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LPU EIS: Equipment Information System for Lyceum of the Philippines University - Cavite

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Abstract: **In today's modern society, computers, laptops, and other electronic devices are now a necessary tool for learning. Computers have provided countless learning resources and increased the accessibility and flexibility of education. Using the LPU-EIS, students who want to bring equipment will not have to worry about its registration anymore. It will be developed as a web-based equipment registration system that can be accessed on personal computers and mobile devices through a web browser in which students, college departments, campus offices, security staff, and LPU Property office will greatly benefit. Aside from personal equipment of students, the project will also be available to monitor the equipment or materials from the university. Employing features like RFID tagging, registration module for student's equipment and LPU-owned equipment, and user account management for each user. The application was developed using the Notepad++ with HTML, CSS, and JavaScript as the main programming language with PHP and MySQL, on the Database. All graphical assets of the system were created using Adobe Photoshop. The researchers used Agile model as the software development life cycle. The ISO 25010 was used to evaluate the web-based system by thirty (30) End Users and ten (10) IT Experts with a total average mean of "3.52" and a Standard Deviation of "0.31", interpreted as "Highly Acceptable." The evaluation results proved that the application was valuable and effective for students and the university as a tool for securing their equipment and eliminating the hassle of manual equipment registration.**

Keywords: **Equipment Registration, LPU-EIS, LPU Property, RFID tagging, LPU-owned equipment, User Account Management.**

I. INTRODUCTION

In today's modern society, computers, laptops, and other electronic devices have become necessary tools for learning (Zadvinskis, 2020). According to Williamson (2018), computers have provided numerous learning resources and increased the accessibility and flexibility of education. Information systems play a vital role in storing historical and operational data, important documents, and revision records. To fully use the potential of information systems, it is necessary to exploit their capabilities (Markgraf, 2019).

In the Lyceum of the Philippines University – Cavite, there are school activities that require the use of computers but in some instances, the computer laboratory is fully occupied. To maximize the time, students tend to bring their own laptops, but the campus has these rules that any equipment that will enter the campus must have the approval of the campus personnel. As well as bringing musical instruments for those students who love music and are willing to provide those whenever it is needed.

With the researcher's initiative, they came up with the project entitled: LPU EIS: RFID-Based Equipment Information System for Lyceum of the Philippines University Cavite to avoid the inconvenience caused by the long process of

registration for equipment. Specifically, the hassle of going to different departments and offices to ask for several signatures and allotting time for it.

The study focused on the development of an online equipment information system that helped students and the university to register and monitor their equipment more conveniently. The study was very useful and helpful in a way that some students who wanted to bring equipment did not have to worry about its registration anymore. It has always been a hindrance for some to bring their needed equipment to school. The study will also be implemented on LPU-owned equipment for monitoring and tracking.

Project Context

Equipment that is often brought to school is laptops and musical instruments. According to Amer et.al. (2018), laptops are considered one of the essentials of a student that are used to create projects or conduct research. It helps the students to study well for it is also one of the resources a student may use to gain knowledge. Musical instruments like guitars and beatboxes are used in school when there are scheduled events or school presentations.

During face-to-face classes up to the present time, students who bring equipment to the campus are required to register it in the security office to bring it inside by submitting some requirements like Enrollment Assessment Form and completing the approval form signed by different campus personnel. The university allows the students to bring such but due to the campus policy, equipment must be registered. “The school assumes no responsibility for any student’s personal belongings” (Lyceum of the Philippines University, 2018). The security of bringing such is strict because the school will not be liable in case the equipment is damaged or lost.

The researchers developed this system for the university security office and the student to adapt to the online environment of registering equipment as well as to eliminate the hassle of manual registration of equipment. The project will be developed as a web-based equipment registration system that can be accessed on personal computers and mobile devices through a web browser which students, college departments, campus offices, security staff, and the LPU Property office will greatly benefit from as they can lessen the long process of registering equipment.

Project Description

The study aims to help both student and campus offices to reduce the hassle of the registration process for entering equipment in the Lyceum of the Philippines University - Cavite. By using this study, it will serve as a pre-registration where it will hold all active records and will validate their equipment’s proof of registration. Aside from the personal equipment of students, the system will also monitor the equipment or materials from the university.

The RFID-Based Equipment Information System is a web-based application that can be accessed through a web browser on personal computers and mobile phones with an internet connection. There will be six types of end-users: The super administrator (superadmin), who can create accounts for administrators, security office personnel, and the enrolled students every semester. The superadmin can also upload student records to those who are officially enrolled within the semester. The superadmin also has access to all system features. They hold all the information after the registration process. The superadmin can also do any modifications to the website necessary to keep up with the updates in processes and requirements. The second end-user is the administrator, who has the authority to approve or deny registration requests from the students. In this case, they can move the request to the approval workflow by clicking the approve button. The third end-users are the students, who can register their equipment by inputting details and information about the equipment subject for registration. The students can also upload photos if their equipment is an electronic gadget or if the equipment is subject to physical inspection. They can also modify the duration of registering their equipment and they can also indicate their purpose(s) in bringing their equipment to the campus. The fourth end-user will be the LPU Property Office wherein they can import university equipment records, tag an RFID to each university-owned equipment, and assign it to different departments. They can also allow LPU staff to borrow university equipment with the help of RFID for monitoring and tracking purposes to eliminate loss and theft. The fifth end-users are the ICTD office, wherein they can approve and deny requests only for electronic equipment registrations. They can also tag RFID to all the approved requests from the student and monitor them. Lastly, the sixth end-user will be the Security Office which will serve as the security office personnel. They can tag RFID to all approved registration from the admin as well as they can monitor and track it using the RFID attached to it.

Objectives of the Project

The project will develop an RFID-Based Equipment Information System for Lyceum of the Philippines University Cavite that will be used by the security personnel, the LPU Property Office, the LPU ICTD Office, and the LPU students.

Specifically, the project aims to:

1. Design a web-based registration system that has the following features:

    a. Log-in module which automatically identifies the user that could change the interface according to the type of user.

    b. Account creation module where students can sign up using their student ID which the system could automatically identify if the student is currently enrolled or not.

    c. Email confirmation feature regarding the user account details.

    d. Equipment Registration module for students' personal equipment and LPU-owned equipment that can be used by the students and the LPU Property Office for monitoring and tracking.

    e. RFID tagging feature.

    f. Administrator interface where they can approve and decline registration requests from the students.

    g. Security Office interface to monitor the RFID logs made by students.

    h. ICTD office interface where they can provide inspection slot availability.

    i. User Account Management module for administrators to manage the user accounts of administrators and students. It will also provide help for administrators to import files for enrolled students that will serve as the basis for the system during the account creation of students.

    j. Tracking Module to track the status of their registration that will have a report lost feature to declare the status of equipment as lost.

    k. Notification feature for students to be notified regarding the status of their registration.

2. Create the project using HTML, CSS, and JavaScript as the front end and using PHP and MySQL Database as the back end. It will run on a web platform.
3. Test and improve the developed system using functionality and compatibility testing.
4. Evaluate the performance of the system and measure it based on the following criteria according to ISO 25010 to wit:

    a. Functional Suitability

    b. Performance Efficiency

    c. Compatibility

    d. Usability

    e. Reliability

    f. Security

    g. Maintainability

    h. Portability

Scope and Delimitation

The study is focused on developing an equipment registration system that will enable students to pre-register their personal equipment and LPU-owned equipment available for borrowing, along with other equipment prone to theft. The target user of the system will be the students who would like to bring the equipment inside the campus and the LPU Property Office for university-owned property monitoring. They are the people who will benefit from the system. The security personnel

and ICTD staff will also perform a specific task by validating the students' registrations and tagging RFID to the equipment. Through the system, this will eliminate the hassle of manual registration and shorten the process of registering equipment. The users' layout was done using Adobe Photoshop and Balsamiq wireframe. The code was done using PHP, HTML, CSS, and JavaScript, while the database was done using MySQL. Lastly, the system was accessible to users with an internet connection.

The system did not include matters other than those that were included in the equipment registration in the Lyceum of the Philippines University - Cavite. It was only limited to subjects associated with equipment such as laptops, instruments, cooking equipment and/or utensils, electronic gadgets, and certain LPU equipment and materials such as tools, furniture, and electronic equipment of the university.

Significance of the Project

The relevance of the study is to minimize the actual process of equipment registration in LPU Cavite and maximize the use of technology. The hassle and stress caused by the long process of the usual registration will be prevented, and the long process itself will be shortened. The system is designed to make a convenient way of registering equipment by simply pre-registering the equipment ahead of time before bringing it into the campus to avoid delays. In addition, the LPU-owned equipment will be extra secured before releasing it to different offices because it will be legally borrowed through this system to prevent being stolen or missing.

Security Office

This helps the security personnel to assist students with the registration of their equipment with ease, time efficiency, and in a more orderly manner.

Lyceum of the Philippines University-Cavite

This helps the university to provide both students and offices with convenience when it comes to complying with university rules regarding the registration of equipment; also, for tracking and monitoring LPU property or equipment.

Future Researchers

Future researchers will be able to use this study as a tool to enhance the processes for students' equipment registration and the property tagging of LPU-owned equipment for tracking and monitoring. They can also use this as a guide for conducting other related studies.

II. REVIEW OF RELATED LITERATURE AND SYSTEM

This chapter presents the review of related literature and studies underlying the framework of the study and includes the synthesis and the project's conceptual framework.

