Mobile App: Development and Evaluation of the Proposed Computer Laboratory Management System (CLMS) for World Citi Colleges

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Abstract

The Mobile App: Development and Evaluation of the Proposed Computer Laboratory Management System (CLMS) for World Citi Colleges system was created with the intention of making it easier to manage and monitor computer labs and to make it easier for labs to hold lecture classes at World Citi Colleges. This study evaluated our program using the ISO 9126 Model and had a significant influence on both faculty and non-faculty members of the College of Information Technology Education. The goal of this research is to create a LAN-based remote-control system that can keep an eye on the terminal activity in each computer lab. To include a file transfer feature for the data and documents that the computer automatically saves, as well as a power control feature that can log off, shut down, and restart the terminals. To have a screen casting option for lectures, class discussions, and other uses, as well as an Android mobile application with power control functionality that is easily accessible on your smartphone. The created system provides the user with great functionality and flexibility to make administering the computer lab easier. The responders, including the ITS department, evaluated the developed system on a technical level. using the ISO/IEC 9126 model by experts. It has a number of software quality attributes like functionality, dependability, usability, efficiency, and maintainability. It received an overall score of 4.5 with the comment "Very Acceptable." The created system will advance with the installation of new features, which are advised to offer more capabilities that will enhance the system and continuously aid the beneficiaries.

Keywords: Android Mobile Application, ISO/IEC 9126, LAN-Based Remote-control System, automated process, Computer Laboratory Management System

Introduction

All of us are currently living in the so-called "computer generation," where there has been a significant transition from manual to contemporary information systems, with nearly everything being operated and controlled by technologically advanced and extremely potent equipment. The user can now participate actively in the processing of data in order to make it happen more quickly and effectively thanks to advancements in information technology. In his study, Hasan[1] came to the conclusion that an organization's performance is

greatly influenced by how well its information systems (IS) are managed. As a result, several institutions and businesses continue to implement cutting-edge information systems.

The development of several multipurpose equipment, such as computers, that can be utilized to implement the information system has been made possible by modern technology. Technology has aided in all of these revolutions by making life simpler, faster, better, and more enjoyable. Every organization now views an information system as being created and programmed to operate autonomously. It lessens the need for paper while improving data storage, retrieval, and searchability.

For example, manually recording the status of the inventory and the log-in and log-out procedures in the past required time and effort. However, employing information systems with similar and advanced features can greatly aid in increasing the productivity and efficiency of office and organizational processes.

These days, information systems are being adopted by smaller businesses as well. Universities and schools are also hastily automating and even going online with their processes. Universities are among the places where people may see how the world is changing quickly and how technology is acting as the change's trigger. The enrollment and grading systems in universities both use online processes. This aids in easing the procedure for both students and university faculty and staff.

The process of recording and monitoring would be made simpler for all users by creating a computerized management system for computer labs. It can be designed to ensure that all users are tracked, that the software and hardware inventories are kept up to date, that the usage and borrowing of hardware equipment can be tracked, and that the attendance of students can be communicated with their professor's file. This can be accomplished with the aid of a computer laboratory management system by giving the students better-organized, strategic, value-generating activities. Since a lot of data were manually collected and recorded each day, an automated solution is very necessary.

Therefore, the primary goal of this study is to design and create a Computer Laboratory Management System (CLMS) that can carry out the following tasks: (1) automatically logging in users (students) when they have laboratory classes; (2) assigning schedules for using the lab at particular times and days; and (3) updating the inventory of the lab's hardware and software that is installed in the servers. The study will also include testing and system walkthrough evaluation of the chosen responders. The proposed CLMS will be assessed using both the ISO Software Evaluation Matrix and an evaluation of its characteristics.

Methodology

MATERIALS AND METHODS

Both qualitative and quantitative methods will be applied in the descriptive study design. Descriptive design will be useful for the study because it aims to describe the design and development process of the proposed CLMS. The foundation of descriptive research is the idea that through observation, analysis, and description, issues may be resolved and practices can be improved. It produces data that describe the state of nature at a certain time, both qualitatively and quantitatively [2].

