CHAPTER I

INTRODUCTION

1.1 Introduction

Space tracking for dormitories is a process that involves monitoring and managing the utilization of bed space within a dormitory building. This includes tracking of the in and out of the occupancies as well as to determine the time of occupancy return to the dormitory, and the occupancy of rooms as well as identifying areas where space is underutilized or overutilized. This information can then be used to monitor the occupancies and how to optimize space utilization and improve the living experience for dormitories.

Radio Frequency Identification (RFID) is a technology that uses radio waves to passively identify a tagged object. It is used in several commercial and industrial applications, from tracking items along a supply chain to keeping track of items checked out of a library [1]. RFID systems consist of three components: an RFID tag or smart label, an RFID reader, and an antenna. RFID tags contain an integrated circuit and an antenna, which are used to transmit data to the RFID reader (also called an interrogator). The reader then converts the radio waves to a more usable form of data [2]. Information collected from the tags is then transferred through a communications interface to a host computer system, where the data can be stored in a database and analyzed at a later time.

The Housing Management Division of Mindanao State University. Marawi (MSU Marawi) plays a role in the university infrastructure by providing on campus housing options for a range of individuals. Ensuring management and optimal use of these housing facilities is crucial, for maintaining a living and learning environment.

OccupEye represents a transformative solution for the Housing Management Division of Mindanao State University - Marawi, introducing an advanced web-based space tracking system to optimize the management of dormitory spaces. This system not only streamlines the student experience by enabling them to effortlessly reserve spaces in advance, eliminating the need for physical visits to the housing management division, but it also serves as a powerful tool for administrators. The system's multifaceted advantages encompass time and effort savings for students, enhanced resource management for the Housing Management Division, and the ability to foster improved planning, collectively contributing to a more streamlined and effective dormitory management process at MSU-Marawi.

1.2 Statement of the Problem

The current housing management at MSU-Marawi faces several challenges, including inefficient monitor tenants' in and out of the dormitory, space utilization, manual record-keeping, and bias on the reservation of vacant space. The lack of real-time occupancy data rely on manual record-keeping processes makes it difficult to track dormitory assignments effectively.

This process not only consumes valuable time but also contributes to a lack of transparency and fairness in dormitory assignments. These challenges underscore the pressing need for a more streamlined and technologically advanced solution to enhance the overall efficiency and fairness in the allocation and management of dormitory spaces at Mindanao State University – Main Campus. Furthermore, the management

sometimes prioritizes their relatives when reserving vacant space, which is unfair and unethical.

1.3 Objectives of the Project

This project aims to design and develop an Online Monitoring System for MSU-Marawi Housing Division.

Specifically, this project aims to:

- To monitor and manage the utilization of bed space within a dormitory building.
- For student, to reserve for the bed space within a dormitory.
- For manager, to track the in and out of the occupancies as well as to determine the time of occupancy return to the dormitory.

1.4 Expected Outputs of the Project

The goal of the project is to implement online monitoring of dormitories at MSU – Marawi to enhance efficiency in monitoring and facilitate online reservations through a website.

The expected outputs of the system are the following:

1. The system can track the in and out of the tenants from the building in a use of RFID.
2. The system can monitor the real-time information on dormitory space availability.

3. The system enables students to check for vacancies and reserve their living bed space online.
4. The system will feature an automated reservation process, allowing students to secure dormitory spaces through the online platform without the need for physical visits to the Housing Management Division.

1.5 Operational Definition of Terms

This part will include a list of terminology that will be used throughout the dissertation, as well as definitions for each of them, to ensure that your readers grasp the project's components.

Web-based is software application or platform that is accessed and operated through a web browser over the internet.

Radio Frequency Identification (RFID) is a wireless technology that uses electromagnetic fields to transfer data from an RFID tag or card to an RFID reader.

Monitoring is the process of tracking and observing the movements and activities of individuals or objects within a given environment.

Space Tracking is the systematic process of monitoring, recording, and managing the utilization of physical spaces within a specific environment, such as dormitories. This involves tracking occupancy, availability, and overall utilization of rooms, common areas, and facilities.

Housing Management Division is the administrative unit within an educational institution, in this case, Mindanao State University Marawi, responsible for overseeing and managing on-campus housing facilities.

Space Utilization is involves analyzing data on the usage of dormitory rooms and facilities to optimize allocation and enhance planning and decision-making.

Reservation System a mechanism or process that allows users to secure or book a space in advance for a specified period.

1.6 Conceptual Framework

The concept framework is a structure wherein the research presumptions can best describe the natural development of the phenomenon to be studied [3]. It is the researcher's description of how the research problem would be explored. The conceptual framework offers a unified way of looking at a problem under study [4].

Figure 1 presents the conceptual framework for this project. To address the primary research questions, the study will undergo to 4 different phases such as: Input, Process, Output, and Feedback. This cycle is pattered to the systems theory discussed [5]. First, the input stage involves the development and implementation of the Online Monitoring System, which includes the necessary technology infrastructure, user requirements from housing administrators and students, and occupancy data from initial dormitory assignments, occupancy rates, and historical information.

Second, the process phase will include Rapid Application Development (RAD) for rapid application building and technology assessment adoption from the existing

literature for acceptability of the prototype. Moreover, this rapid pace is made possible by RAD's focus on minimizing the planning stage and maximizing prototype development [6]. Then, technology acceptance model as proposed by Davis (1989) will be adopted for the assessment of the prototype.

And lastly, the expected output for this project will provides real-time dormitory space availability updates, aiding administrators in decision-making. It offers a user-friendly platform for students, standardized procedures, and transparency, reducing bias and improving fairness. It also saves time and costs by eliminating manual record-keeping.