Related Literature

This section contains discussions, studies, ideas, or conclusions acquired from other sources of literature and articles that have already been conducted and contains some relationship or similarity to the current study.

Registration System

A registration system, according to Law Insider Dictionary (2021), is used to process, record, and store information for various registration functions. Hagene (2018), states that a registration system provides a more generic solution that aims to save a considerable amount of time. Some examples are the school registration system, civil registration system, and equipment registration system. Hagene (2019), stated that to easily fill and hence lead to saving of time and money as compared to multiple forms filled manually, businesses and other institutions rely on a registration system. According to Chan (n.d.), its role is to offer ease of use with the use of desktop, tablet, or mobile phones. It can save thousands of dollars and countless hours of clerical work. In addition, it eliminates data entry errors.

Halawi et.al., (2019) states that the use of information technology has a significant effect. As stated by Soegoto and Pamungkas (2018), in this case, it can help to speed up company performance in generating desired information. According to Pisarek (2019), using an online registration method reduces the need to manually complete paper forms. Comparing a thorough online registration process to the "traditional" paper registration process, convenience and speed are the two most

salient advantages. Additionally, the online registration system is highly secure. Form submissions are handled through a well-secured platform and the database will also be stored on an extremely secure server with no place for third parties. Moreover, since online registration systems do not require paper, they take an environmentally favorable stance.

Online Registration. According to Obua (2021), a registration system requires a tremendous amount of data and documentation. With the primary objective of simplifying the transfer of information, online registration is a system that can conveniently manage its information while offering additional benefits. Online registration enables institutions to concentrate more on what matters most, such as meeting the educational needs of their students by having a cost-effective secure registration process that eliminates registration hassles.

With the same idea and goals as the LPU EIS, the researchers would like to minimize the use of papers for registration, which is eco-friendly, and maximize the use of technology for conveying information wherein the process is more convenient and saves time. In addition, the registration system is more secure in terms of handling the data in the database and may have a backup of each registration.

Design Consideration

Functionality

Data Management. The US Department of Education (2020), reports that student records are related to students that include but are not limited to grades, basic identifying information of students, transcripts, student course schedules, health records, and a lot more. On the other hand, Law Insider Dictionary (2022), also reports that equipment records are all records, logs, and other documents related to operations and information in identifying specific equipment. According to the University of Delaware (2020), any data must be disposed of appropriately when it is no longer necessary for any university-related purposes. Effective data management can help to reduce the possibility of errors and utilize solutions for authentication and encryption to protect from data breaches, theft, and loss.

RFID Technology

Tracking. According to Task Management Guide (n.d.), process tracking is the mix of procedures and tasks used to monitor a given process for compliance with original requirements to control performance and make sure that the process is moving in the direction of the intended result. It is a system for controlling how processes are adjusted to requirements during the course of implementation, whether the process is successful or not. According to Rowe (2022), by using asset monitoring solutions, any organization with physical assets may greatly boost efficiency and security. RFID tags and readers are used in this system to maintain track of the names, locations, and other data of important company equipment.

As stated by Stazzone (2022), RFID tags are beneficial in different ways, it reduces labor costs and faster scanning than barcodes. Faster scanning is one of the features of RFID tags, unlike barcodes that need to be directly in the line of sight of the scanner, once the chip is within the radius of the reader, it will be read. It also reduces labor costs for certain areas like inventory, counting, and shipment confirmation which can be done with scanning instead of hiring employees to do the task. Lastly, it tracks returnable assets. It reduces the chances of theft or stealing since assets in the supply chain can be tracked in the inventory. Although there are also cons to this technology, which are: cell phones cannot be used as scanners, significant costs for readers used depending on the specifications for specialized RFID scanners, time and infrastructure demands due to installation and software requirements, and security concerns.

RFID technology will help the LPU EIS with the accuracy of the information it will display in the system. Information such as the student's name, equipment type, date, and time in and out will be displayed upon entry of equipment in LPU-C. In LPU EIS, the user can report the loss of his missing equipment as long as it is registered, and the system will display all the necessary information. The security of one's equipment is the priority of this study. RFID technology contributes a big help in securing the equipment.

Information System

According to Juneja (n.d.), an information system is a coordinated network that works together for assembling, allocating, and processing data. This type of system significantly increases precision but may not be possible for other types of systems. While Johnston (2022) defined an information system as the concept, production, deployment, usage, sourcing, management, and value generation of information technology are all topics covered by information systems. Although

information technology is at the heart of the phenomena under study, research on the subject of information systems also examines behavioral, social, organizational, strategic, and societal concerns related to information technology.

LPU EIS is an information system to hold records of students' equipment information, registration details, and the university's own properties. The information systems and their function are an essential part of LPU EIS for monitoring, inventory, adaptability, and analysis of data.

Manual Registration

The current registration system is manual registration. According to Obua (2021), manual registration calls for people to use their physical abilities and energy to operate by hand rather than a machine. Under the manual approach, students must handwrite their names on the registration form which can only be completed during business hours. Moreover, manual registration can be described as the process of using non-technological tools, such as paper, writing tools, and physical filing cabinets for data processing. The manual method also involves filling out various forms, which are then submitted to the appropriate officers in charge, who will eventually file them as approved.

LPU-Cavite's current process of registration is a manual registration. The process involves filling out a form given by the Security Office Personnel while the students will collect signatures from various departments stated on the form to comply with the university's policy when bringing personal equipment inside the school premises.

Related System

This section discusses the development research studies that are related to the study and can also identify its difference from the previous projects that will be discussed below.

The Development of an Online Registration System for Picking-up Tablets of the Office of General Education and Innovative Electronic Learning.

According to Chanprapas (2019), Suan Sunandha Rajabhat University asked 8,000 first-year undergraduate students to receive a tablet from the Office of General Education and Electronic Learning Innovation. Since there are a huge number of students and encountered problems in service in the past, the Office of General Education and Electronic Learning Innovation developed an online registration system for students who will get a tablet. Its purpose is to save time and manage the queueing properly to avoid service delays. The process includes the registration of the student and tablet, confirmation of the registration, etc. It is accessible anywhere and anytime via the website. The system is also a real-time management system wherein it receives registration and student services on time. The system is designed to book a queue and check the schedule for the pick-up of tablets.

Just like their study, the LPU EIS is also accessible anytime and anywhere since it is a website, it only requires connectivity to the internet. It is also a registration system that receives the registration of many students in real-time feature, but the difference is that the LPU EIS is not designed as a queuing system. Also, the LPU EIS is the one who is responsible for the registration and tagging of the owner's equipment, not for the distribution of one.

Research on Equipment Management Systems Based on Robot Laboratory

According to Hu et al. (2020), equipment management systems will help manage the information of the equipment efficiently. Furthermore, the goal of the system is to ensure the safety and security of the laboratory equipment. Upon the development of the equipment management system, maintenance, and repair of the system as well as the equipment has been improved.

The information system for LPU-C is also capable of managing the equipment registrations of students as well as the LPU-owned equipment. The same goal as the study above, the security of both sides' equipment is important.

Smart Health and Safety Equipment Monitoring System for Distributed Workplaces

According to Al-Dulaimi et al. (2019), the world has entered a new era of connectivity due to rapid technological development. This equipment monitoring system intends to reduce the time, cost, and manpower requirements of distributed workplaces. The system has a real-time feature for monitoring. The status of consumable office equipment is accessible online via the internet and gives priority to the locations that are critically low on supplies and need to be restocked.

The information system for LPU-C also has a real-time feature that monitors the equipment registrations and availability records of equipment in the LPU property office. The objective of this system is also to save time and make the most out of technology.

Supplies and Equipment Inventory, Monitoring and Tracking Management System using Data Mining Techniques

According to Tungcul and Kummer (2021), the equipment management system will help organize the equipment in the office. The system can display the information of the equipment immediately if it is registered. In addition, monitoring and tracking of the equipment will be convenient for the system will also display its records such as the quantity and availability.

LPU EIS also helps authorized users to manage the equipment registration of students for it can display the necessary information that the student inputs regarding their equipment and their personal information. They are also similar in a way that the quantity of equipment on the LPU property side has records as well as the on-hand equipment available for borrowing.

RFID-based Access Control and Registration System

According to Abdalla et al. (2018), they developed an RFID for Sudan Atomic Energy Commission premises for security purposes which can help the users register, monitor, and control an access pass. The system displays the user's card number, username, and arrival time. In addition, the RFID includes a feature that sends SMS to the master or admin in case an unauthorized entry happens.

The study is similar to LPU EIS in terms of the registration system that has the ability to monitor each user's registration and the RFID reader scans the information and status of each piece of equipment being entered in the campus. They just differ in the way that access pass is what is being scanned by the RFID in their study while equipment with RFID tags is being scanned in this study.

RFID Localisation for Internet of Things Smart Homes: A Survey

According to Alsinglawi et al. (2017), IoT has many functions that can satisfy users and RFID is a tool that can play a significant role in smart homes technically to the IoT. RFID is often used for its usefulness, characteristics, and low cost. This study is designed to develop localization of RFID for IoT in smart homes. It is to easily monitor and identify the IoT devices through the RFID tags attached to them. The factors considered in this study are the proximity, accuracy, distance, and challenges of adopting RFID.

The LPU EIS relates to this study by having RFID tags attached to items and equipment. This is to monitor the equipment that is brought inside the campus and what equipment leaves the school premises.