On the other side, the researchers developed the suggested solution using the Agile SDLC Model. Iterative and incremental process models are combined to create the agile SDLC model, which is focused on process adaptability and customer satisfaction through quick delivery of functional software. The product is divided into smaller incremental builds using agile methods. Iterations of these builds are supplied. Usually, an iteration lasts between one and three weeks. According to the agile approach, each project should be handled uniquely and the existing procedures should be customized to better meet the project's demands. To deliver specific features for a release, tasks are separated into time boxes (short time spans) in the agile methodology. Working software builds are delivered after each iteration using an iterative technique. In terms of features, each build is incremental; the final build contains all the features requested by the client [3]. The methods used in the Agile approach are depicted in Figure 1.

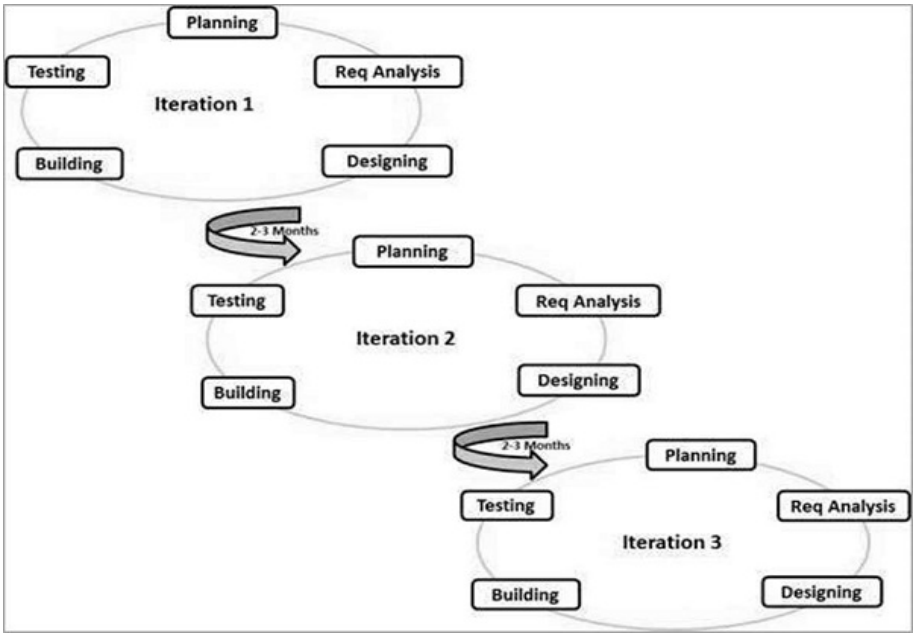

Figure 1. AGILE SDLC Model

Checklists and survey questionnaires served as the primary data collection tools for this investigation. A questionnaire is a prepared list of questions with written answers about a specific subject. The questionnaire includes a series of questions to assess the system feature, the proposed CLMS's dependability, and the CLMS's compliance with ISO 9126 or the Software Quality Matrix, which was chosen as the questionnaire's primary indications. The aforementioned questionnaire was pretested on some students who were not participating in the study as respondents in order to validate it. This is to check if the questionnaire has any ambiguous questions. On the other side, a checklist was utilized to verify if the proposed system's claimed characteristics and functions were present or not. This ensures that the suggested system complies with the specifications laid down by the client, in this research the PUPSTB Computer Laboratory, who served as the system's client. The acquired information allowed the advocates to assess the requirements of the students and how the proposed study will address those needs.

Thirty (30) students who have actually utilized the computer lab were specifically chosen as the study's primary respondents, with interviews used to collect preliminary data for the system development requirements.

The Data Collection Procedure and Analysis

At first, the respondents were required to complete a checklist that included all potential system needs. This includes the elements and capabilities that the designer may choose to incorporate. The system requirement document, which specifies all the functional and non-functional needs required to be included in the design and development, is created using the information acquired in the checklist. In order to acquire additional pertinent information for the study, lab supervisors and a few professors who supervised computer lab subjects were also interviewed.

The respondents were gathered once more to evaluate the system after the development. They completed the questionnaire in a computer lab, which took them 5 to 15 minutes. This is carried out following the testing and demonstration of the final installation of the proposed system in the server of the computer lab. During the testing, the proponents assisted them and instructed them on how to use it. The participants heard a reading of the instructions on how to complete the questionnaire. This made sure that the right information and response were gathered. The respondents were then given access to all of the completed papers. After being combined and totaled in a spreadsheet, the acquired data were next subjected to statistical software analysis.

