Development of a Novel E-Learning System for Improved Usability

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Abstract

E-learning is a learning approach that combines organized instruction with the use of technological resources such as laptops, computers, and tablets. It allows students to study at any time and from any location with the help of Information Communication Technologies (ICT) that can connect instructors and pupils who are separated by thousands of miles. The criticality of this study is to fulfill students' and instructors' expectations of using virtual learning systems while having thrilling and interesting learning and teaching experience. This proposed system will help them to know more about the technology tools functioning and teach them a better understanding of using the system's features. Most lecturers and students faced challenges in utilizing e-learning systems with such factors being reviewed by some researchers.

Keywords: e-learning, ethics, technologies, online learning, pandemic

1. Introduction

E-learning is a learning approach that combines organized instruction with the use of technological resources such as laptops, computers, and tablets. It allows students to study at any time and from any location with the help of Information Communication Technologies (ICT) that can connect instructors and pupils who are separated by thousands of miles. E-learning has provided on improving education's efficacy and efficiency by assisting students' needs such as offering access to updated content, having quick delivery of lessons, and the ease of having unlimited access to the content. Most institutions use tools such as Microsoft Teams, Google meet, Zoom , and so on to impart the e-learning facility to the learners [1].

The critical of this study is to fulfill students' and instructors' expectations of using virtual learning systems while having thrilling and interesting learning and teaching experience [3]. This proposed system will help them to know more about the technology tools functioning and teach them a better understanding of using the system's features. Most lecturers and students faced their challenges in utilizing e-learning systems with such factors being reviewed by some researchers [9],[10],[11].

According to (Wood, 2022), the usage of e-learning has been increasing around the world since the covid-19 pandemic occur [4]. During that period, it was an important instrument for effectively conducting the teaching-learning process [2]. Therefore, institutes of higher learning have been forced to swiftly migrate to distance and online education as the result. Students rarely go back to the usual physical classes to avoid getting infected. Many universities have adapted to investing in online learning as they are interested in finding the most effective ways to distribute course content online, engage students, and perform evaluations [5],[6].

2. Background Study

There are some of the current e-learning systems that have been discussed by past researchers related to novel e-learning systems and the latest technologies.

According to [13], e-learning benefits the education industry in both urban and institutional settings by offering a variety of instruments for students' managerial and instructional needs at the institutional

level. the administrative elements, like student enrolment, and the instructional elements, such as making course materials available. An alternative to conventional servers that can better utilize resources is cloud technology as it has been offered as a cutting-edge approach to enabling IT solutions because of its elasticity, speed, scalability, and adaptability capabilities.

E-learning is more than just learning online. It offers solutions that incorporate management and system standardization technologies according to [11]. The researcher provides that different institutions and people are interested in using cloud computing because of its recent emergence. It suggested there are many technologies on the cloud platform that should be fully utilized in the development of cloud-based e-learning. However, cloud computing cannot completely be reliable as some challenges in cloud platforms have been identified.

Based on [12], researchers suggest ensuring that students have access to the same assessment and learning materials, most existing e-learning platforms include traditional e-learning systems. The proposed adaptive e-learning model's integration of Big Data technologies allowed for the consideration of novel techniques and approaches to deliver the most relevant learning materials to each learner while providing an adaptive e-learning approach. It can give additional learning time to students to solve issues for slow learners. However, there are some discussions on related issues in big data on PLP.

3. Problem Statement

There are three problems have been identified as below:

- Usability issues in using e-learning systems among students and instructors

The students may find it difficult to adapt to e-learning immediately due to a lack of IT background and hard to communicate with a lecturer or their friends. They will also feel less interested in learning online without their help. Some studies reviewed the challenges which students faced without technological knowledge [4]. For Instructors who are accustomed to lecturing courses in physical classrooms, they will face similar issues like inexperience in using technological tools such as teaching platform training, inability to get focus on students' learning attention, keep the classroom in order, coordinate classroom discussion, and provide feedback and discussion via the internet [5]. Due to that, there must have some guidance and instruction for them to know how to use the e-learning system and get familiar with it.

- Ethical and trustworthy in using an e-learning system

Most of the time, users do not realize that ethical issues could cause problems while using an e-learning system [7]. For example, cheating during exams would be easily caught when students are in a typical classroom context. however, in e-Learning, the detection methods have not been clearly spelt out. In this case, they are likely to accept academic dishonesty as it is common for them to do so during online learning periods. In addition, they can also copy from other people or unauthorized sources and put it as their work. While they also have no confidence and trust in the e-learning system [13]. Therefore, they must understand the ethics and avoid being caught by exam protocol because of doing this unethical work. Thus, the development of a novel e-learning system enables them to have more confidence for a brighter online learning experience.