Attendance and Information System Using RFID and Web-Based Application for Academic Sector

According to Ali et al. (2018), checking students' attendance is time-consuming and affects the student's academic performance which encourages them to develop a web-based application with RFID technology to track a student's absentees and his grading marks. This attendance and information system is time efficient as compared to manual checking of attendance. The proponents mentioned the need for RFID technology in tracking student attendance rather than proceeding to the traditional way which is not time and work efficiently. Attendance is very influential for students to perform greatly in school, RFID is applied to monitor the student's attendance in reducing the complexity of administrative tasks rather than boosting educational effectiveness.

The similarities of this attendance system to LPU EIS are that the LPU EIS also uses RFID technology to get information on each piece of equipment with RFID tags. They also have the same objective of eliminating the use of paper designed to save time and effort for authorized personnel. Registering a student's personal equipment is time-consuming and increasing manpower or sticking to the traditional method is not as practical. RFID technology can greatly enhance the current process. As cited in the study above, there are a lot of benefits that come along with the utilization of RFID. It reduces the complexity of administrative tasks, is time-efficient, and is convenient.

Radio Frequency Identification (RFID) Based Car Parking System

According to Mazlan et al. (2018), they proposed a system that allows the user to register their personal information as well as their vehicle information for a convenient parking experience. Together with the RFID technology, the hassle for both gate guards and drivers will be lessened as this system was developed. An RFID tag will be attached to the client's vehicle and the RFID reader is responsible for displaying information in its database.

The use of RFID technology is also very useful for the LPU EIS. It is very convenient and removes the hassle for the clients and security personnel. The RFID technology allows the user of the system to know the information of a registered object that is used for monitoring and reference.

RFID-based Vehicle Monitoring System

According to Panganiban and Dela Cruz (2017), they developed a vehicle monitoring system that can detect vehicles entering in a specific area with the help of RFID. Registered vehicles will be stored in the database.

Same with LPU EIS, they both use RFID technology to monitor a specific object. On LPU EIS, the RFID reader can know the real-time in and out of the equipment on the campus. Both studies have a database that will hold information on the vehicle and equipment.

RFID-Based Student Monitoring System Using Web Application

According to Amit, et al. (2019), there is an existing system that is a manual paper-based checking of the attendance of students who attend the class, but it is not automated. This study was developed to make the attendance system more automated than the existing one. Through the use of RFID, the student just needs to tap his or her ID on the RFID reader and it automatically checks his or her class attendance. In addition, the student's guardian will also know that their children arrive in class once the RFID reader successfully reads the RFID tag on the student's ID for an SMS to be sent to them.

RFID technology is very useful and convenient for people who are used to doing things manually. In LPU EIS, the student will have to scan his equipment's RFID tag to the RFID reader for the security personnel to know the equipment's status.

Synthesis

The gathered sources are about the utilization of online registration systems which includes features such as monitoring, tracking, and information systems. The sources showed evidence of registration systems as convenient, allowing it to be accessible online and generally improving the workflow, thus eliminating hassle. The collected studies have used various features that the researchers have used for this project such as having an online registration system with features of online tracking, monitoring, information system, and the utilization of RFID. The use of the said technology has improved processes significantly, mainly by having information easily accessible to organizations that use it.

RFID boosts security while being able to keep track of assets. The study can use RFID for the same purpose. While students' personal equipment is going in and out of the school premises, RFID technology is able to monitor the status of the items as well as to track LPU properties that are not allowed to leave the university. As one article stated, RFID is effective for inventory, this can apply to the information system of LPU property and student equipment records. Additionally, asset tracking eliminates input inaccuracy from paper and excel sheets, though this type of error cannot be eliminated completely since typographical errors are very possible and cannot be avoided. These factors are considered in completing the overall functions of the system. Furthermore, evaluating the features of the system for a more practical outcome. Studies also discussed the comparison between the traditional method and the online method with the use of RFID. It was evident that RFID considerably improved the current process and discerning obvious results after the implementation of the said technology.

LPU EIS is a project accessible through the web for personal equipment of students to be registered online for the purpose of providing less hassle to students and school offices; and LPU property for inventory purposes, less time is consumed, while keeping up with the current changes caused by the pandemic. The literature and studies collected have helped the researchers in extending current knowledge, attaining interesting new ideas, and applying the acquired information to the study. It has served as an aid by considering and assessing the ideas within the sources for the development of LPU EIS as a web-based application.

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Conceptual Framework of the Project

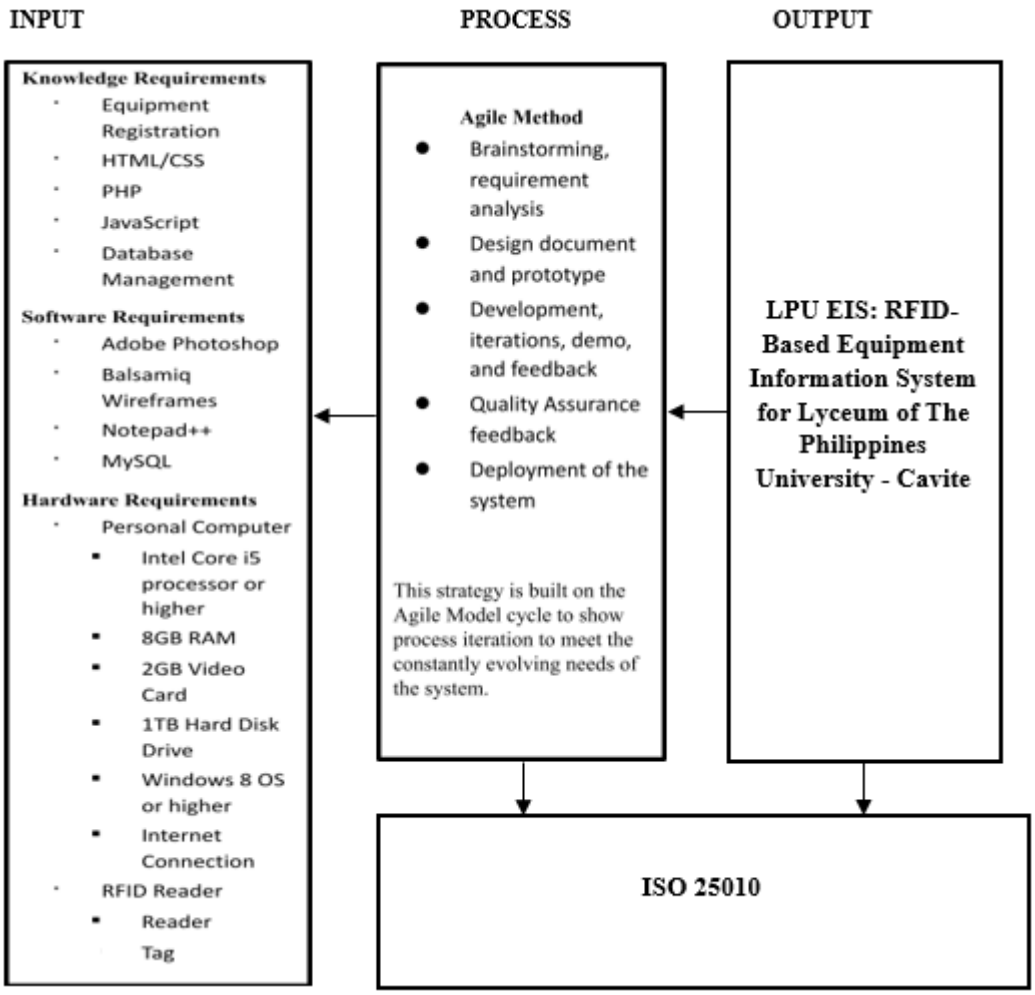

Fig. 1: Conceptual Framework of LPU EIS: RFID-Based Equipment Information System for Lyceum of the Philippines University Cavite

Figure 1 illustrates the conceptual framework of the LPU EIS. It has three levels which include: input, process, and output. The prerequisites for creating the project are discussed at the input phase. It contains every component that researchers take into consideration when creating the system to meet the knowledge requirement. The Process Phase describes the process model that will be used in creating the project. It discusses the Agile Model to demonstrate process iteration in response to the system's ongoing needs. The designed system was evaluated using the applicable ISO 25010 standards and is subject to the RFID-Based Equipment Information System for Lyceum of the Philippines University - Cavite as the output phase.

Technical Definition of Terms

The technical definition of terms gives the user a much more complete understanding of the framework and associated phrasings. A list of conceptual definitions used throughout the system is provided below:

Adobe Photoshop

The researchers utilized Adobe Photoshop as the main editor for graphics design and logos.

Balsamiq Wireframes

The researchers used Balsamiq Wireframes for website design drafting.

CSS

This is used by the researchers for the design and layout of the website. Equipment Information System. This term is utilized by researchers to refer to the main purpose or function of the website.

HTML

The researchers used HTML as the markup language in creating the website.

JavaScript

JavaScript is utilized in this project for the interactive layout of the website.

MySQL

MySQL is used by researchers as the database used in holding data and files of the website.

Notepad++

This is used by the researchers as the compiler to run the website.

PHP

PHP is the programming language used by researchers in creating the website.

Property Office Staff

This term was used by the researchers to refer to the authorized personnel of the LPU Property Office that is responsible for managing the LPU equipment.