RESULTS AND DISCUSSIONS

Design and Development of the Proposed CLMS

The proponents have developed the designs for the proposed CLMS after carefully analyzing the data collected and the current manual procedure. The system designs that served as a model for creating the suggested system are listed below.

The System Architectural Diagram illustrates the relationship between the user and the system. The user must first input all the variables before the application can process it. All of the user's inputted data is then saved on the database.

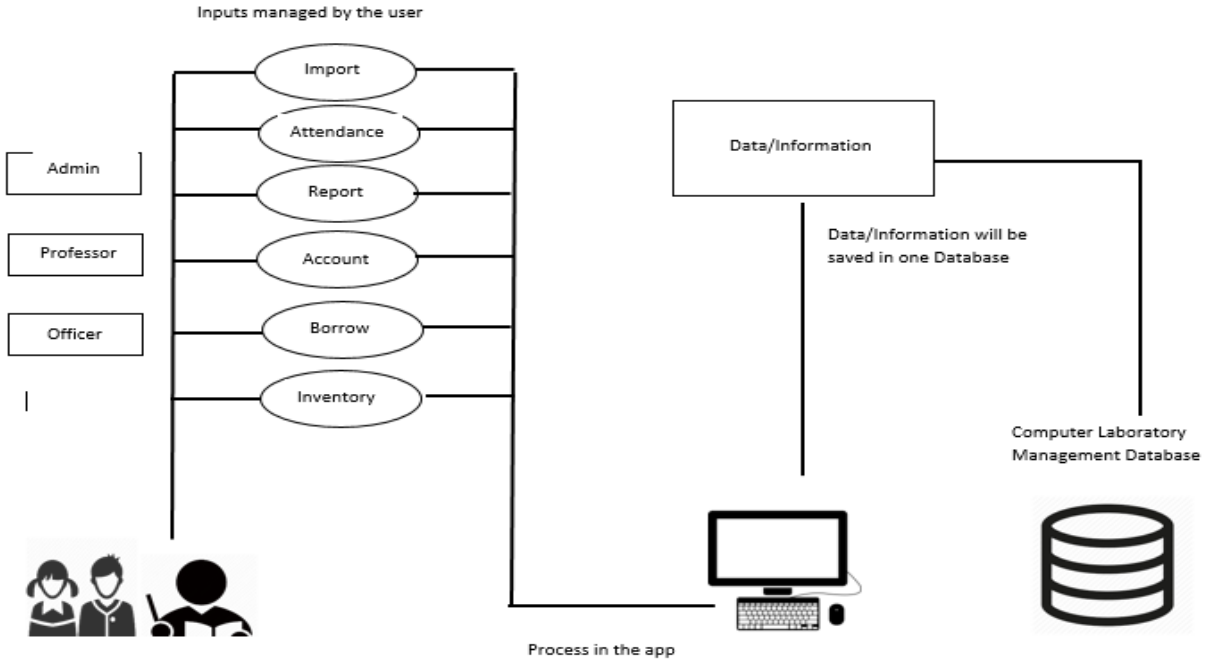

Figure 1. System Architectural Diagram

The suggested CLMS's input-process-output diagram is shown in Figure 2. The IPO displays the input data or information the system requires, the processes it will carry out, and the output or results in the form of reports that the system will produce.

Username and password; administrator's add schedule, reports, account settings, inventory, borrow, professor, and activity log; professor's attendance, reports, view schedule, and account; officer's inventory, borrow, and account settings are included in the first section of the diagram..

The second one demonstrates the procedures that must be followed, including confirming the user name and password, keeping track of the inventory and status of the hardware and software, creating the schedule and reports, determining borrowing and equipment returns, and checking the student's attendance.

The final section of the diagram displays the anticipated results, including program access and automated scheduling and report generation.