How could be OccupEye help the Housing Management Division and Students for real-time tracking of occupied space in MSU - Marawi				
INPUT	**PROCESS**	**OUTPUT**	**IMPACT**	**OUTCOME**
• Software Engineering • Technology Adoption • User Requirements • Occupancy Data • RFID Reader	• Rapid Application Development • Technology Assessment for Acceptability • Automation of Reservation Process • Matching the system record of the students	• Real-time Monitoring • Online Reservation Platform • Automated Reservation Process	• Enhance Administrative Efficiency • Improved User Experience • Fairness and Transparency	• Optimized Space Utilization • Increase the Fairness and Transparency • Monitored the student's record

Figure 1.1: Conceptual framework for space tracking system of MSU – Marawi Dormitories.

1.7 Significance of the Project

OccupEye holds significant importance due to its multifaceted benefits for students and administrators alike, along with its potential to revolutionize dormitory management processes.

By allowing students to effortlessly reserve spaces through a web-based platform, enhances their overall living experience and reducing administrative hassles by eliminating the need for physical visits to the housing management division and providing transparency in space availability, thereby saving time and effort. While for the housing management division enables real-time monitoring of dormitory occupancy and the tenants' as of the in and out on the dormitory, facilitating efficient allocation of resources and space management, empowering administrators to identify underutilized or overutilized areas, eliminating the need for manual record-keeping, and leading to improved administrative decision-making.

Moreover, its utilization of Radio Frequency Identification (RFID) technology enables to monitor the tenants' effortlessly.

1.8 Limitations of the Project

The proposed project aims to create a web-based system to manage dormitory spaces at Housing Management Division in Mindanao State University's Main Campus. The system will provide an intuitive interface for students to check availability, make reservations, and receive real-time updates, and for the manager to monitor the tenant's if in and out from the building in a use of RFID. It will integrate with the Housing Management Division's infrastructure for smooth administrative operations and data

flow. Security controls will be in place to protect user information and ensure system integrity.

To enhance the system's capabilities, Radio-Frequency Identification (RFID) technology will be used. Tenants will be assigned unique QR-Code, allowing them to access dormitory. RFID technology will streamline check-in and check-out processes and contribute to accurate occupancy monitoring.

However, the project has limitations, such as the need for stable internet connection.

CHAPTER II

REVIEW OF RELATED LITERATURE

2.1 Review of Related Theories

This section focuses on the review of theories or concepts related to the proposed project.

2.1.1 Mindanao State University Housing Management Division

The Housing Management Division supervises student dormitories and residence halls for faculty, staff and other MSU employees in accordance with approved rules and regulations. It also administers the established housing policies to the university-owned housing units. Accommodation at the dormitories is free to all scholars and grant in-aid recipients (MSU – Main Campus | Housing).

The Housing Management Division Office objectives are to ensure a sociocultural integration in all University dormitories and to ensure that scholars and other deserving students are prioritized and are accordingly awarded bed spaces. The office comes up with an updated master-list of student residents and facilitates the admission of qualified students in all University dormitories (MSU – Main Campus | Housing).

2.1.2 Online Hotel Reservation

Online hotel reservation is a popular method for booking hotel rooms. Travelers can book rooms on a computer by using online security to protect their privacy and

financial information and by using several online travel agents to compare prices and facilities at different hotels (Wikipedia).

Prior to the Internet, travelers could write, telephone the hotel directly, or use a travel agent to make a reservation. Nowadays, online travel agents have pictures of hotels and rooms, information on prices and deals, and even information on local resorts. Many also allow reviews of the traveler to be recorded with the online travel agent. Online hotel reservation is also helpful for making last minute travel arrangements. Hotels may drop the price of a room if some rooms are still available. There are several websites that specialize in searches for deals on rooms (Wikipedia).

2.1.3 Radio Frequency Identification (RFID)

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. An RFID system consists of a tiny radio transponder called a tag, a radio receiver, and a transmitter. When triggered by an electromagnetic interrogation pulse from a nearby RFID reader device, the tag transmits digital data, usually an identifying inventory number, back to the reader. This number can be used to track inventory goods (Wikipedia).

RFID tags are widely used in identification badges, replacing earlier magnetic stripe cards. These badges need only be held within a certain distance of the reader to authenticate the holder. Tags can also be placed on vehicles, which can be read at a distance, or to person, which can be used as an automatic attendance, this allows to entrance to controlled areas and present a card or enter an access code (Wikipedia).

2.1.4 Technology Acceptance Model (TAM)

The technology acceptance model (TAM) is an information systems theory that explains how to encourage users to accept and utilise new technology (Davis, 1989). It has been widely applied by information systems scholars to addresses the challenge to organizations of promoting acceptance of new information systems (Liu, Dedehayir, & Katzy, 2015). TAM presents two factors that are important determinants of users' acceptance: perceived usefulness and perceived ease of use (Davis, 1989). The fundamental principle is that the better users perceive that a specific application will enhance their performance, and the less effort the application requires to use, the higher the adoption rate will be. Since the model was first developed, several other factors have been added.

TAM has been applied to study the factors influencing the adoption of big data initiatives. For example, applied TAM to analyze the determinants of big data adoption. It was discovered that perceived usefulness and perceived benefit have an influence in adopting big data. On the other hand, perceived ease of use was not a relevant predictor. Liu et al. (2015) incorporated variable social influence with TAM and analyzed its impact on the adoption of big data in an organization. Social influence seemed to affect adoption of big data initiatives; that is, the shared opinion of a group of individuals towards big data may influence its successful implementation in organizations.

2.2 Review of Related Systems

2.3 Summary Matrix

Table 2.1 Summary Matrix

System	Web-based	Tracking	Occupancy Monitoring	Online Reservation	QR Code	RFID Reader Infrastructure
OccupEye	✔	✔	✔	✔	✔	✔

CHAPTER III

METHODOLOGY

3.1 Research Design

This study draws on quantitative research into the space tracking system of dormitories. This discussion of methodology aims to illustrate some of the specific tools and experiences that were utilized to inform the research design and interpretation development.

For instance, the proponent will develop a platform that would help the housing management division in managing the occupancy. Additionally, the proponent's another intention would be evaluation of the said system. In this evaluation, variables as proposed by Davis 1989 will be used with some modification.