Security Office Personnel

The term is used by the researchers to refer to the admin of the website that is responsible for the physical inspection of equipment.

Super Admin

This term is used in this paper to refer to the admins who have access to all the system files and data of the website.

III. METHODOLOGY

This chapter describes the rationale and theoretical foundation for each action made and the result attained during the project's development. It provides all the concepts and plans that future readers and researchers will need to easily evaluate the system's flow and understand the project's vision. The methodology for developing the project was explained. This comprises various diagrams and depictions of how the application works on the inside.

Design

This section depicts the design process model and object model that are used to illustrate the system's process flow.

Process Model. This depicts the graphical representation of the system processes.

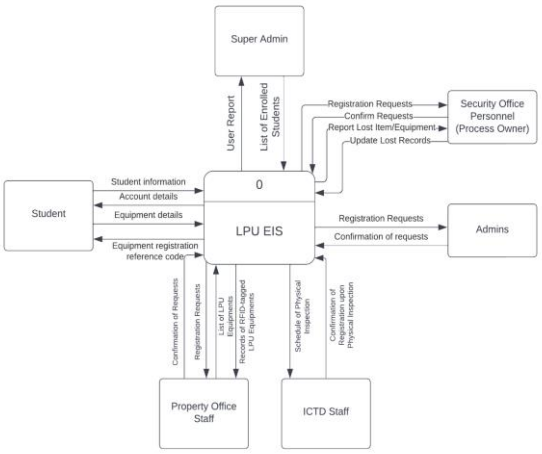

Fig. 2: Context Diagram of LPU EIS: RFID-Based Equipment Information System for Lyceum of the Philippines University – Cavite

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Figure 2 above shows the context diagram for the Equipment Registration of LPU EIS. During account registration, students will be asked to enter their student information, specifically their Student ID number, into the system. Afterward, the system will generate their account and login information, which will be used to access the system. While the ICTD will be managing registrations for gadgets and technological equipment; and be able to release available schedules for physical inspection of the student's equipment that falls under this category.

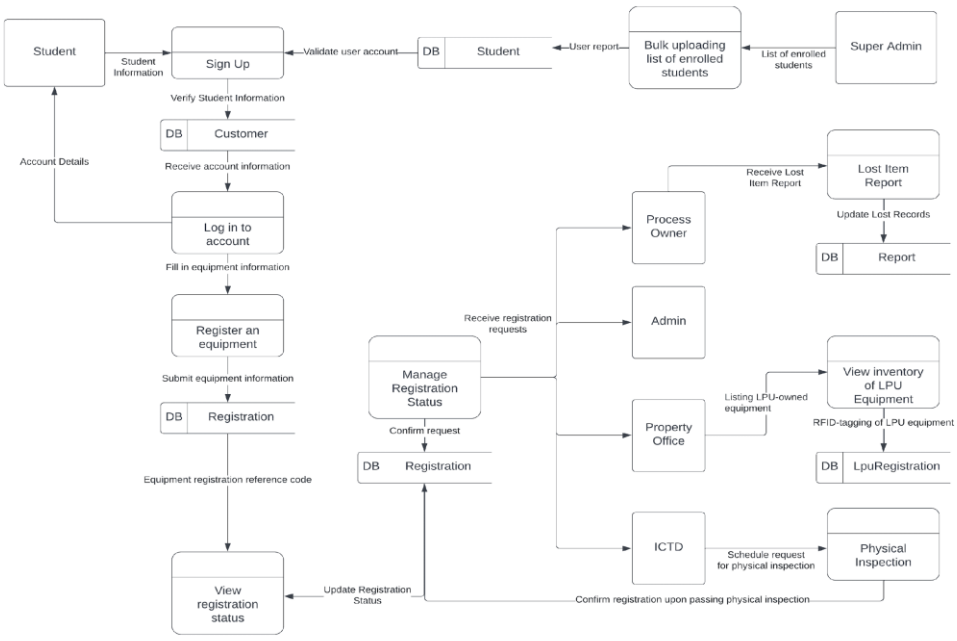

Fig. 3: Data Flow Diagram of LPU EIS: RFID-Based Equipment Information System for Lyceum of the Philippines University – Cavite

Figure 3 shows the flow of information in each process on the system. On registration, the database will gather the following details of the equipment. The security office personnel will view the registration request that contains the data from student information and equipment details. After viewing the request, the security office personnel will confirm the request and forward it to the corresponding admins. The admins will check the confirmation and label the request "Approved"; the status will then be recorded onto the database. Conditionally, if the item is an electronic gadget, the ICTD will be responsible for these requests and can schedule a physical inspection. The schedule for physical inspection will be stored in the database and will show on the student's end. The Property Office, aside from approving and rejecting registration requests, will also be tagging LPU equipment for tracking and monitoring.

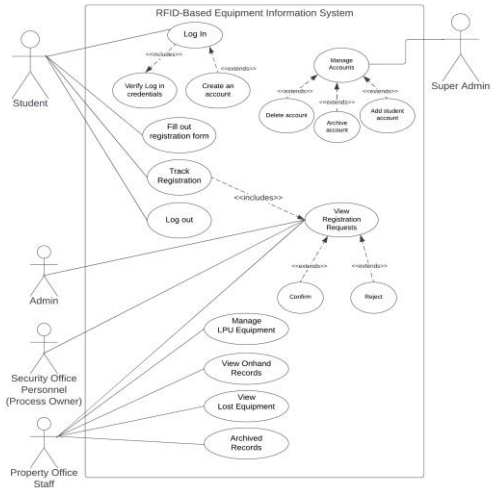

Fig. 4: Use Case Diagram of LPU EIS: RFID-Based Equipment Information System for Lyceum of the Philippines University – Cavite

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Figure 4 above shows the Use Case Diagram of LPU EIS. The student will log in to the website, wherein the system will verify the credentials given by the student. If the student does not have an account yet, they are asked to create or sign up for an account. When the student has already created an account, they are able to register equipment by filling out the form. Once submitted, they can track their registration request if pending, and if registration is approved, they can track its status, and they can log out afterward. The super admin will be managing all the accounts on the website, they can delete, archive, and add an account to the system. The admin's task is to manage registration requests; and whether to approve or reject incoming requests. The Property Office admin can also approve and reject registration requests, as well as to manage LPU's own equipment in terms of tagging it with RFID, tracking, and monitoring.

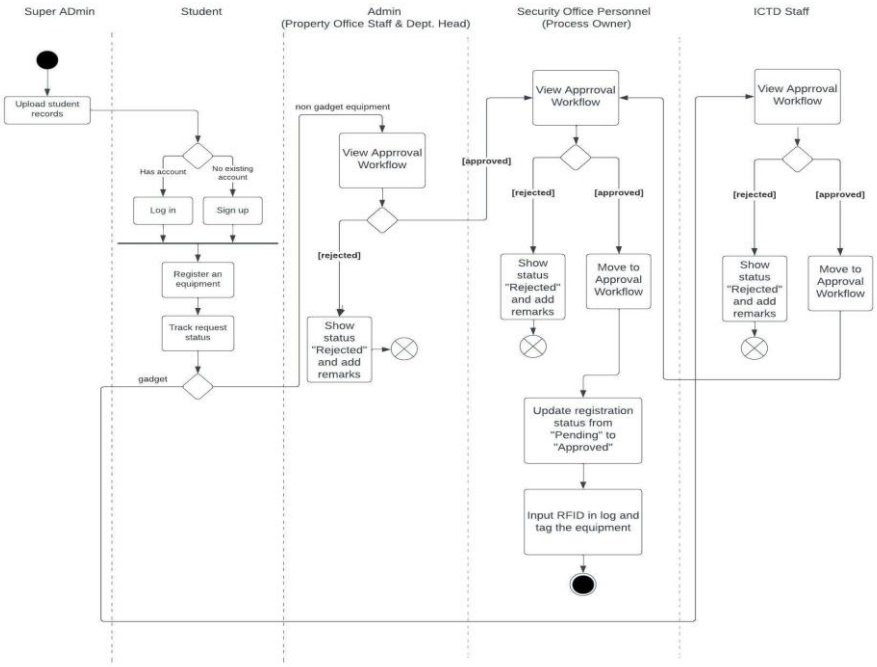

Fig. 5: Activity Diagram of LPU EIS: RFID-Based Equipment Information System for Lyceum of the Philippines University – Cavite

The figure shows the overall activity flow of entities within the system. The super admin will upload records of enrolled students and the admin involved. Students will have to register to have an account, the system will be validating their registration by their student number if they are enrolled or not. Once the student logs in, they can either track their registration requests or submit a request to register equipment. The security office personnel will be receiving these requests and has the authority to either reject the request or confirm it. After confirming, the request will be moved to the Approval Workflow where it will have a 4-day deadline starting from the day it was transferred. Designated admins can view the requests to either confirm or reject them. If the Property Office and/or the Department Heads have already confirmed, the security office personnel can receive the active requests and they can release the confirmation to the student with the status from "Pending" to "Active". They can also tag an RFID to each equipment before releasing it to the students. This will only work for equipment with no serial number. But for equipment such as laptops, gadgets, and electronic equipment, it will be forwarded to the ICTD's Approval Workflow first. The ICTD can provide a specific available schedule for physical inspection where students can choose before it is approved. After approval, ICTD staff can now tag an RFID to each equipment registered by the students. When all admins have approved the request, status will be changed to "Approved" and will be released to the student.