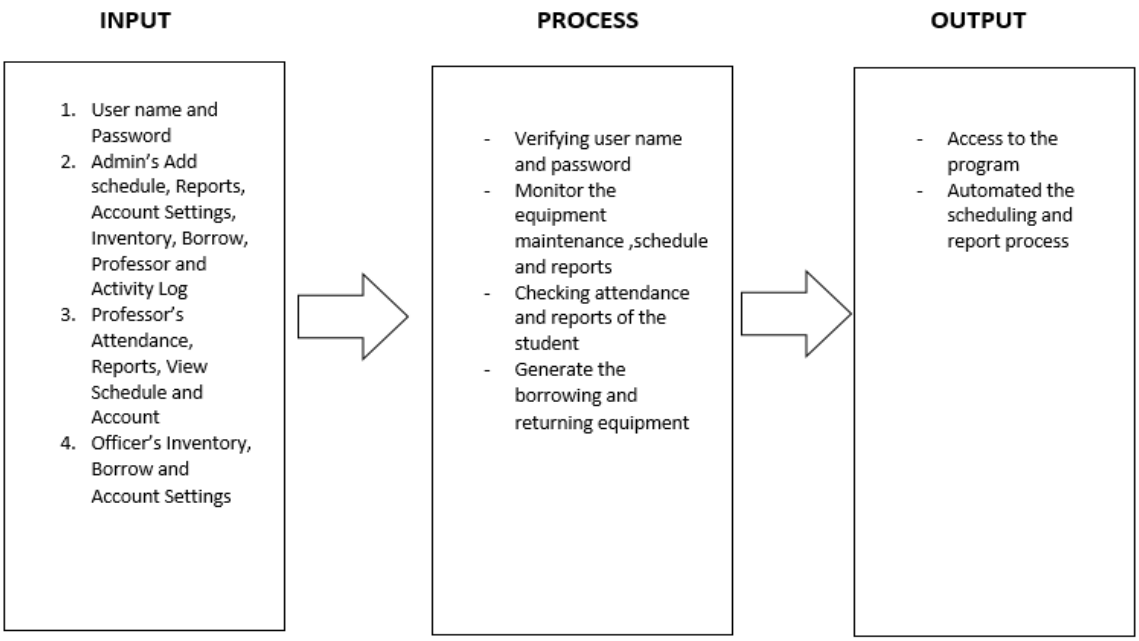

Figure 2. CLMS IPO Diagram

The suggested CLMS's flowchart is seen in Figure 3. A flowchart is a type of diagram that shows how a system, process, or computer algorithm works [4]. It has the rectangular shape for process, diamond for decision, connection for flow arrow, and parallelogram for data, along with the oval for terminator.

The diagram depicts the system's entire depiction of the process that takes place. The START sign should be read first, then the flow lines for each process should be read until they reach the END symbol. The initial stage in this system's login procedure is for users to submit their credentials in order to keep using it. This CLMS will have three separate users. The Admin, who is the system's primary user, comes first, followed by the Professor and the class officer. The main features of the system, such as the adding of schedules, inventory, and borrow functions, will be used, and benefited by the admin. The technician or professor in charge of the computer lab may be this user. On the other side, the teachers can utilize the system to monitor or manage their schedule in the lab and check their attendance. Class officers are given an optional account to assist the faculty or the administration in their obligations.