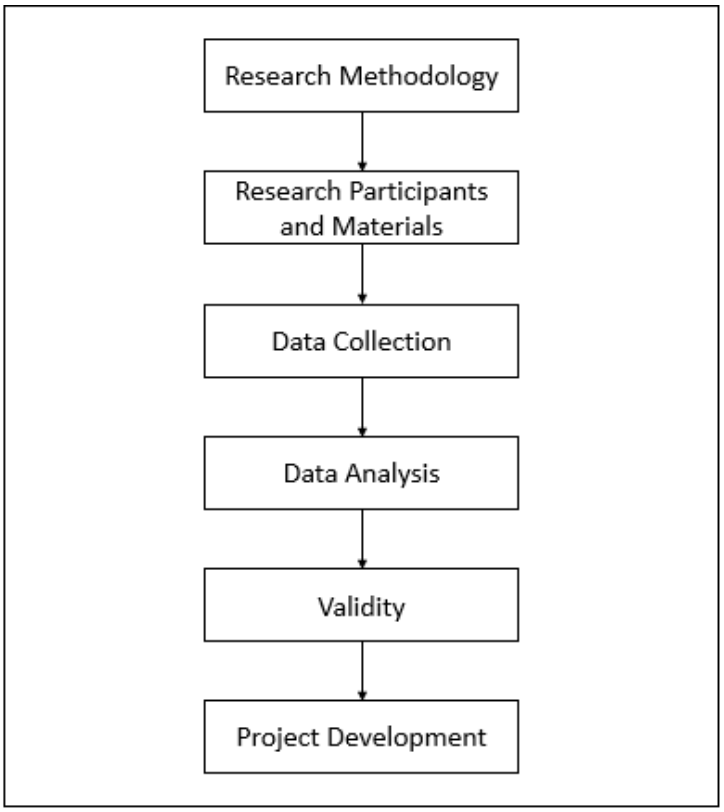


Figure 3.1: Research Methodology

3.2 Research Participants and Materials

During the conduct of the pilot testing in the aforementioned organization in this study, the participants would be one (1) Housing Management Division admin/managers and the Tenants of MSU – Marawi Dormitories. Materials to be used are but not limited to: 1. Space Tracking System that will be developed by the researcher, and 2. the survey questionnaire which will be adapted modified from Davis et al. (1989).

3.3 Data Collection

To validate the acceptability of the software, an instrument adapted from the work of Davis (1986) will be considered and modify to fit with the current project. This

survey instrument will be given to the students of the MSU - Marawi. The data will be collected and processed to create figure to determine the level of acceptability of the platform in terms of the following but not limited to (1) Perceived ease of use has a significant effect on the perceived usefulness of the system, (2) Perceived ease of use has a significant effect on attitude towards using, (3) Perceived usefulness has a significant effect on attitude towards using. (4) Perceived usefulness has a significant effect on intention to use. (5) Attitude towards using has a significant effect on intention to use.

3.4 Data Analysis

A survey will be conducted to the students of Mindanao State University - Marawi to evaluate the Space tracking system of MSU-Marawi using TAM.

On a 5-point Likert-type scale with the end ends of "strongly disagree" and "strongly agree," each participant will be asked to fill out a multiple questionnaire stating his or her agreement or disagreement with each topic. The survey's scale items will be modified from Davis et al (1989) scales for assessing variables. Appendix shows the measurement items utilized in this investigation.

Table 3.1: Data Analysis

NUMERICAL VALUE	DESCRIPTION	WEIGHTED AVERAGE
1	Strongly Agree	1.0-1.79
2	Agree	1.80-2.59
3	Neutral	2.60-3.39
4	Disagree	3.40-4.19
5	Strongly Disagree	4.20-5.00

3.5 Validity

The measurement validity will be assessed in terms of reliability and construct validity. The reliability study will be carried out to check that the items chosen for each variable were internally valid and consistent. A factor analysis will be used to investigate the construct validity of the measures to be used in this study. The underlying structure for the TAM questionnaire's fifteen items will be assessed using principal factor analysis with varimax rotation.

3.6 Project Design

In this section, the process, and the facility of planning, organizing, coordinating, and controlling the resources to accomplish specific goals. The following diagrams and other figures will show system be materialized.

There are two basic styles of software development that are frequently discussed. Waterfall was an earlier type of project management that relied on specific requirements and extended planning cycles. Iterative releases are the center of agile development, which is defined by a quick application development technique. Smaller sprints, when small incremental chunks of a project will provide, are the focus of rapid application development. With that, Rapid Application Development will be used in the project. Overall, this speeds up project deliverables by eliminating the need for rework due to changing requirements or business demands.

Four steps will be considered in creating the software such as understand the requirements, create a minimal viable product, solicit feedback, and testing and presentation.

The aim is determined because of understanding the requirements, and it aids in the development of the project, including the budget, delivery of deliverables, and milestone setting. The following steps will carry out when all parties were pleased with the criteria. The following step is to produce an MVP, or minimum viable product, from which the project's development may begin as soon as the minimal need is met. Then, throughout this phase of the development, the developers are constantly seeking for customer input. In addition, the data is used to make various modifications during the development process. Finally, during testing and presentation, the solution is compared to all customer requirements to confirm that it works properly. In addition, all third-party connectors inside the program should be reviewed during testing since changes in one area might have an influence on others. During the deployment phase, users were trained to guarantee that all the data was correct.

