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POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
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ELECTRONIC INVENTORY AND ACCOUNTABILITY SYSTEM

A Research / Capstone Project Presented to
Polytechnic University of the Philippines –
Taguig Branch

In Partial Fulfillment of the Requirements
for the degree of Diploma in Information Communication Technology

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April 2021

CERTIFICATION-AND-APPROVAL SHEET

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APPROVAL

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CERTIFICATION OF ORIGINALITY

This is to certify that the research work presented in the thesis, Pre-Qualification Examination for the degree of Diploma in Information Communication Technology at the Polytechnic University of the Philippines – Taguig embodies the result of original and scholarly work carried out by the undersigned. This thesis does not contain words or ideas taken from published sources or written works that have been accepted as basis for the award of a degree from any other higher education institution, except where proper referencing and acknowledgement were made.

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ABSTRACT

Title	:	ELECTRONIC INVENTORY AND ACCOUNTABILITY SYSTEM
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Degree	:	Diploma in Information Communication Technology
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Most people who work with inventory and create reports from it manually not only waste a lot of time, but they also double their work by double-checking if the information entered is correct. Nowadays, in our community, computer technology escalates as the people move along in modern civilization. system and methods with certain aspects related to a certain invention called the inventory management process, an intelligent system that enables monitoring and gathering various information.

The project focused on the development and implementation of the Electronic Inventory and Accountability System (EIAS). It is a web application that manages, monitors, updates, tracks, and generates reports more easily of the

electronic items. The project aimed to resolve the problems regarding the manual typing of inventory in the Dost Lab and Aboitiz room also the issues of item loss. The tools used for the web application development were the MySQL database server, PHP, CSS, and Bootstrap.

The rating of the system is 4.48 (“Strongly Agree”). Therefore, based on the data gathered, the system provided a solution for the problems that were mentioned, thus making the transaction effective and efficient.

Keywords: Inventory, Manage, Track, System, Electronics

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CHAPTER 1

PROJECT DEFINITION

1.1 INTRODUCTION

In today's generation, most of the industries use a computer to manage the control and monitoring aspects of their business, since doing it in a manual way, the info processing could not meet the business demands in increasing the standard of any volume of transactions. Upgrading and seeking continuous improvement using technology, the system becomes useful and its powerful application could make business transactions tons efficient and straightforward. In order to make a transaction smoothly, an inventory is mainly concerned about the position of an item, it also defines the stock of resources that is maintained by a certain organization to anticipate a certain future demand. Nowadays, in our community, computer technology escalates as the people move along in modern civilization. System and methods with certain aspects related to the certain invention called inventory management process an intelligent system that enables to monitor and gather various information, the present invention collects information from RFID, Barcode, and QR code tags attached to an item. In one aspect a common form of lending and borrowing a specific item manually relates to the certain issue that a lender must solve specifically; the system processes an item which use to lend the item to a certain borrower without specification of the exact item they borrowed. The manual process of lending an item and manually putting it on the system might be another source of problem to resolve the recurring problem of grant an advancement or process lending the item via computer is a help for the lender

1.2 STATEMENT OF THE PROBLEM

The Polytechnic University of the Philippines Taguig has an existing problem regarding their inventory and borrowing status, a manual log of borrowed items and the items must be classified on their status for their schedule, when somebody uses it for the campus activities. The administrator has such a problem for finding and identifying the storage output or item status. After conducting the study, it must answer the following questions:

1. How efficient and effective is the system in terms of:
    a. Performance Efficiency?
    b. Usability?
    c. Compatibility?
    d. Reliability?
    e. Security?
    f. Processability?
    g. Maintainability?
    h. Flexibility?
2. On what level of efficiency did the system meets the system requirements of the client?
3. Has the client's working time been reduced as a result of the system?

1.3 THEORETICAL FRAMEWORK

Inventory problems of too great or too small quantities on hand can cause business failures. If an organization experiences stock-out of a critical inventory item, production halts could result. Inventory management indicates the broad framework of managing inventory. (Sheakh Dr.Tariq, 2018).