- Lack of completeness resources and material in online learning the problem and the solution are depicted in Table 1.

Not all disciplines and subjects are appropriate for digital learning especially STEM subjects such as science, psychology, and engineering where the use of practical knowledge is required. It is impossible to completely adopt online learning in the long term as a student's practical work must be evaluated in person by their lecturers physically. Without the practical, they will feel difficult in understanding their representative course and only rely on learning its theories. As the result, the interest in learning online will be also gradually reduced. Therefore, a digital board must be included, and providing more practical tasks can attract more attention from students during the online learning environment [8],[9],[10],[11].

Table 1 Problem and Solution

Problem	Solution
Usability issues in utilizing an e-learning system among students and instructors	Develop a simplified and user-friendly system that is easy to understand and use.
Ethical and trustworthy in using e-learning system	Educate the students regarding academic dishonesty Implement additional validation features within the system
Lack of completeness resources and material in	Provide some interesting learning resources to have a more enjoyable learning

online learning	experience.

4. Aim and Objective

The project's purpose is to satisfy the students by providing them with a virtual learning environment through an improvised e-learning system. This will offer them a similar learning experience as face-to-face classes during the hybrid period. Some related issues will be identified and provide suitable solutions for solving them.

There are three project objectives:
- To develop an advanced e-learning system that is convenient and efficient for students and lecturers to use.
- To study existing modern technologies that enable the implementation of a practical environment simulation within the e-learning system.
- To test and evaluate, investigate, and identify the security of the current e-learning system.

5. Methodology

The methodology used in this project to develop an e-learning system is the Prototyping model.

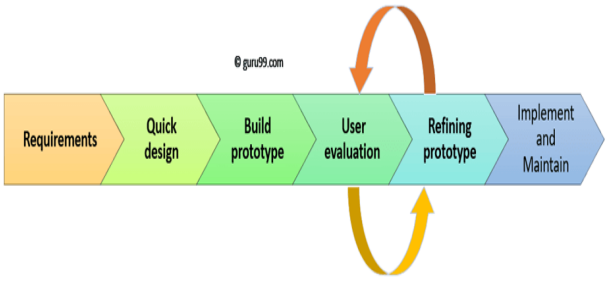

Figure 1: Step of prototyping methodology (Martin, 2022)

Figure 1 show that there are five phases of prototyping and each of them will be described below. Table 2 demonstrate the phases of the approach and deliverables.

1- Requirements gathering and analysis
The requirements of the system are defined in detail. During the process, the users of the system are surveyed and formally interviewed to know what their expectation from the system is.

2- Quick design
In this stage, a simple design of the system is created. However, it is not a complete design. It gives a brief idea of the system to the user. The quick design helps in developing the prototype.

3- Build a Prototype
The information acquired during rapid design is used to create a real prototype in this step. It's a scaled-down version of the needed system.

4- Initial user evaluation
In this stage, the proposed system is presented to the client for an initial evaluation. It helps to find out the strength and weaknesses of the working model.

5- Refining prototype
If the user is dissatisfied with the existing prototype, it must be refined in response to the user's input and ideas.

6. Implementation and Product Maintenance

The final system is tested and deployed to the client. Any feedback will be considered for further improving the system.

Table 2 Prototyping phases

Prototyping	
Phases	Deliverables
Gather requirements	• Survey results based on what they expected
Design	• A simple idea
Development a Prototype	• Build an e-learning
Initial user evaluation	• Testing the prototype
Refining prototype	• Evaluation of the prototype
Implementation	• Deploy the system and maintain

7. Result Analysis and Synthesis

The analysis is needed to gather the data and to be analyzed to complete the system. There are various ways to gather data such as interviews, questionnaires, and research based on requirement data. The survey is a good way to know the target needs and to collect opinions from users who have used e-learning conveniently. The target audience for this survey is people who are students, and employees who work in various jobs. The survey is released on 2nd October 2022 until 25th October 2022 and a total of 100 students responded. The platform used to conduct the survey is google forms posting the link on social media such as WhatsApp Group and Instagram.
After the survey has been conducted, most of the users benefit by using an e-learning system for attending

classes. Most of the users get the new norm of using it during the technological era. Although some responders will still prefer face-to-face learning, users are very convenient and easy to use the e-learning system even before the pandemic when some of the users have been using it for their own learning purposes. There are some issues that users currently face such as incomplete resources, and a lack of security features. Users believe that using e-learning systems can help them verify their assignment work without having to meet with the lecturer. They will be honest with their work without plagiarizing from another source.