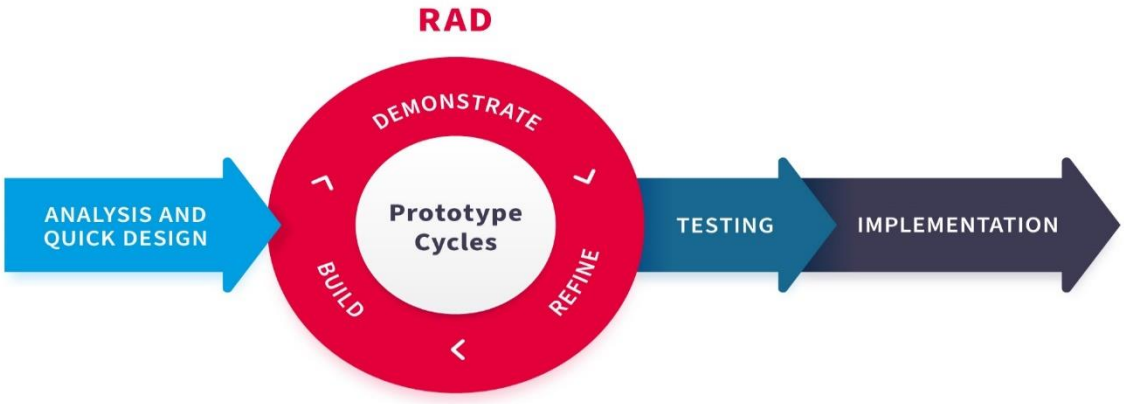


Figure 3.2: Rapid Application Development

3.7 Database Schema

This component of the capstone project will describe the entity relationship diagram. Admin, Room, Occupancy Record, and Student are some of the suggested database tables.

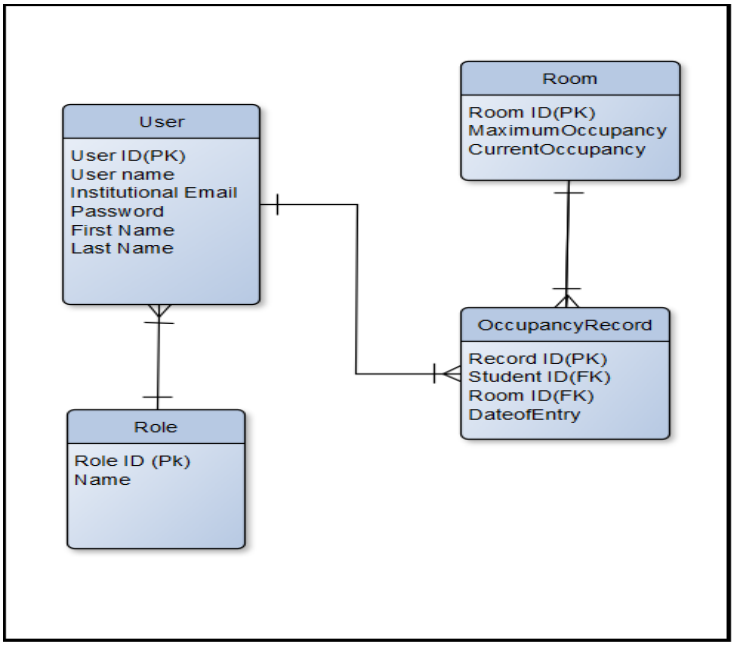


Figure 3.3: Database Schema

3.8 System Requirement Specification

Table 3.2: System Requirements Specification

Functional Requirements	Input	Process	Output
The admin can login into the system	Username and password.	Authenticate credential to database	Access into the system
The student and admin can register in into the system	First name, middle name, last name, address, institutional email, identification number (ID Number).	Validate input and store data to database	To have profile in the system
The user can change password.	Current password, new password,	Validate and compare input	Password changed.

	confirm new password.	and store data to database	
The admin can update the room vacancy	Username, password, select room update.	Validate input and store data to database	Access into the system to upload update of rooms

3.9 Software Requirements Specification

Table 3.3 shows the software requirements specification for the development of the study. The developer requires these software requirements for the systems that might be able to function well for its compatibility with the database and other software to be used to create the system.

Table 3.3: Software Requirements Specification

SPECIFICATION	MINIMUM	RECOMMENDED
Operating System	Microsoft Windows 7	Microsoft Windows 10
Software Application	Visual Studio 2017	Visual Studio 2019d
Database	SQL Express 2016	SQL Express 2019