Development

This depicts the entire project process, including the software and hardware utilized in its development.

Development Process Model

This is used to discuss the life cycle model in developing the project.

Software Development Life Cycle. According to Techopedia (2020), it is a conceptual framework that describes the steps involved in a software development project. It describes the detailed approach for planning, implementation, testing, documentation, developing, deploying, and maintaining software. In addition, some of the most common SDLC models are the Waterfall Model, the Spiral Model, and the Agile Model.

Agile Model. This methodology helps the developers and the group to enhance their ability to work effectively by being versatile enough to adapt to changes while focusing on high-quality development. Defects and incompatibilities in the software can be easily identified and corrected early on, enhancing the overall quality of the project.

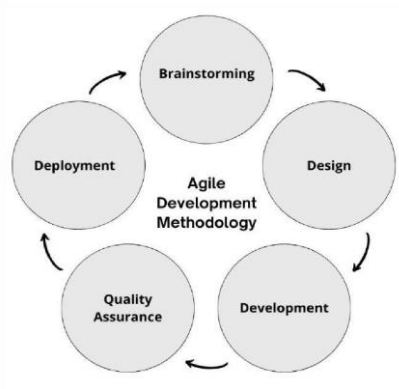

Fig. 6: Agile model of LPU EIS: RFID-Based Equipment Information System for Lyceum of the Philippines University – Cavite

This illustration in figure 7 shows the project stages of development in the Agile Process Model based on the article created by java point (n.d.).

The first stage is the brainstorming phase. This is where all the project's requirements, scope, and concept will be determined by the researchers. Various works of literature and research have been gathered by the researchers to strengthen the framework of the project. After conceptualization and determining the project's requirements, the process moves to the next stage.

The design phase is the second stage that involves designing the project including the creation of the wireframe and the flowchart to determine the project's workflow. Afterward, the consultant and technical advisor reviewed the proposal and provided suggestions to the researchers for further enhancement of the system.

The next stage is the development phase, this is where the creation of the project takes place by the researchers. Suggestions and recommendations from the consultant and advisor were added.

Next is the quality assurance phase, which includes ensuring quality and identifying potential errors and mistakes while giving recommendations for improvement in order to produce high-quality projects. This includes the testing phase participated by the advisors and consultants. Recommendations and suggestions were implemented and recorded on the next version of the system.

Lastly, is the deployment phase where the researchers produced the actual project through web hosting. The development team pursues and uses the agile model's strategy because it provides improvement for project's adaptability, enhances the team's performance, and it helps to manage the development of the project effectively.

Software Requirement

The programming languages utilized in developing the user interface design of the web-based application system includes HTML, CSS, PHP, and JavaScript using Notepad++. While the MySQL workbench was used in the system's database. It is used to store the user's information such as account details, and equipment registration records.

Adobe Photoshop was used to create the LPU EIS logo, while for the initial design of the user interface of the web-based application system, Balsamiq Wireframe was used. In addition, LucidChart was used to create the diagrams such as activity diagram, context diagram, and data flow diagram. Microsoft Teams was mostly utilized by the researchers for team communication and technical consultation. Microsoft Suite applications were used to create the documentation.

Hardware Requirements

The primary device used to develop the web-based application is a Lenovo IdeaPad S340 laptop equipped with an Intel(R) Core (TM) i5-10210U processor, 8GB RAM, 2GB NVIDIA GeForce MX250 GDDR5 graphics card, and the Windows 11 Home Single Language operating system. The system's graphical elements were also created using a Lenovo IdeaPad S340 laptop equipped with an Intel(R) Core (TM) i5-10210U processor, 8GB RAM, 2GB NVIDIA GeForce MX250 GDDR5 graphics card, and the Windows 11 Home Single Language operating system. The specification list that was discussed is made up of suggested system requirements that helped the project move forward and made sure it continued to run smoothly.

Test Plan

The objective of this plan is to assess the functions as well as to determine the possible errors and bugs of the system for debugging and improvement. The test tools that will be used for testing are functionality and compatibility tests. The test will be done by the researchers with the cooperation of a preferred number of test respondents in their choice of day and time availability in a peaceful place for them to test the system properly. The test respondents are one (1) technical adviser, five (5) IT experts, and one (1) ICTD personnel. The system will be tested on Mac OS and Windows 10 and 11, including mobile phones with iOS 14 and 15 and for Android, versions 9 and 10. The system will be accessible to web browsers such as Google Chrome, Safari, Microsoft Edge, Firefox, and Opera. The researchers are responsible for implementing the actual process of testing of the system from preparation of test sheets to recording the test results.

Test Instrument. The test instruments are functionality and compatibility test. These tests help the respondents assess if the system is working well. The functionality tests will be used to evaluate if all of the desired functions were properly working without problems. The types of functional tests that will be used are unit, regression, smoke, sanity, and system testing. The unit testing will be used to make sure that each code in the system functions as it is intended by the developers first before forwarding it to the testers. Regression testing will be used to ensure that the system still functions well despite some changes in code. The smoke testing will be used to check the quality and see if it met the requirements of the desired organization. The sanity test will be used to ensure that minimal changes made in the system's codes do not affect its performance. Lastly, the system testing will be used to check if its codes function as what the objective of the study contains. On the other hand, the compatibility test will be used to determine if the system is compatible with the device indicated on the test plan.

Evaluation Plan

The objective of this plan is to evaluate the system by its usefulness to the target users. The evaluation tool that will be used is in accordance with ISO 25010 which will primarily help to ensure that the system is in high quality. The evaluation will be done by the researchers with the cooperation of a preferred number of evaluation respondents in their choice of day and time availability in a peaceful place for them to evaluate the system accordingly. The required evaluation respondents are thirty (30) end users, ten (10) IT experts, and one (1) ICTD personnel. The system will be tested on Mac OS and Windows 10 and 11, including mobile phones with iOS 14 and 15 and for Android, versions 9 and 10. The system will be accessible to web browsers such as Google Chrome, Safari, Microsoft Edge, Firefox, and Opera. The researchers are responsible for implementing the actual process of evaluation of the system from preparation of evaluation tool to recording the evaluation results.

Evaluation Tool. The researchers will be using an ISO 25010. The overall functionality of the website will be tested following the criteria with regards to content, navigation, structure and design, appearance, and uniqueness. The ISO 25010 is used to ensure that each criterion is fulfilled and met by the website.

TABLE 1: SCORING SYSTEM

Numerical Rating	Equivalent
4	Highly Acceptable
3	Acceptable
2	Fairly Acceptable
1	Unacceptable

The table shows the scoring system of ISO 25010. It has four levels: 4 as "Highly Acceptable" being the highest, followed by 3 as "Acceptable", 2 as "Fairly Acceptable", and lastly 1 as "Unacceptable" being the lowest.

Statistical treatment of data. The proponents used weighted mean and standard deviation for the analysis and statistical approach towards the gathered data. The data used in the evaluation are collected from a total of 41 respondents which are 30 end users, 1 adviser, and 10 IT experts.

Weighted Mean. Calculates the respondents' average scores within data sets.

$$\bar{x} = \frac{\Sigma x}{N}$$

Where:

$\bar{x}$ = mean

Σ = summation

X = score of proper weight

N = total number of respondents

Standard Deviation. A measurement of the data's deviation in regard to the mean. A low standard deviation means data is grouped around the mean. A high standard deviation means data are more scattered.

$$SD = \sqrt{\frac{\Sigma(x - \bar{x})^2}{N - 1}}$$

Where:

SD = standard deviation

Σ = summation

$\bar{x}$ = mean

x = score proper weight

N = total number of respondents

Likert Scale. The proponents used the Likert Scale to assess the degree to which responses to the questionnaires satisfied the requirements of the evaluation tool.

TABLE 2: LIKERT SCALE OF ISO25010

Numerical Equivalent	Description
3.51-4.00	Highly Acceptable
2.51-3.50	Acceptable
1.51-2.50	Fairly Acceptable
1.00-1.50	Unacceptable

The table shows the level of acceptance of the website. "Highly Acceptable" is the highest level, ranging from 3.51 to 4.00 which means the respondents are pleased with the overall state of the website. "Acceptable" is ranging from 2.51 to 3.50, this shows that respondents are satisfied with the outcome but lacking in some respects. "Fairly Acceptable" is equivalent to 1.51 to 2.50, this means the respondents are not impressed with the outcome. "Unacceptable" is the lowest level, ranging from 1.00 to 1.50, which means it did not meet expectations at all.

IV. RESULTS AND DISCUSSIONS

This chapter discusses the user interface design, project capabilities and limitations, test results and evaluation results of the study to prove that the objectives are met.

User Interface Design

These designs were made simple but elegant and functions were made to fulfil the goals of the project to develop a very useful system.

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Fig. N: User Interface – Login page

The homepage of LPU EIS displays automatically when the link is visited in a web browser.

Test Results

The test tools that were used for testing were functionality and compatibility tests. It was conducted to ensure that the project is completely functional and running as planned. To check whether the website is operating and working in accordance with the design standards and system performance, test cases and functional criteria were employed. Different browsers, including Google Chrome, Mozilla Firefox, and Opera, are used to run the test phase. The testing was participated in by one (1) technical adviser, five (5) IT experts, and one (1) ICTD personnel. The respondents used test sheets to manually check the system's capabilities and performance. During the test phase, almost all criteria were met, although some modules initially failed but were eventually fixed by the developer before proceeding to the evaluation phase.