The inventory management technique is more useful in determining the optimum level of inventory and finding answers to problems of safety stock and lead time with the advent of powerful computers gets into a state where the process of not only planning is represented by large parts of computer technology. However, data processing and analysis is a software matter. The decision itself is then at the discretion of management and the resulting analyzes serve as a basis for the best possible decision. An effective and efficient management inventory flow across the value chain is one of the key factors for the success of large and small industries. The challenge in managing inventory is to balance the tradeoff between the supplies of inventory with demand. Inventory as a party of organization assets whereby management becomes concerned with the inventory stock. Inventory referred to as a stock of materials that used to facilitate in manufacturing of goods or to satisfy customer needs (Chitale A.K and Gupta R.C, 2014)

1.4 CONCEPTUAL FRAMEWORK

Based on the theoretical framework, the researchers came up with the conceptual framework. The figure below shows how the proposed system works.

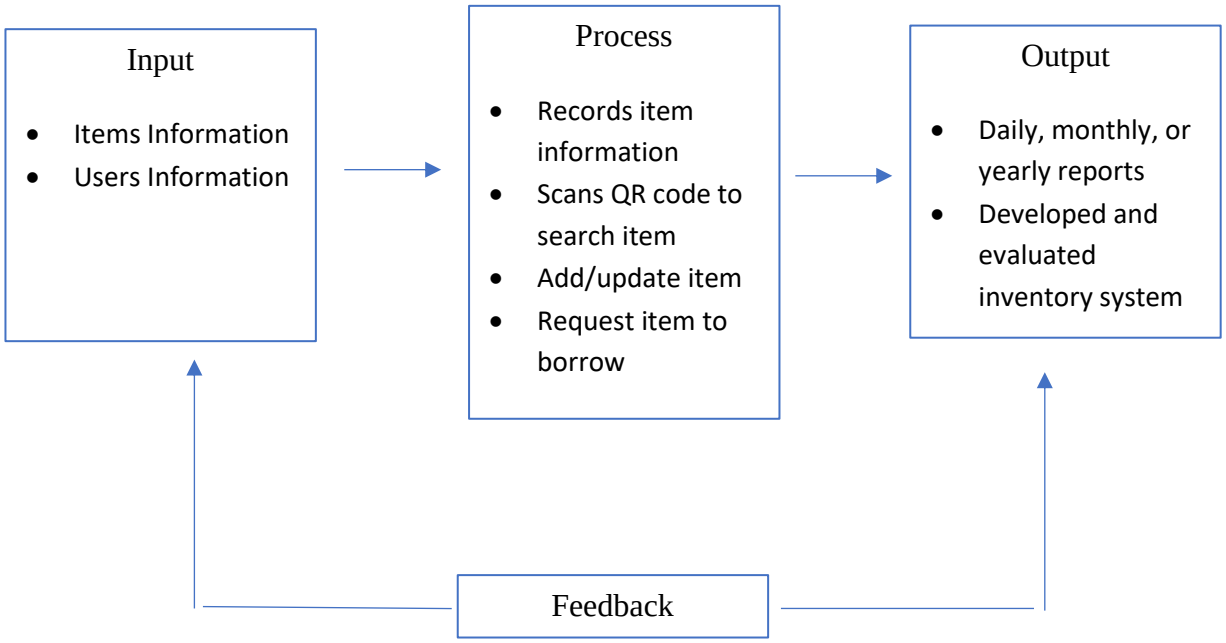


Table 1 – IPO

The conceptual framework being used in this research study is the Input - Process - Output model or the IPO Model. The study of the system is an online and computerized version of inventory. Instead of doing it manually the researchers developed a system that will handle the inventory of the given University with an added borrowing functionality, the system will generate reports of the items, status and their locations, each item has a unique identification via QR code.

1.5 PROJECT ASSUMPTIONS

Project Name:

Electronic Inventory and Accountability System for the Aboitiz Room and Computer Laboratory of Polytechnic University of the Philippines – Taguig Branch.

Project Definition:

The Electronic Inventory and Accountability System is a system that stores the lists of all the items of ABOITIZ and DOST – Laboratory and also helps the students to make the borrowing process easier lastly, to help the administrator monitor all the borrowed items of the students.

1.6 PROJECT OVERVIEW

1.6.1 Objective

The PUP – Taguig has a ton of electronic devices located at the Aboitiz Room and Computer Laboratory, which use an un-updated system that monitors its inventory. The project aims to make the management of items easier not only for the Administrator and its assistant but also to the borrowers by making a new System with an embedded Qr Code.