3.10 Hardware Requirements Specification

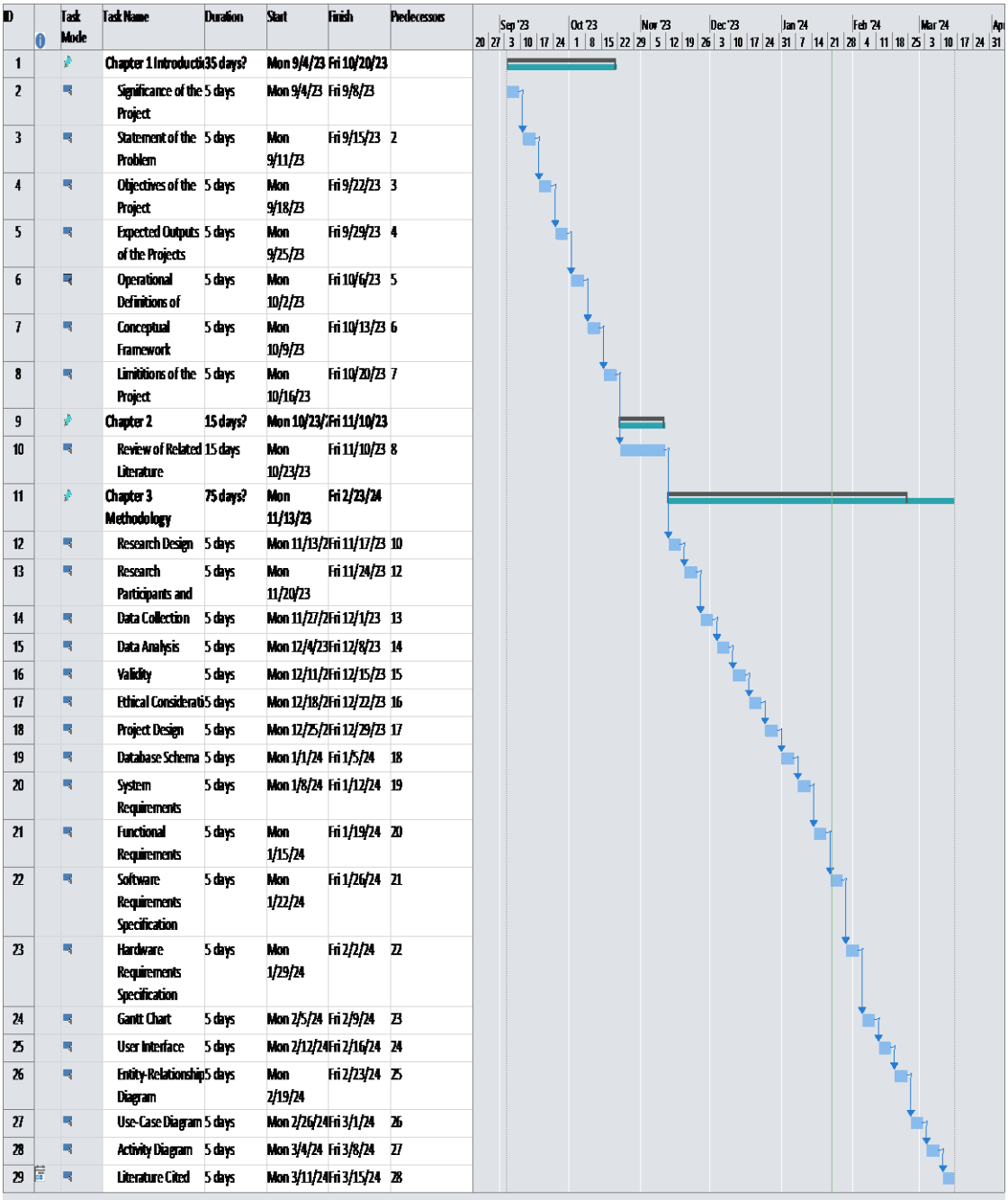
Table 3.4 shows the hardware requirements specification which was categorized by its field.

Table 3.4: Hardware Requirements Specification

SPECIFICATION	MINIMUM	RECOMMENDED
Processor	Intel Core i3	Intel Core i5
Memory		2gb 1066MHz DDRAM
Hard Disk Storage		500gb Serial ATA Drive, 5400RPM
Monitor		24” Colored
Printer		Inkjet
Network Connectivity		Built-in 10/1000Base Ethernet

3.11 Gantt Chart

This figure shows the development activity of the capstone project. It started from September then the project development will end until March prior to the deployment.



ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		Chapter 1 Introducti	35 days?	Mon 9/4/23	Fri 10/20/23	
2		Significance of the Project	5 days	Mon 9/4/23	Fri 9/8/23	
3		Statement of the Problem	5 days	Mon 9/11/23	Fri 9/15/23	2
4		Objectives of the Project	5 days	Mon 9/18/23	Fri 9/22/23	3
5		Expected Outputs of the Projects	5 days	Mon 9/25/23	Fri 9/29/23	4
6		Operational Definitions of	5 days	Mon 10/2/23	Fri 10/6/23	5
7		Conceptual Framework	5 days	Mon 10/9/23	Fri 10/13/23	6
8		Limitations of the Project	5 days	Mon 10/16/23	Fri 10/20/23	7
9		Chapter 2	15 days?	Mon 10/23/2	Fri 11/10/23	
10		Review of Related Literature	15 days	Mon 10/23/23	Fri 11/10/23	8
11		Chapter 3 Methodology	75 days?	Mon 11/13/23	Fri 2/23/24	
12		Research Design	5 days	Mon 11/13/2	Fri 11/17/23	10
13		Research Participants and	5 days	Mon 11/20/23	Fri 11/24/23	12
14		Data Collection	5 days	Mon 11/27/2	Fri 12/1/23	13
15		Data Analysis	5 days	Mon 12/4/23	Fri 12/8/23	14
16		Validity	5 days	Mon 12/11/2	Fri 12/15/23	15
17		Ethical Considerati	5 days	Mon 12/18/2	Fri 12/22/23	16
18		Project Design	5 days	Mon 12/25/2	Fri 12/29/23	17
19		Database Schema	5 days	Mon 1/1/24	Fri 1/5/24	18
20		System Requirements	5 days	Mon 1/8/24	Fri 1/12/24	19
21		Functional Requirements	5 days	Mon 1/15/24	Fri 1/19/24	20
22		Software Requirements Specification	5 days	Mon 1/22/24	Fri 1/26/24	21
23		Hardware Requirements Specification	5 days	Mon 1/29/24	Fri 2/2/24	22
24		Gantt Chart	5 days	Mon 2/5/24	Fri 2/9/24	23
25		User Interface	5 days	Mon 2/12/24	Fri 2/16/24	24
26		Entity-Relationship Diagram	5 days	Mon 2/19/24	Fri 2/23/24	25
27		Use-Case Diagram	5 days	Mon 2/26/24	Fri 3/1/24	26
28		Activity Diagram	5 days	Mon 3/4/24	Fri 3/8/24	27
29		Literature Cited	5 days	Mon 3/11/24	Fri 3/15/24	28

Figure 3.4: Gantt Chart for Space tracking system of MSU - Marawi Dormitories.

3.12 User Interface

The screenshot in figure 3.5 shows the login page of OccupEye: Web-based Space Tracking System of MSU – Marawi Dormitories.

