specific and useful by using EduLearn.

“Listening to or viewing instructional media” was one of the useful features of EduLearn LMS. More than 45% users think it is very useful and 18,18% users did not use the features. According to response, more than 75% users EduLearn LMS is more flexible than others.

About 80% users customized EduLearn LMS to their choice, less than 20% did not customize it. Almost all the users consider EduLearn LMS is less expensive comparatively. And more than 80% user can easily control the full system of EduLearn LMS according to their choice.

Almost all users suggest having a LMS in Bangla language; they think it will be useful for our country. Most users want to use a LMS in their Android device; according to them it will be more popular in young generation of our country. Near about 90% users think LMS of lower cost like EduLearn will be more popular & effective in universities in our country.

In Bangladesh, our IT infrastructure is not yet strong enough to use a LMS in web or through internet in all sectors. But desktop version of EduLearn LMS is much easier to implement in a developing country like Bangladesh.

Figure 14: Easy to Use

Over 40% users find EduLearn LMS more user friendly than other users.

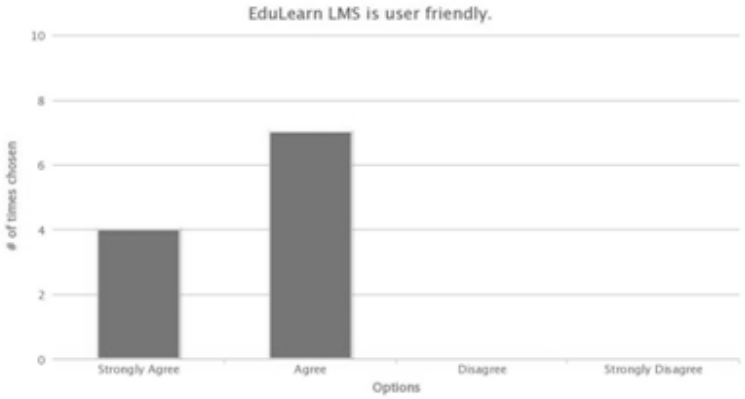

Figure 15: User Friendly

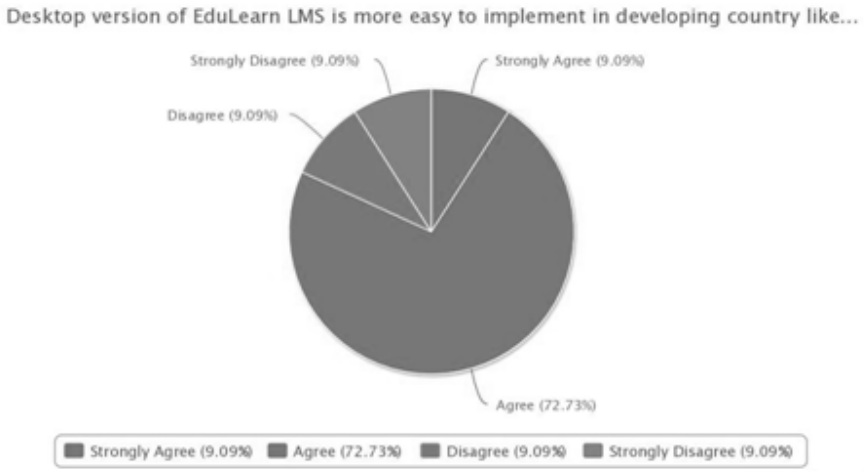

Figure 16: Suitability of Desktop Version in A Developing Country

Most respondents think that using of EduLearn LMS in universities will increase efficiency of students & Lecturers

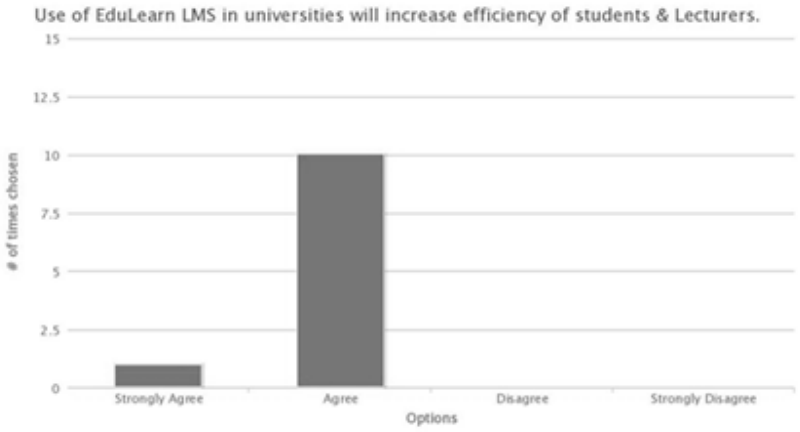

Figure 17: Efficiency Improvement

Comparing both conventional and LMS based learning and after the analysis I found 45% learners have positive change in performance & efficiency of a student after using a LMS, 40% learners have no change in performance & efficiency of a student after using a LMS, 15% learners have negative change in performance & efficiency of a student after using a LMS.