7.1. UML Diagram

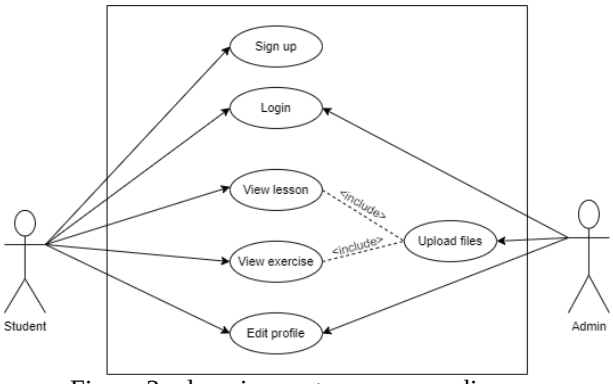

Figure 2 e-learning system use case diagram

A use case diagram is a diagram that describes the interaction between actors and the system. The activities can be carried out by students and the admin when they are using it. Showed in Figure 2, there are two actors who interact with the e-learning system, namely the student and the admin. Students need to sign up by filling in their personal information which includes username and password. Then the registered user can log in to view lessons, and view exercises uploaded by the admin. Admin needs to log in to upload files into view lesson, and view exercises for students to view them. In addition, both admin and students can edit their respective profiles. Only the admin can see their student's full information that has been registered. Students would need to request permission from the admin to see it after making changes.

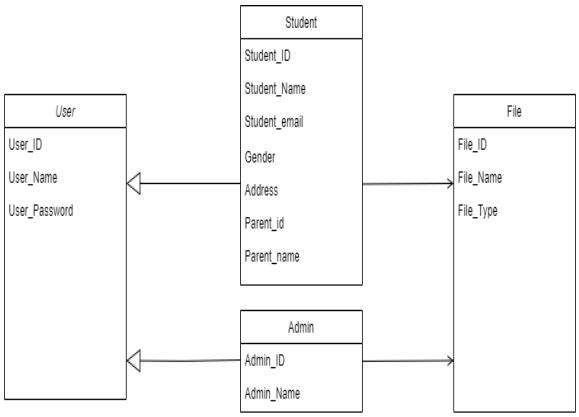

Figure 3 e-learning system class diagram

The class diagram of the e-learning system is illustrated in Figure 3. There are five classes namely student, admin, user, and file. For student's class diagram, it contains the student id, student name, student email, gender, address, parent id, and parent name. Admin's class diagram includes admin id and admin name. Both relate to a user class diagram which includes the user ID, username, and user password. Both also relate to file class diagrams which contain file id file name and file type.

8. Evaluation

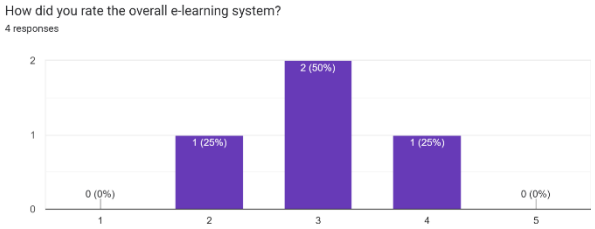

Figure 4 poll of the e-learning system

On a scale of 5, as shown in Freigu 4, two users feel moderate about using the e-learning system while one user feels a bit dissatisfied, and one feels satisfied with using it.

Overall, based on the poll, respondents are satisfied with the usefulness of the e-learning system. However, there are some suggestions given by respondents to develop the system further, for example, by giving view file options. The ideas are noted down and developers will make additional improvements to the system before publishing the system in the future and hope to meet user-expectation

9. Conclusion and Further Work

The project is to give students and lecturers convenient and efficient use of the system as it has features such as adding lessons and exercises for students to download it. Users can make changes to their profiles in the future.

9.1 Main Contribution

The major contribution made to this project is that it has provided file sharing for the lesson and exercise to students. The e-learning system can help benefit students learning in hybrid mode. It can enhance usability that includes adding, editing, viewing, and deleting lessons and exercise files. Students' personal information will be monitored by the admin when the user makes changes to it.

System Limitation
Most of the system development has some disadvantages due to a lack of knowledge during the build prototype phase. This system consists of several disadvantages such as:

Lack of messaging tool
The system lacks a way for users to communicate via messaging.

Unable to upload videos
The system doesn't allow the admin to upload lesson videos for students to view.

System interface
The system design might be simple and least attractive for users due to not having much design implemented.

Future Research
The system is believed to be further enhanced by introducing a video upload function. Next, the system can also be improved by adding a video viewing function. Finally, the system can improve a view function that allows users to view the files before downloading them.

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Authors Introduction

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