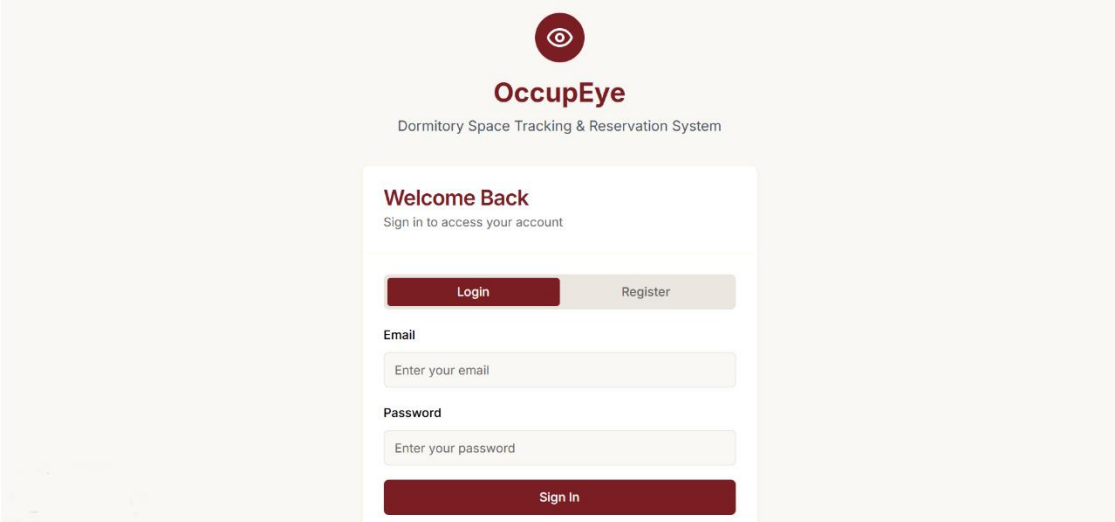


Figure 3.5: Sign-in Page of OccupEye

The figure 3.6 shows the registration page for the OccupEye: Web-based Space Tracking System of MSU – Marawi Dormitories.

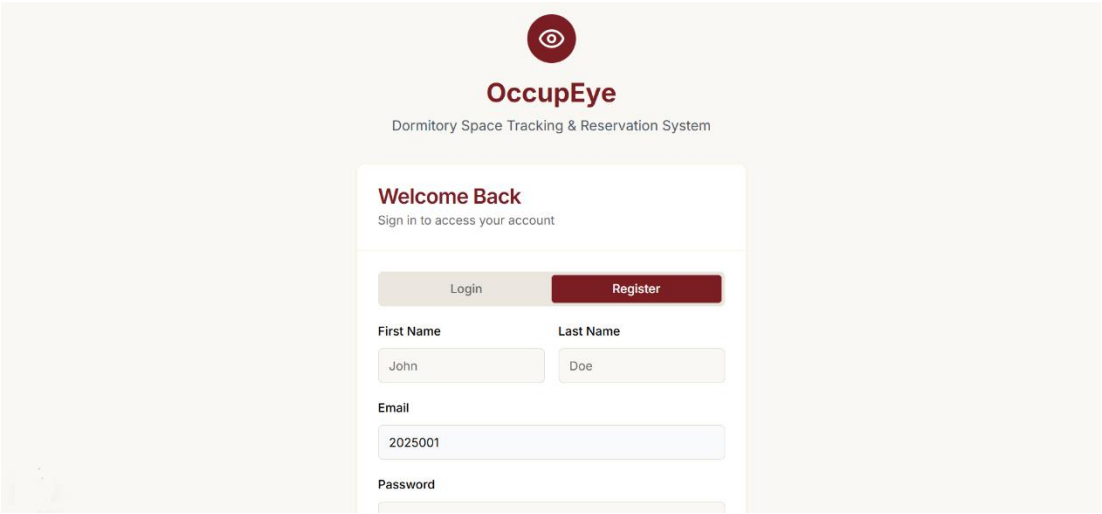


Figure 3.6: Registration Page of OccupEye

3.13 Entity Relationship Diagram

An entity relationship diagram (ERD), often called an entity relationship model, is a graphical depiction of relationships between people, objects, places, concepts, and events in an information technology (IT) system. An ERD is a relational database that uses data modeling approaches to assist design business processes and act as the foundation. Further, Entity relationship diagrams serve as a visual starting point for database architecture, as well as a tool for determining information system requirements across an organization. An ERD can still be used as a reference point after a relational database has been deployed in case any debugging or business process re-engineering is required afterwards.

In this capstone project, the entity relationship diagram shown in figure 3.7 will be explained in this section. The following are the proposed table for the database such as Manager, Buildings, Room, Student, Occupancy, and Reservation.