Table 3: Test Results Using the Functional Testing for Super admin side

Test Respondents	Pass	Fail	Test Criteria	Percentage
Technical Adviser	133	3	136	97.79%
IT-Expert 1	128	8	136	94.12%
IT-Expert 2	126	10	136	92.65%
IT-Expert 3	135	1	136	99.26%
IT-Expert 4	122	14	136	89.70%
IT-Expert 5	124	12	136	91.18%
Administrator	133	3	136	97.79%

Functional Testing for the super admin side was participated by the technical adviser, five (5) IT experts, and one (1) Administrator in the Lyceum of the Philippines University Cavite Campus. The instrument has 136 total criteria tested; the technical adviser, marked three (3) as fail resulting in a 97.79% passing rate. IT expert 1, marked eight (8) as fail resulting in a 94.12% passing rate. IT expert 2, marked ten (10) as fail resulting in a 92.65% passing rate. IT expert 3, marked one (1) as fail resulting in a 99.26% passing rate. IT expert 4, marked fourteen (14) as fail resulting in an 89.70% passing rate. IT expert 5, marked twelve (12) as fail resulting in a 91.18% passing rate and one (1) administrator marked three (3) as fail resulting in 97.79% passing rate. Most failed remarks are corrections and minor bugs that have been discovered during testing. Including button validations, field validations, search bar and filter dropdown button problems. However, all failed remarks were corrected and improved by the proponents before proceeding to the evaluation phase.

Table 4: Test Results Using the Functional Testing for Admin ICTD side

Test Respondents	Pass	Fail	Test Criteria	Percentage
Technical Adviser	51	0	51	100%
IT-Expert 1	51	0	51	100%
IT-Expert 2	51	0	51	100%
IT-Expert 3	51	0	51	100%
IT-Expert 4	47	4	51	92.16%
IT-Expert 5	51	0	51	100%
Administrator	51	0	51	100%

Functional Testing for the admin ICTD side was participated by the technical adviser, five (5) IT experts, and one (1) Administrator in the Lyceum of the Philippines University Cavite Campus. The instrument has 51 total criteria tested; the technical adviser, four (4) IT experts, one (1) administrator checked and passed all the criteria resulting in a 100% passing rate. However, one (1) IT expert marked four (4) as fail resulting in a 92.16% passing rate. Errors include minor bugs such as search bar errors and button validations that have been discovered during testing by the IT Expert. Suggestions were made and errors were fixed for the improvement of the system before the evaluation.

Table 5: Test Results Using the Functional Testing for Student side

Test Respondents	Pass	Fail	Test Criteria	Percentage
Technical Adviser	72	0	72	100%
IT-Expert 1	72	0	72	100%
IT-Expert 2	72	0	72	100%
IT-Expert 3	72	0	72	100%
IT-Expert 4	69	3	72	95.83%
IT-Expert 5	72	0	72	100%
Administrator	72	0	72	100%

Functional Testing for the student side was participated by the technical adviser, five (5) IT experts, and one (1) Administrator in the Lyceum of the Philippines University Cavite Campus. The instrument has 72 total criteria tested; the technical adviser, four (4) IT experts, one (1) administrator checked and passed all the criteria resulting in a 100% passing rate. However, one (1) IT expert marked three (3) as fail resulting in a 95.83% passing rate. Errors include minor bugs on the search bar that have been discovered during testing. Suggestions were made and errors were fixed before the evaluation phase.

Table 6: Test Results Using the Functional Testing for LPU Property side

Test Respondents	Pass	Fail	Test Criteria	Percentage
Technical Adviser	84	0	84	100%
IT-Expert 1	84	0	84	100%
IT-Expert 2	84	0	84	100%
IT-Expert 3	84	0	84	100%
IT-Expert 4	80	4	84	95.24%
IT-Expert 5	84	0	84	100%
Administrator	84	0	84	100%

Functional Testing for LPU Property side was participated by the technical adviser, five (5) IT experts, and one (1) Administrator in the Lyceum of the Philippines University Cavite Campus. The instrument has 82 total criteria tested; the technical adviser, four (4) IT experts, one (1) administrator checked and passed all the criteria resulting in a 100% passing rate. However, one (1) IT expert marked four (4) as fail resulting in a 95.24% passing rate. Failed remarks are corrections and minor bugs on the search bar that have been discovered during testing as identified by IT experts. Suggestions were made and errors were corrected before the evaluation phase.

Table 7: Test Results Using the Functional Testing for Security Office side

Test Respondents	Pass	Fail	Test Criteria	Percentage
Technical Adviser	43	0	43	100%
IT-Expert 1	43	0	43	100%
IT-Expert 2	43	0	43	100%
IT-Expert 3	43	0	43	100%
IT-Expert 4	40	3	43	93.02%
IT-Expert 5	43	0	43	100%
Administrator	43	0	43	100%

Functional Testing for the Security office side was participated by the technical adviser, five (5) IT experts, and one (1) Administrator in the Lyceum of the Philippines University Cavite Campus. The instrument has 43 total criteria tested; the technical adviser, four (4) IT experts, one (1) administrator checked and passed all the criteria resulting in a 100% passing

rate. However, one (1) IT expert marked three (3) as fail resulting in a 93.02% passing rate. Failed remarks are corrections and minor bugs on the search bar that have been discovered during testing. Suggestions were made and errors were corrected before the evaluation phase.

Table 8: Test Results Using the Functional Testing for Admin side

Test Respondents	Pass	Fail	Test Criteria	Percentage
Technical Adviser	28	0	28	100%
IT-Expert 1	28	0	28	100%
IT-Expert 2	28	0	28	100%
IT-Expert 3	28	0	28	100%
IT-Expert 4	27	1	28	96.43%
IT-Expert 5	28	0	28	100%
Administrator	28	0	28	100%

Functional Testing for the admin side was participated by the technical adviser, five (5) IT experts, and one (1) Administrator in the Lyceum of The Philippines University Cavite Campus. The instrument has 43 total criteria tested; the technical adviser, four (4) IT experts, one (1) administrator checked and passed all the criteria resulting in a 100% passing rate. However, one (1) IT expert marked one (1) as a failure resulting in a 96.43% passing rate. Failed remarks are corrections and minor bugs on the search bar that have been discovered during testing. Suggestions were made and errors were corrected before the evaluation phase.

Table 9: Test Results Using the Compatibility Testing

Test Respondents	Pass	Fail	Test Criteria	Percentage
Technical Adviser	22	0	22	100%
IT-Expert 1	22	0	22	100%
IT-Expert 2	22	0	22	100%
IT-Expert 3	22	0	22	100%
IT-Expert 4	22	0	22	100%
Administrator	22	0	22	100%

Compatibility Testing was participated by the technical adviser, five (5) IT experts, and one (1) Administrator in the Lyceum of the Philippines University Cavite Campus. The instrument has 22 total criteria tested. All the testers verified that the requirements had been met resulting in a 100% passing rate.

Evaluation Results

During the evaluation phase, thirty (30) end-users, one (1) administrator, and ten (10) IT experts assessed the project's user acceptability. The ISO 25010 criteria were used to evaluate the web-based system. All the results were calculated using Microsoft Office Excel.

Table 10: Evaluation Result from thirty (30) end-users

Criteria	Mean	SD	Interpretation	Rank
Functional Suitability	3.56	0.08	Highly Acceptable	1
Performance Efficiency	3.42	0.35	Acceptable	5
Compatibility	3.21	0.02	Acceptable	7
Usability	3.55	0.27	Highly Acceptable	2
Reliability	3.43	0.29	Acceptable	4
Security	3.45	0.39	Acceptable	3
Maintainability	3.36	0.22	Acceptable	6
Portability	3.18	0.18	Acceptable	8
Average Mean and Standard Deviation	3.39	0.22	Acceptable	

Table 10 displays the evaluation results of thirty (30) end-users from Lyceum of the Philippines University - Cavite. LPU students, Security Officers, Property Office Personnel, and ICTD Personnel were among the thirty (30) end-users who

participated in the evaluation of the system. According to the table, Functional Suitability has the highest rank, with a mean of "3.56" and a standard deviation of "0.08," indicating that it is "Highly Acceptable," due to the overall functionality of the website. Overall, the average mean for the thirty (30) end-users is 3.39, with an average standard deviation of 0.22, indicating that the end-users rated the product as "Acceptable."

Table 11: Evaluation Result from one (1) Administrator

Criteria	Mean	SD	Interpretation	Rank
Functional Suitability	4	0	Highly Acceptable	1
Performance Efficiency	4	0	Highly Acceptable	1
Compatibility	3	0	Acceptable	5
Usability	3.5	0.83	Acceptable	4
Reliability	3	0.81	Acceptable	5
Security	3.8	0.44	Highly Acceptable	2
Maintainability	3.8	0.44	Highly Acceptable	2
Portability	3.66	0.57	Highly Acceptable	3
Average Mean and Standard Deviation	3.59	0.39	Highly Acceptable	

The Administrator who evaluated the project's web-based system was from the Information and Communications Technology Department from Lyceum of the Philippines University – Cavite. The table's highest-ranking criteria are Functional Suitability and Performance Efficiency, with a mean of "4" and a standard deviation of "0", indicating "Highly Acceptable." The results show that the system is exceptional. Overall, the administrator interpreted the average mean of "3.59" with a standard deviation of "0.39" as "Highly Acceptable."