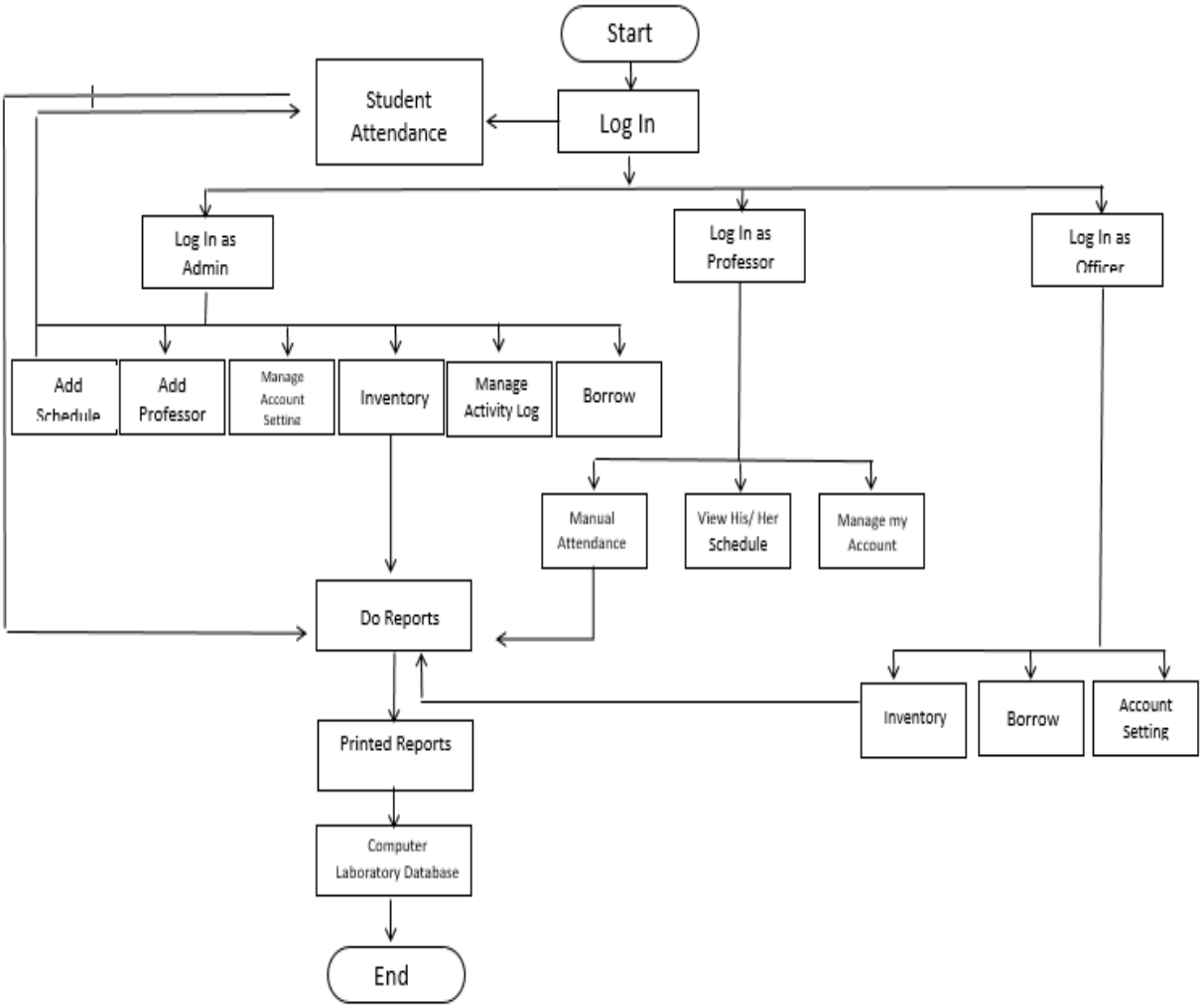

Figure 3. Proposed CLMS Flowchart

The suggested CLMS's database schema is shown in Figure 4. In a database management system, a database schema is the logical and visual architecture of the database [5]. The complete database design and structure are displayed graphically. It offers a way to categorize and visualize database items including tables, fields, functions, and relations logically. The organization of the data that must be stored in the system database is shown in the figure. Additionally, it displays the relationship between each table, which is indicated by the lines that link them.