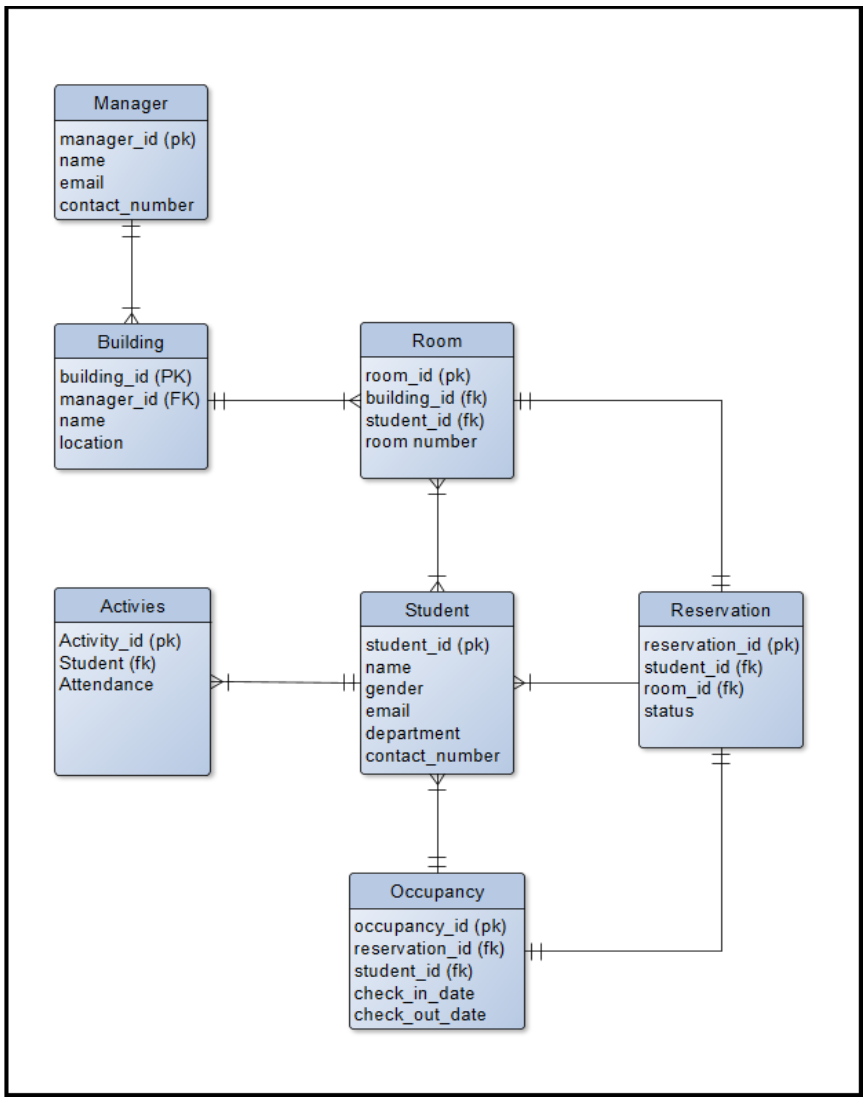


Figure 3.7: Entity Relationship Diagram

3.14 Use Case Diagram

The proposed system will have three (3) actors, the admin, the user, and the manager as shown in figure 3.8 The admin will register and login an account and will maintain and monitor the database. The user will register and login an account, check or select the prefer building, then inspect if there's a vacant room, lastly make a reservation. The manager will register and login an account, then view and manage the reservation list, if the reservation is accepted or not.

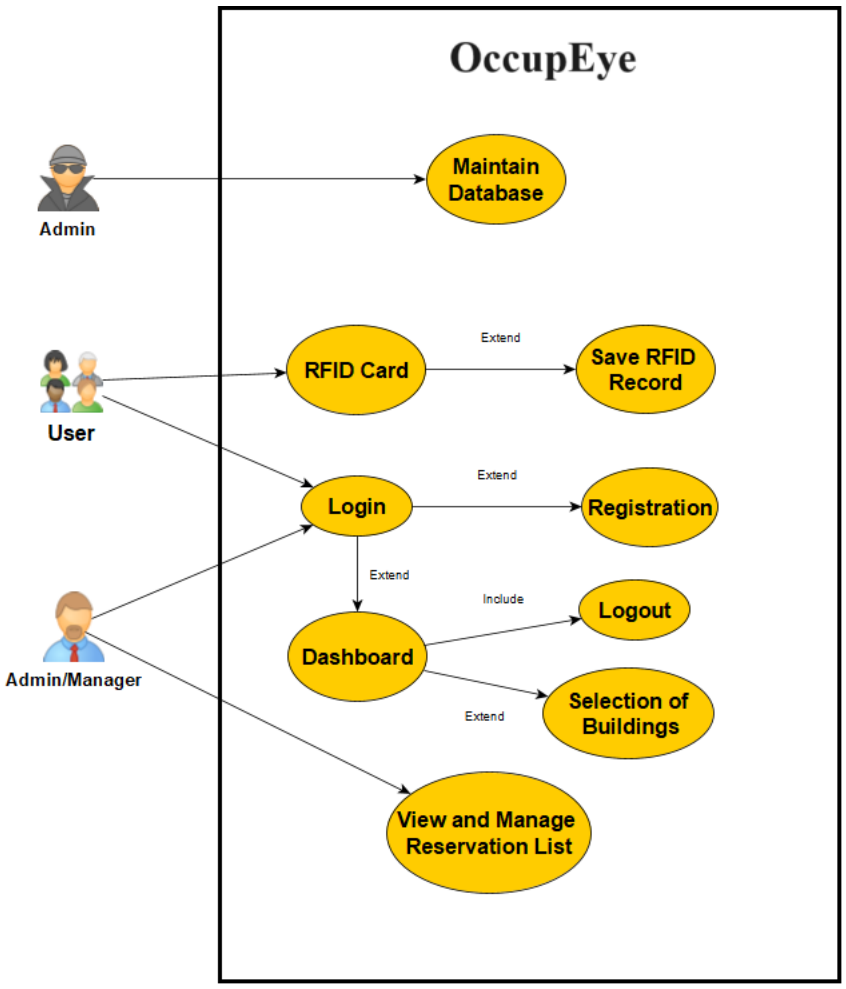


Figure 3.8: Use Case Diagram

3.15 Activity Diagram

In the diagram shown in figure 3.9, two actors of the process are highlighted. Administrator will create the user credential of Farmers Association Coordinator per barangay, and the Admin User. Credentials will be validated before storing to database.