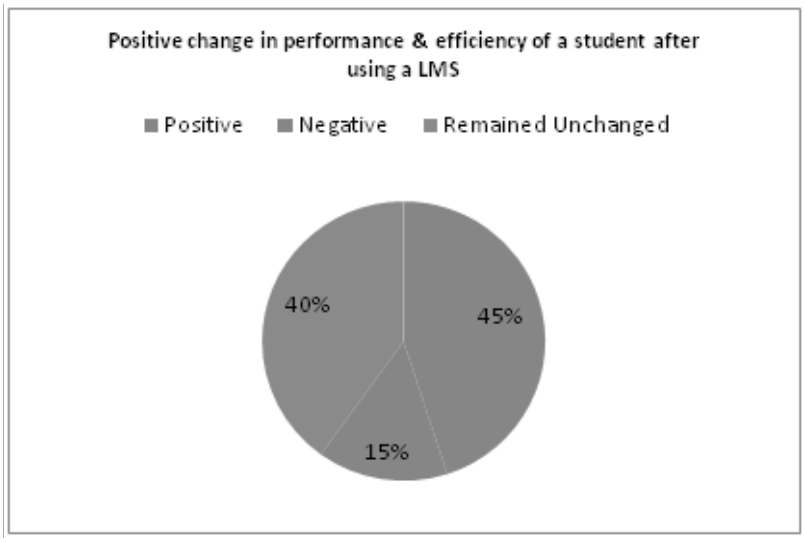

Figure 18: Performance Improvement

5.6. Discussion of findings

Overall results demonstrated that more than one third of respondents who use assistive technology to access online educational tools reported the experience as a successful use/access. Open ended questions gave respondents the opportunity to share their personal stories. Data indicated that several of the most important features of online educational tools posed the most problems for those who used screen reading or screen magnification software. In nearly every instance, respondents indicated features that were inaccessible.

The ability of respondents to effectively use access technology was considered in this report. As mentioned, respondents included students who have used online educational tools, family members of such students, as well as teachers and university faculty who had substantial experience and expertise with such online tools. Consistent trends among participant responses were substantial enough to negate this otherwise potentially salient factor.

Even though the survey did not ask for suggestions about how to best accommodate for many of the most problematic features that people may want with online education, respondents provided suggestions. Those involved with online education are encouraged to adhere to the aforementioned suggestions and those who have the potential to develop the technical expertise to better the situation are urged to resolve many of the problematic features. It is noted that

adhering to these suggestions can give students a better chance for successful access with the usable features of online education until the problematic features are remedied by the necessary experts. It is also noted that adhering to these suggestions can give all students a notable better chance for successful online education experiences.

Efforts to remedy the situation should be grounded in bettering the problematic features that prevent full and equal access for people. Respondents shared their personal stories through the open ended questions included in this survey. Parents must access online education materials for their high school children. University students are unable to complete posts-secondary degrees that involve the use of online educational tools due to accessibility barriers that are too substantial to overcome. These are unacceptable circumstances in this time of technological prominence when computers have the capacity to bridge the digital divide.

6. Conclusions

Despite of the necessity of implementing eLearning to supplement the traditional education system and improve the overall learning, an inexpensive, easy to use, effective and efficient LMS is still on demand. One of the important features of e-learning experience is the easy interaction between users and computer systems. The computer is able to transcend the traditional textbook content by providing dynamic interaction. However, there is a lack of an interactive and inexpensive medium of communication between instructors and students. The focus of this study was to design, implement and evaluate the effectiveness of an interactive learning management tool which is accessible to students and faculty, helping them communicate with each other using an inexpensive, user friendly, and secure environment. These objectives were achieved by designing and implementing the learning environment which found useful in many ways through an online survey conducted to students and faculty. The system addressed the most common needs such as viewing the courses, assignments, presentation, contact, and editing. From the survey result, it is found that the users find this proposed system useful and effective.

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