Table 12: Evaluation Result from ten (10) IT Experts

Criteria	Mean	SD	Interpretation	Rank
Functional Suitability	3.6	0.17	Highly Acceptable	2
Performance Efficiency	3.46	0.47	Acceptable	5
Compatibility	3.75	0.07	Highly Acceptable	1
Usability	3.6	0.37	Highly Acceptable	2
Reliability	3.5	0.34	Acceptable	4
Security	3.58	0.39	Highly Acceptable	3
Maintainability	3.5	0.29	Acceptable	4
Portability	3.36	0.35	Acceptable	6
Average Mean and Standard Deviation	3.54	0.31	Highly Acceptable	

Senior Quality Analyst, Quality Assurance, IT Instructor, Software Test Engineer, and Automation Test Analyst were among the ten (10) IT experts who participated in the evaluation. The table shows that Compatibility ranks first for the criteria evaluation, with a mean of "3.75" and a standard deviation of "0.07", indicating that the evaluators deemed the web-based system to provide efficient performance that can perform its required function. Overall, the average mean for the ten (10) IT Experts is "3.54", with a standard deviation of "0.31", indicating a "Highly Acceptable" interpretation.

Table 13: Overall Evaluation Result from thirty (30) end-users, and ten (10) IT Experts

Criteria	Mean	SD	Interpretation	Rank
Functional Suitability	3.72	0.09	Highly Acceptable	1
Performance Efficiency	3.62	0.28	Highly Acceptable	2
Compatibility	3.32	0.31	Acceptable	6
Usability	3.55	0.50	Highly Acceptable	4
Reliability	3.31	0.48	Acceptable	7
Security	3.61	0.41	Highly Acceptable	3
Maintainability	3.55	0.32	Highly Acceptable	4
Portability	3.40	0.37	Acceptable	5
Average Mean and Standard Deviation	3.51	0.31	Highly Acceptable	

The overall evaluation result showed that the Functional Suitability criteria landed in the first rank, with a mean of "3.72" and a standard deviation of "0.09", signifying "Highly Acceptable." Overall, the average mean is "3.51", with a standard deviation of "0.31", indicating "Highly Acceptable."

The evaluators concluded that the system's operation meets the stated or implied requirements. As a result, evaluators unanimously agreed on Functional Suitability as the first rank in the criteria. The results show that the evaluators are pleased with the functionalities in the system because they are capable of doing its tasks efficiently. The evaluators also found that the system meets the anticipated outcome in terms of response and processing times when carrying out its function, which led to the system's performance efficiency being ranked second. Furthermore, due to the system's security access and database restrictions, the security ranking is third. However, some evaluators made recommendations to improve some of the system's functionalities including its security. Usability and Maintainability came in fourth place because the evaluators discovered that the system's design and structure adhered to the design standards. Additionally, Portability came in fifth place while Compatibility ranked sixth. Lastly, Reliability came in last place because the evaluators believe that the system could be improved further when it comes to its maturity, availability, fault tolerance, and recoverability.

V. SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents the summary findings that explains the test and evaluation results furthermore, the conclusion that emphasizes the relevance, objectives and results of the project and the recommendations that provides a list of suggestions that could help the future researchers with the same project.

Summary of Findings

The researchers of this study were challenged to develop a web-based registration system with RFID technology. The developed project is more efficient and convenient than the usual. The system will allow the end users to register their personal equipment or legally borrow LPU's equipment. Furthermore, the system will be able to monitor university equipment via RFID tagging prior to assigning and distributing it to various departments/offices. The system will also provide extra security for both student and university equipment to prevent loss.

During the testing of the project, the IT experts encountered several minimal problems with regards to the UI and some of the functionalities of the system. The IT experts gave a few comments and suggestions about the user interface and some functionalities of the website that will make the project at its best. Furthermore, one of the IT experts observed that all of the search bar and filter dropdown buttons are inaccurate in terms of their functionality. After the testing phase, all the errors were fixed before proceeding to the evaluation phase. However, some of their suggestions were put in the recommendations of the project for reference of the future researchers.

The overall results of the evaluation with the use of ISO 25010 criteria shows that the LPU EIS is "highly acceptable." The criterion "Functional Suitability" ranked as the number one that the respondents considered best in LPU EIS. It has an average mean of "3.72" and a standard deviation of "0.09" while the criterion ranking as the lowest is the "Reliability" with the average mean of "3.31" and a standard deviation of "0.48" and was interpreted to be acceptable. Besides, the evaluators concluded that the system met the stated objectives of the project, and it performs well as intended.

Conclusion

The researchers of RFID-Based Equipment Information System for Lyceum of the Philippines University - Cavite with the objectives of developing a website which is a registration system of equipment in LPU was met and properly developed the way it is expected to be.

The system functions are working as it is intended for each user. The users are namely the LPU students, super admin such as the ICTD, admin department, admin ICTD, security office personnel such as the security office and lastly, the LPU property. The LPU students are the end users that are allowed to register as much equipment as they need. The other mentioned users are the authorized department or personnel that is responsible for managing the students' registrations. The system features were also applied and developed as it should be. Features include user account management, email confirmation regarding user account details, equipment registration module, approving and declining feature for registration requests, status tracking module, RFID tagging, report lost feature, and notification module for student. The project was created in accordance with the processes provided by Lyceum of the Philippines University. The UI and color scheme was designed to help the users to easily navigate it since the developed system was based on the MyLPU E-Learning portal.

Based on the test result, the modules are functional but some of the buttons and fields had issues due to the validation on each button and field. On the other hand, the compatibility test yields 100% passing rates for all testers. The test proved that the system could run in a variety of web browsers, specifically Google Chrome, Microsoft Edge, Safari, Opera, and Firefox as well as smoothly running on 1920x1080, 2560x1440, 1280x720, 768x1024, 1200x1920, 1600x2560, and 360x640 screen resolutions.

Based on the evaluation result, the respondents found the LPU EIS as highly acceptable. The end users, IT experts, and consultants acknowledged that the application was valuable and effective for students and the university as a tool for securing their equipment and eliminating the hassle of manual equipment registration. The researchers therefore conclude that the users are interested in using this developed project for its functional suitability. Aside from being useful, the LPU EIS has proven efficient and convenient for the students in registering their equipment as well as to the departments involved in this system as they can easily manage the equipment registrations and LPU-owned equipment.

Recommendations

1. Conduct a stress testing for RFID technology to test the number of scans it can do;

2. Find a cheaper alternative for RFID reader and tags;

3. Improve the Graphical User Interface of the system. Background image for the login page should be responsive as well;

4. Include functionality to view and edit the details of LPU-owned equipment on the LPU Property interface. Specific details include price, equipment lifespan, and equipment supplier;

5. RFID code tagging should be in a list box option, where users can simply select the available RFID instead of typing the entire RFID code;

6. Improve the text buttons so that they appear clickable to users;

7. Add list of RFID users to the admin dashboards;

REFERENCES

[1] Aastha and Gulia (2017). Review on Security of Radio Frequency Identification Technology. Research India Publications. 10(8). 2427-2433. https://www.ripublication.com/acst17/acstv10n8_20.pdf

[2] Abbod, J., et al. (2019). Smart Health and Safety Equipment Monitoring System for Distributed Workplaces. MDPI. https://www.mdpi.com/2073-431X/8/4/82

[3] n.a. (n.d.). Aesthetics. Interaction Foundation Design. https://www.interaction-design.org/literature/topics/aesthetics

[4] Abdalla, A. A. O., et al. (2018, July 31). RFID based access control and registration system. Semantic Scholar. https://www.semanticscholar.org/paper/RFID-based-Access-Control-and-Registration-System-Allah-Abdalla/b2dd9ac62032ba35d94a4bbbb4f5faf99fb1d0b5

[5] Ali, M. A. M., et al. (2019). Study on RFID based book tracking and library information system. ResearchGate. https://www.researchgate.net/publication/332675899_Study_on_RFID_Based_Book_Tracking_and_Library_Information_System

[6] Ali, S. N., et al. (2018, January). Attendance and Information System Using RFID and Web-Based Application for Academic Sector. ResearchGate. https://www.researchgate.net/publication/322862382_Attendance_and_Information_System_Using_RFID_and_Web-Based_Application_for_Academic_Sector

[7] Amer, T. S., et al. (2018). Project - X: an initiative to increase student engagement through laptops. ResearchGate. https://www.researchgate.net/publication/331211005_Project_-_X_An_Initiative_to_Increase_Student_Engagement_through_Laptops?fbclid=IwAR02LsQkWYdOPwCwZXU29jQU58JpHIA-33CTTMaaGI_Qh4MDMlP56w1HasY

[8] n.a. (2021). What is Photoshops. American Graphics Institute. https://www.agitraining.com/adobe/photoshop/classes/what-is-photoshops

[9] Amit, S. A., et al. (2019). RFID Based Student Monitoring System Using Web Application. Daffodil Varsity. http://dspace.daffodilvarsity.edu.bd:8080/bitstream/handle/123456789/3604/P13330%20%2826%25%29.pdf?sequence=1&isAllowed=y

[10] Andres, F. L. (2018). RFID technology for management and tracking e-health applications. MDPI. https://www.mdpi.com/1424-8220/18/8/2663