Goals and Objectives:

To help the Administrator record all items and assist all the needs of the borrowers also to generate reports quickly with a reliable System

1.6.2 Significance of the Study

For the users, it will benefit the PUP-Taguig. The administrator will handle the system that will lessen the workloads by doing it automatically, manually applying all items but verify by scanning, borrowers have no access in the system at anyway. Students and authorized people can only borrow an item and for verification of the borrowed. The study of the known projects focuses on the efficiency, time, and effectiveness of the system, which may be recommended for implementation.

For the researchers, this will increase their productivity, enhance their insights regarding the path they will take, it also applies to real-life situation when it comes to the industry they choose. This study will help their skills, bring out their deep thoughts and ideas by giving them an opportunity to bring up concepts that will apply and can used in the corporate world.

For the future researchers, the study will serve as reference for study trials to improve their research. It will come up to help them build a better concept by assessing the system or this will serve as their reference as literature review to make a better and creative project. Lastly the proposed system will ensure data security by producing backups that will be helpful in the future.

1.6.3 Scope and Limitation

The system has the function to record, to keep track of items and to generate reports. The verified item must place a QR code for validating its status. The system has no mobile application for QR code scanner but an embedded application will be provided.

The borrowers have one way to borrow items, if the borrower already have an account, they can login already and request to borrow an item, if they don't have an account yet they need to register first and then they can now login to request an item to borrow and wait for the admin's approval. Reach out to the admin. Also, the group decided to disregard the financial statement, hosting is not shouldered by the group and should be handled by the client.

1.7 DEFINITION OF TERMS

QR Code (Quick Response Code) – a machine-readable code consisting of an array of black and white squares, typically used for storing URLs or other information for reading by the camera on a smartphone.

Management – the process of dealing or controlling things.

ISO 25010 – a quality in use model that relate to the outcome of interaction when a product is used in a particular context of use.

Borrower – a person that takes and uses something belonging to someone else with the intention of returning it.

CHAPTER 2

FUNTIONAL SPECIFICATION REPORT

2.1 SYNTHESIS OF THE REVIEWED LITERATURE AND STUDIES

After reading and analyzing the review of related studies, the researchers came up with a conclusion regarding the articles. Almost all inventory management are using QR Code to store a lot of useful information through a mobile device, and the purpose of using QR Code to the system is to help the user or the admin to have an efficient, fast, and a reliable system.

2.2 CURRENT IT ENVIRONMENT / INFRASTRUCTURE

2.2.1 Hardware Specification

Minimum hardware specification can be use are the laptop or desktop that can run the system itself.

2.2.2 Software Specification

Software Specifications – there is only one mode of automation for the software (Gmail) Application.

2.2.3 Network Specification

Network Specifications – can be used by WIFI or Data Connection.

2.2.4 Manpower

Administrator

- The admin will be able to generate reports.
- The admin can track the location of the certain item.
- The admin can monitor, update and view the data of the inventory.

User

- Register
- Can request to borrow an item

2.2.5 Backup and Recovery

There are no separate records or copy of transactions they use online.

2.3 DATA REQUIREMENTS

This section illustrates different reports associated with the proposed system which is the Electronic Inventory and Accountability System (EIAS).

2.3.1 Reports

2.3.1.1 List of Reports

Figure	Name of Form	Description	Source	Receiver
2.3.1.1	Daily	1.Summary of daily borrowing and cancelation of item. 2.Summary of weekly item/supplies purchase. 3.Summary of weekly added item/supplies. 4.Summary of weekly item under maintenance and for disposal. 5.Summary of weekly penalty or replacement of item of the accountable person.	EIAS	Admin
2.3.1.2	Weekly	1.Summary of weekly borrowing and cancelation of item. 2.Summary of weekly item/supplies purchase. 3.Summary of weekly added item/supplies. 4.Summary of weekly item under maintenance and for disposal. 5.Summary of weekly penalty or replacement of item of the accountable person.	EIAS	Admin
2.3.1.3	Monthly	1.Summary of monthly borrowing and cancelation of item. 2.Summary of monthly item/ supplies purchase. 3.Summary of monthly added item/supplies. 4.Summary of monthly item under maintenance and for disposal. 5.Summary of monthly penalty or replacement of item of the accountable person	EIAS	Admin
2.3.1.4	Yearly	1.Summary of yearly borrowing and cancelation of item. 2.Summary of yearly item/supplies purchase. 3.Summary of yearly added item/supplies. 4.Summary of yearly item under maintenance and for disposal. 5.Summary of yearly penalty or replacement of item of the accountable person	EIAS	Admin