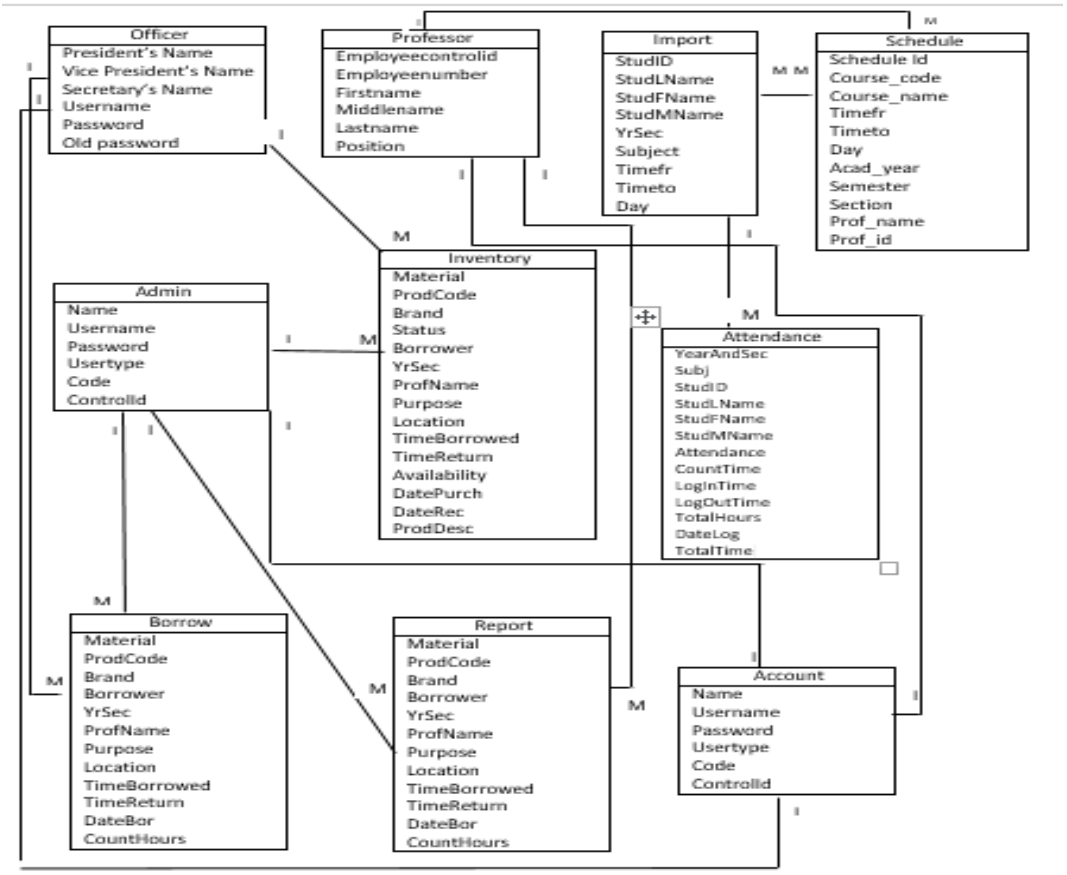

Figure 4. CLMS Database Schema

Evaluation of Proposed CLMS Features and Functions

Table 1 presents the data about the evaluation of the features and functions of the proposed system as assessed by the respondents after the system demonstration and testing.

Table 1

CLMS Features & Functions Evaluation

System Features and Functions	MEAN	VI	RANK
Log In Features	4.95	E	1
Attendance Monitoring Functions	4.1	VS	7
Report Generation Module	4.15	VS	6
Excel File Importing	4.25	VS	4
Account Settings Features	4.2	VS	5
Inventory Functions	4.3	VS	3
Borrow & Monitoring Functions	4.5	E	2
GENERAL ASSESMENT	**4.35**	**VS**	

Legend: *4.50-5.00, Excellent(E); 3.50-4.49, Very Satisfactory(VS); 2.50-3.49, Satisfactory(S); 1.50-2.49, Fair(F); 1.00-1.49, Poor(P).*

The data shown in the table above indicates that the majority of the system's features and operations are operational and responsive. The highest mean, 4.95, or an interpretation of "Excellent," was given to the seventh primary feature, log in, out of the seven. The borrow monitoring feature, which had a mean of 4.5, inventory, with 4.3, and the excel file importing feature, with 4.25, all scored "Very Satisfactory" on the scale, came in second and third, respectively. Account settings, which had a mean score of 4.2, the report generation feature, which received a mean score of 4.15, and attendance monitoring, which received a score of 4.1, round out the functions. These actions are likewise considered "Very Satisfactory". Overall, the system received a mean rating of 4.35, which on the verbal interpretation scale translates to "Very Satisfactory." The rating indicates that, after utilizing and testing the system's features and functionalities, the system did meet the respondents' expectations.

Evaluation of proposed CLMS using the ISO (Software Quality Metrics)

On the basis of ISO software quality metrics, the system is assessed. The ratings for each specified criterion are displayed in Table 3 below. In their study, Djouab & Bari [6] came to the conclusion that the ISO 9126 is appropriate for use in the evaluation of information systems because it is well-liked among software engineers, has been modified for application in various settings and domains, and is simple for users to use and comprehend. Because it is an international standard for the evaluation of software, ISO 9126 is utilized. The four elements of the standard, which cover the following topics in turn: quality model, external metrics, internal metrics, and quality in use metrics.