[11] Asinglawi, B. (2017) RFID Localisation for Internet of Things Smart Homes: A Survey. ResearchGate. https://www.researchgate.net/publication/313317386_RFID_Localisation_for_Internet_of_Things_Smart_Homes_A_Survey

[12] Astari, S. (2021). What Is HTML? Hypertext Markup Language Basics Explained. Hostinger Tutorials. https://www.hostinger.ph/tutorials/what-is-html

[13] Belcher, D. (2020, January 31). Functional testing: what it is and how to use it. Mabl. https://www.mabl.com/articles/functional-testing-what-it-is-and-how-to-use-it?fbclid=IwAR1nIeqHy2YJxEYb1ch44Fih45bJF-R6-WataPEX8rEmXZQALDuh5SjvXRc

[14] BMI Imaging Systems (n.d.). What Are The Advantages Of Digitization? https://bmiimaging.com/blog/document-management/what-are-the-advantages-of-digitization/

[15] Chan, C. Y., et al. (n.d.). Design and Development of an RFID-based HIS – A Case Study. Sage Journals. https://journals.sagepub.com/doi/10.5772/45679?icid=int.sj-full-text.similar-articles.5

[16] Chanprapas, A. (2019). The development of online registration system for picking-up tablet of the office of general education and innovative electronic learning. Conferace. https://conferaces.com/index.php/journal/article/view/3/3

[17] Chris, K. (2021). What is PHP? The PHP programming language meaning explained. Free Code Camp. https://www.freecodecamp.org/news/what-is-php-the-php-programming-language-meaning-explained/

[18] Computer Hope (2020). Notepad++. Computer Hope Inc. https://www.computerhope.com/jargon/n/notepad-plus-plus.htm

[19] Dean, J (2023, May 15). How Digitalization Is Simplifying Company Registration Processes. https://norsecorp.com/how-digitalization-is-simplifying-company-registration-processes/

[20] Drake, M. (2020, December 14). What is MySQL? Digital Ocean. https://www.digitalocean. com/community/tutorials/what-is-mysql

[21] Gar N. Chan, DDS. Inc. (n.d.). Why online registration is essential during the COVID-19. Gar N. Chan, DDS, Inc. General & Cosmetic Dentistry. https://www.gilroysmiles.com/why-online-registration-is-essential-during-covid-19/

[22] Gherardelli, M., et al. (2022, August 23). Radio Frequency Identification (RFID) in health care: where are we? A scoping review. SpringerLink. https://link.springer.com/article/10.1007/s12553-022-00696-1

[23] Hagene, E. (2018, October 8). 9 factors to consider when choosing a registration system. Frontcore. https://frontcore.com/blog/9-factors-to-consider-when-choosing-a-registration-system.

[24] Hagene, E. (2019). 15 reasons you should use a professional registration system. Frontcore. https://frontcore.com/blog/15-reasons-you-should-use-a-professional-registrationsystem/

[25] Hamid, I. A., et al. (2018). Radio Frequency Identification (RFID) Based Car Parking System. JOIV. https://joiv.org/index.php/joiv/article/view/173

[26] Hamilton, T. (2022, November 19). What is compatibility testing? Forward & backward testing. Guru99. https://www.guru99.com/compatibility-testing.html

[27] Hamilton, T. (2022, November 19). What is Functional Testing? Types & Examples. Guru99. https://www.guru99.com/functional-testing.html

[28] Hu, C., et al. (2020). Research on equipment management system based on robot laboratory. Scientific Research. https://www.scirp.org/journal/paperinformation.aspx?paperid=101665

[29] Johnston, C. B. (2022, July 25). Information system research. Western Libraries. https://guides.lib.uwo.ca/infosystems

[30] Juneja, P. (n.d.). MIS – understanding information systems. Management Study Guide. https://managementstudyguide.com/information-systems.htm

[31] Kadam, et al. (2020). Real Time Student Tracking System Using RFID Tags and IOT Enabled Device. IRE Journals. 3(10). 81. https://irejournals.com/formatedpaper/1702157.pdf

[32] Ketterman, S. (2019). Form and function—a guide to the top wireframe tools. Medium. https://uxdesign.cc/form-and-function-a-guide-to-the-top-wireframe-tools-aa90d1 a2eb70

[33] Kumar, K. L. S., et al. (2019). Design and Implementation of RFID based Staff Monitoring System. Pramana Research Journal. 9(4). 53-59. https://www.pramanaresearch.org/gallery/prj-s214.pdf

[34] Kummer, M. & Tungcul, M. B. (2021). Supplies and Equipment Inventory, Monitoring and Tracking Management System using Data Mining Techniques. Semantic Scholar. https://www.semanticscholar.org/paper/Supplies-and-Equipment-Inventory%2C-Monitoring-and-Tungcul-Kummer/2985f62e9001067e0ba1024c7f879ef9cf479d19

[35] Law Insider (2022). Equipment Records. In Law Insider. https://www.lawinsider.com/dictionary/equipment-records?fbclid=IwAR35vGA9sYfeb-foNjedM9yk0IfmbMoIn-nqlxcefAdoDY_BFHh6hK-q2RY

[36] Law Insider (2021). Registration System. In Law Insider. https://www.lawinsider.com/dictionary/registration-system?fbclid=IwAR3g8ifgQhEa-r_D709yNmG6bK_eDOaHzDHX7902BeH5wPFbJrG1CU6ZLyM

[37] Lyceum of the Philippines University (2018). Senior High School Diary SY 2018-2019. Strategic Communications Office.

[38] Markgarf M. (2019, March 05). How Is a Management Information System Useful in Companies? https://smallbusiness.chron.com/management-information-system-useful-companies-63415.html

[39] Megida, D. (2021, March 29). What is JavaScript? A definition of the JS programming language. Free Code Camp. https://www.freecodecamp.org/news/what-is-javascript-definition-of-js/

[40] Mifsud, J (n.d.) 8 Free Web-Based Website Accessibility Tools. Usability Geek. https://usabilitygeek.com/10-free-web-based-web-site-accessibility-evaluation-tools/

[41] n.a. (2021). Computer Technology in the Student Registration Process Essay. IvyPanda. https://ivypanda.com/essays/computer-technology-in-the-student-registration-process/

[42] n.a (2020). Managing Data Protection. University of Delaware. https://www1.udel.edu/security/data/protection.html

[43] n.a (n.d.). What is process tracking? Task Management Guide. http://www.taskmanagementguide.com/glossary/what-is-process-tracking-.php

[44] Obua, J. (2021). Design and implementation of an e - registration system. Academia. https://www.academia.edu/17240907/Design_and_Implementation_of_an_E_registration_system

[45] Panganiban, E. B. & Dela Cruz, J. C. (2017). RFID-based vehicle monitoring system. IEEE Explore. https://ieeexplore.ieee.org/abstract/document/8269489

[46] Pisarek, D. (2019, April 30). 5 benefits of using an online registration system. Wow Digital. https://wowdigital.com/blog/5-benefits-of-using-an-online-registration-system/

[47] ResearchGate (2017). Cascading style sheets (CSS). In Java EE Web Application Primer. https://www.researchgate.net/publication/321629654_Cascading_Style_Sheets_CSS

[48] Rowe, A. (2022, August 4). RFID asset tracking uses a system of tags and scanners to collect data from fixed or movable assets. Is it a fit for you? Tech.co. https://tech.co/asset-tracking/rfid

[49] Sahoo, S (2022, October). RFID-GPS Enabled Project Material Control. ResearchGate. https://www.researchgate.net/publication/364984783_RFID-GPS_Enabled_Project_Material_Control

[50] Setyawan, et al. (2022). Development of Automatic Real Time Inventory Monitoring System using RFID Technology in Warehouse. ResearchGate. https://www.researchgate.net/publication/364177200_Development_of_Automatic_Real_Time_Inventory_Monitoring_System_using_RFID_Technology_in_Warehouse

[51] Soegoto, E. S. and Pamungkas, R. S. (2018). Web-based Information System Services in a Textile Industry. IOP Science. https://iopscience.iop.org/article/10.1088/1757-899X/407/1/012060

[52] Stazzone, S. (2022). Using RFID for Inventory Management: Pros and Cons. Camcode. https://www.camcode.com/blog/using-rfid-for-inventory-management-pros-and-cons/

[53] University of Alberta. (2020). Equipment registration and tracking procedure. University of Alberta. https://policiesonline.ualberta.ca/PoliciesProcedures/Procedures/Equipment-Regis tration-and-Tracking-Procedure.pdf

[54] US Department of Education. (n.d.). What is an education record. Protecting Student Privacy. https://studentprivacy.ed.gov/faq/what-education-record

[55] Wardynski, D. (2020). Positive Effects Of Technology That Has Changed Our Lives. Brainspire. https://www.brainspire.com/blog/positive-effects-of-technology-making-everyday-life-better?fbclid=IwAR1WkDa1ClCxMk9VIkxrXxbY3dQLSJUvdpylq7as-N5SJmYPtgruJKicA-Q

[56] Williamson, V. (2019, October 26). Advantages of having a computer in education. Olpccanada. http://olpccanada.com/advantages-of-having-computer-in-education/#:~:text=Computers%20have%20supplied%20infinite%20resources,also%20from%20available%20online%20resources.

[57] Zadvinskis, M. (2020, December 7). How students will benefit from a school laptop program. Higher Ground. https://www.hggear.com/blog/how-students-will-benefit-from-a-school-laptop-program