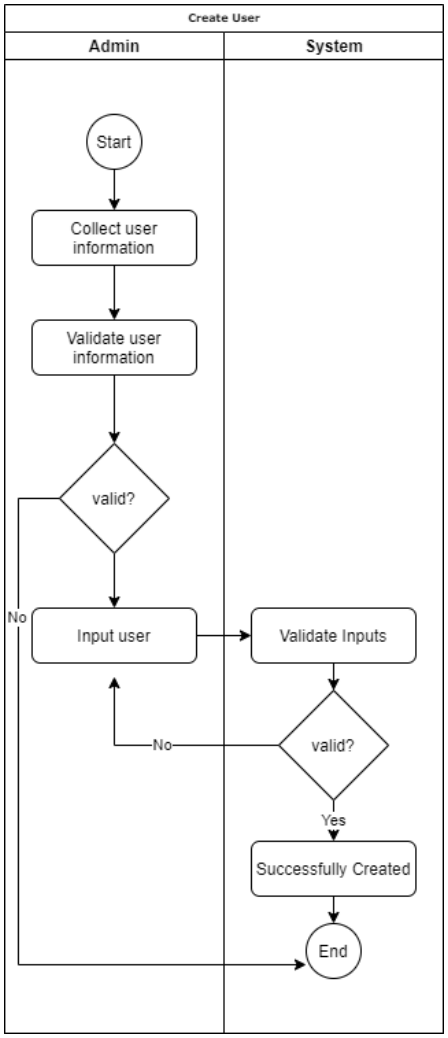


Figure 3.9: Activity diagram for creating admin in the system

In the diagram shown in figure 3.10, the registration of farmer's information to the system will start with the initiation of the farmer to register significant information to the farmer association barangay coordinator. Then, the coordinator will screen and validate the application paper submitted by the farmer, thus will be encoded to the system if no other missing information as required by the coordinator. If inputs are valid,

the information will be saved otherwise, system will notify the coordinator to recheck the inputs. Further, system will prompt the coordinator for possible entry else, the process will stop.

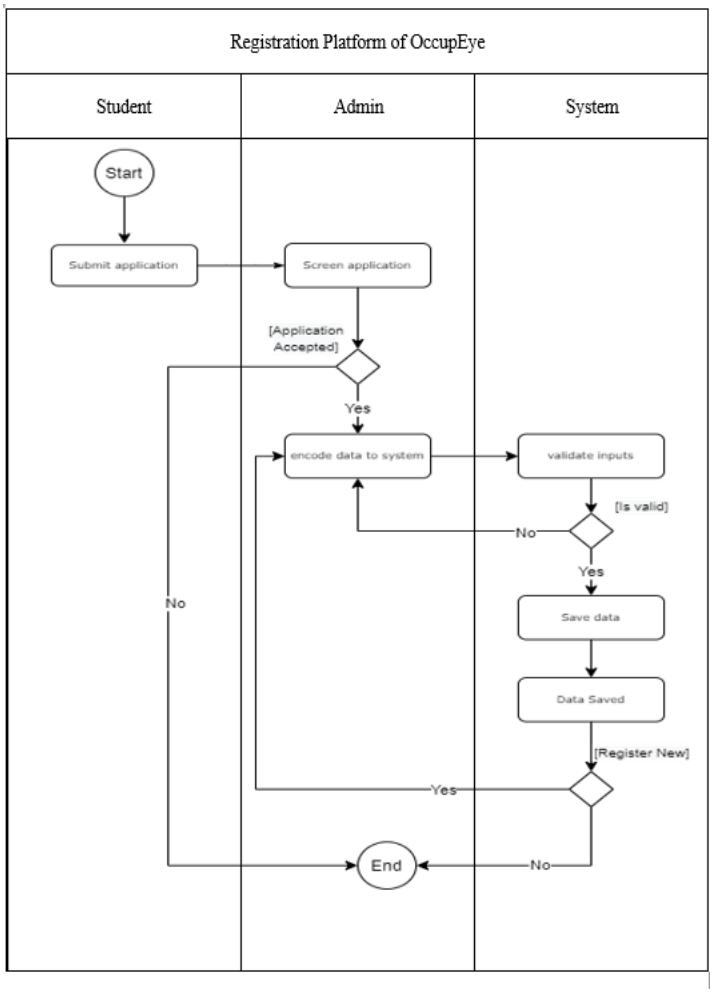


Figure 3.10: Activity diagram for registration of student in the system

LITERATURE CITED

[1] Hayes, A. (2023). Radio Frequency Identification (RFID): What It Is, How It Works.

[2] Stryczek, M. (2020). What is RFID and How Does RFID Work?

[3] Camp, W. (2001). Formulating and Evaluating Theoretical Frameworks for Career and Technical Education Research

[4] Liehr, P. & Smith, M. J. (1999). Theoretical and Conceptual Framework.

[5] Kast, F. & Rosenweig, J. (1972). General Systems Theory: *Applications for Organization and Management*

[6] Mackay, H. (2000). Reconfiguring the User:: *Using Rapid Application Development*

[7] Davis, F. D. (1989). Technology Acceptance Model: TAM. *Al-Suqri, MN, Al-Aufi, AS: Information Seeking Behavior and Technology Adoption, S,* 205-219.

[8] Chang, K. C., & Wang, C. P. (2011). Information systems resources and information security. *Information Systems Frontiers*, *13*(4), 579-593.

[9] Attaran, M. (2003). Information technology and business-process redesign. *Business process management journal*.

[10] Tarek, M., Mohamed, E. K., Hussain, M. M., & Basuony, M. A. (2017). The implication of information technology on the audit profession in developing country: extent of use and perceived importance. *International Journal of Accounting & Information Management*.

[11] BusinessVibes. (2015). The Importance of Information Technology In Business

[12] Berisha-Shaqiri, A. (2014). Impact of information technology and internet in businesses. *Information technology*, Q2.

[13] Kapur, R. (2019). The Significance of ICT in Education. *IOSR Journal of Research and Methods*, *7*(3), 43-49.

[14] Lyon, A. R., Lewis, C. C., Boyd, M. R., Hendrix, E., & Liu, F. (2016). Capabilities and characteristics of digital measurement feedback systems: Results from a comprehensive review. *Administration and Policy in Mental Health and Mental Health Services Research*, *43*(3), 441-466.

[15] Abdul Wahab, R. (2012). Final Year Project Online Management System (FYPOS): *CLIENT AND SERVER DESIGN*

[16] Delgado, H., Todisco, M., Sahidullah, M., Evans, N., Kinnunen, T., Lee, K. A., & Yamagishi, J. (2018, June). ASVspoof 2017 Version 2.0: meta-data analysis and baseline enhancements. In *Odyssey 2018-The Speaker and Language Recognition Workshop*.

[17] Parazo, R. (2016). Online Reservation and Monitoring System for Tarlac College of Agriculture Dormitories.