TABLE 3

System Evaluation Based on ISO SW Quality Metrics

ISO SW Quality Metrics	MEAN	VI	RANK
Relevance – CLMS addresses the needs of the users	**4.55**	E	2
Systematic – CLMS steps and flow are accessible and easy to follow	**4.35**	VS	5
User-Friendliness – CLMS is very easy to use	**4.35**	VS	5
Efficiency – The speed of CLMS is commendable	**4.55**	E	2
Timeliness – CLMS' functions are timely	**4.45**	VS	4
Usability – CLMS is the solution to the users' need of managing the computer laboratory	**4.8**	E	1
Functionality – CLMS behaves according to specifications	**4.3**	VS	7
GENERAL ASSESMENT	**4.48**	**VS**	

Legend: *4.50-5.00, Excellent(E); 3.50-4.49, Very Satisfactory(VS); 2.50-3.49, Satisfactory(S); 1.50-2.49, Fair(F); 1.00-1.49, Poor(P).*

After getting a mean of 4.47857, which equates to an "Extremely Satisfactory" interpretation, based on the facts displayed above, the respondents are very satisfied with how the system behaves and performs. The most highly rated factor is usability, which had a mean score of 4.8, followed by efficiency and relevance, both of which received a mean score of 4.55. The verbal interpretation of "Excellent" in the scale is given to the aforementioned metrics. The final four metrics—timeliness, systematics, user-friendliness, and functionality—received mean ratings of 4.45, 4.35, 4.35, and 4.3, respectively, and are all classified as "Very Satisfactory" on the scale. According to the respondents' assessments, this result shows that the proposed CLMS complies with and meets the criteria set forth in the provided quality metrics.

Problems and Issues in the System

Table 4 below presents the problems and issues encountered by the respondents while using the system.

TABLE 4

Problems and Issues encountered with the usage of CLMS

Problems	MEAN	VI	RANK
Failed Log In	**1.1**	N	3
Bar Code Reader Failure	**1.6**	SE	1
Importing Record Failure	**1.15**	N	2
Printing Record Failure	**1.05**	N	4
GENERAL ASSESMENT	**1.225**	**N**	

Legend: : *4.50-5.00, Always(A); 3.50-4.49, Often(O); 2.50-3.49, Sometimes(ST); 1.50-2.49, Seldom(SE); 1.00-1.49, Never(N).*

According to the challenges and problems they encountered while testing the system, the respondent's evaluation is shown in the table above. With a mean score of 1.6, which may be translated into "Seldom," bar code reader failure was the most common issue reported by respondents. To put it another way, it's uncommon for the ID's bar code to not be read by the scanner. The most frequent types of issues that can be the reason a barcode scanner is not working are low contrast, silent zone violations, wrong reading position, print or mark inconsistencies, damage or distortion, and. Finding an interpretation of "Never," the next three difficulties on the list are as follows: failing to log in with a mean score of 1.1, failing to import records with a mean score of 1.15, and failing to print records with a mean score of 1.05.

Overall, it can be concluded from the information in the table above that there aren't any significant difficulties or problems with the system that could impair its overall performance. This demonstrates even more how nicely the system works and operates.

CONCLUSIONS AND RECOMMENDATION

The respondents assessed the suggested CLMS characteristics and functions as VS, or very satisfying, in light of the study's findings. The responses concur that the proposed CLMS meets the ISO Software Evaluation criterion's performance standards. A never grade in the overall evaluation of the problems and challenges the system has encountered further demonstrates how infrequently problems arise. The respondents came up with recommendations after testing and demonstrating the CLMS. One of the recommendations is to make sure the application will continue to function properly, run smoothly, and behave as expected. Another is to use a backup plan in case an unanticipated error arises while using the system. A third is to continue testing the system to examine more of its features and functions. Lastly, the system was given a favorable rating, and it was also suggested that the proposed CLMS be implemented for better management of computer labs in schools and institutions.

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