Table 2 – List of Report

2.3.2 Logical Data Structure

2.2.2.3.1 Entity Relationship Diagram

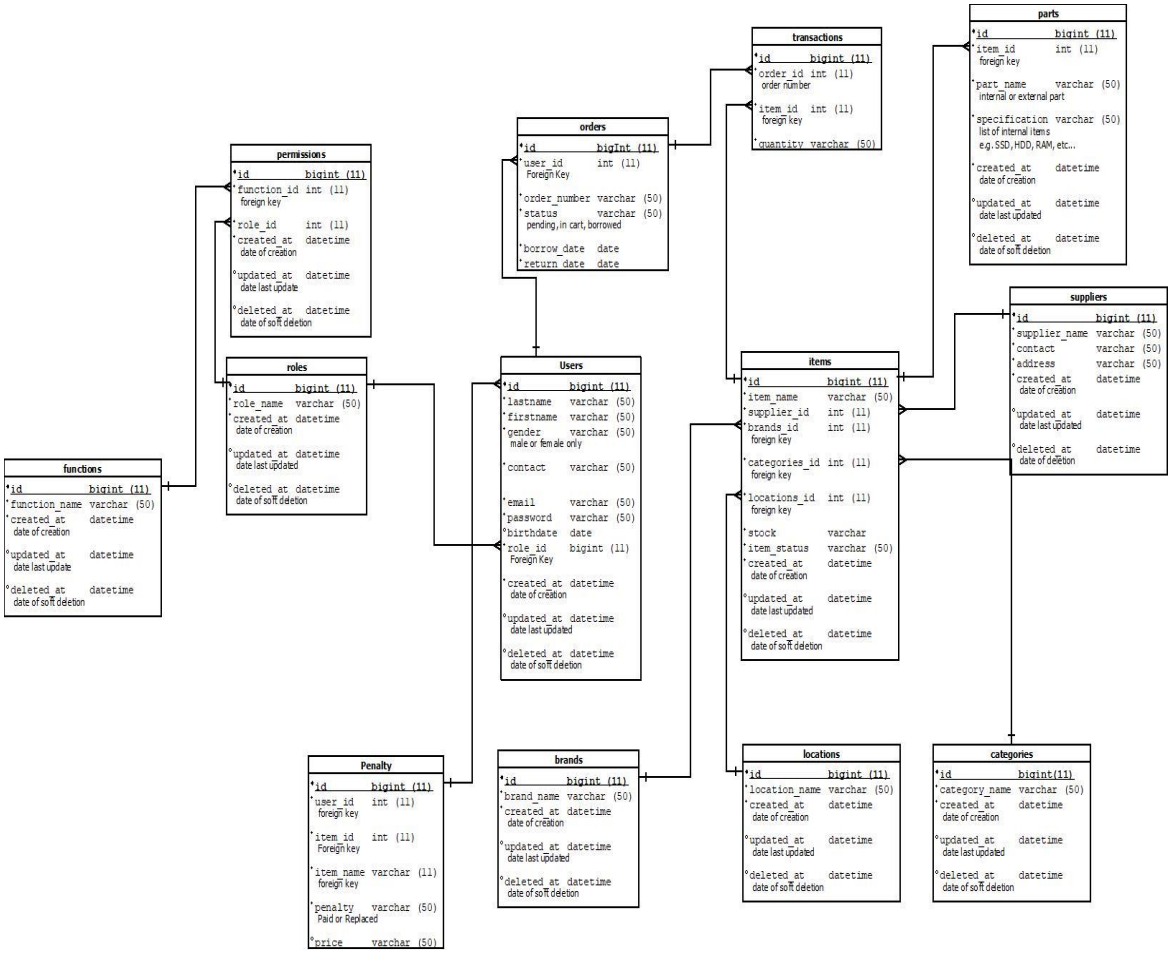


Figure 1 – ERD

2.4 POLICIES AND PROCEDURES

This section contains the policies and procedures of the organization which includes the Context Diagram. Data Flow Diagram (DFD) and the System's Process Flow Diagram.

2.4.1 Procedures

2.4.1.1 Context Diagram

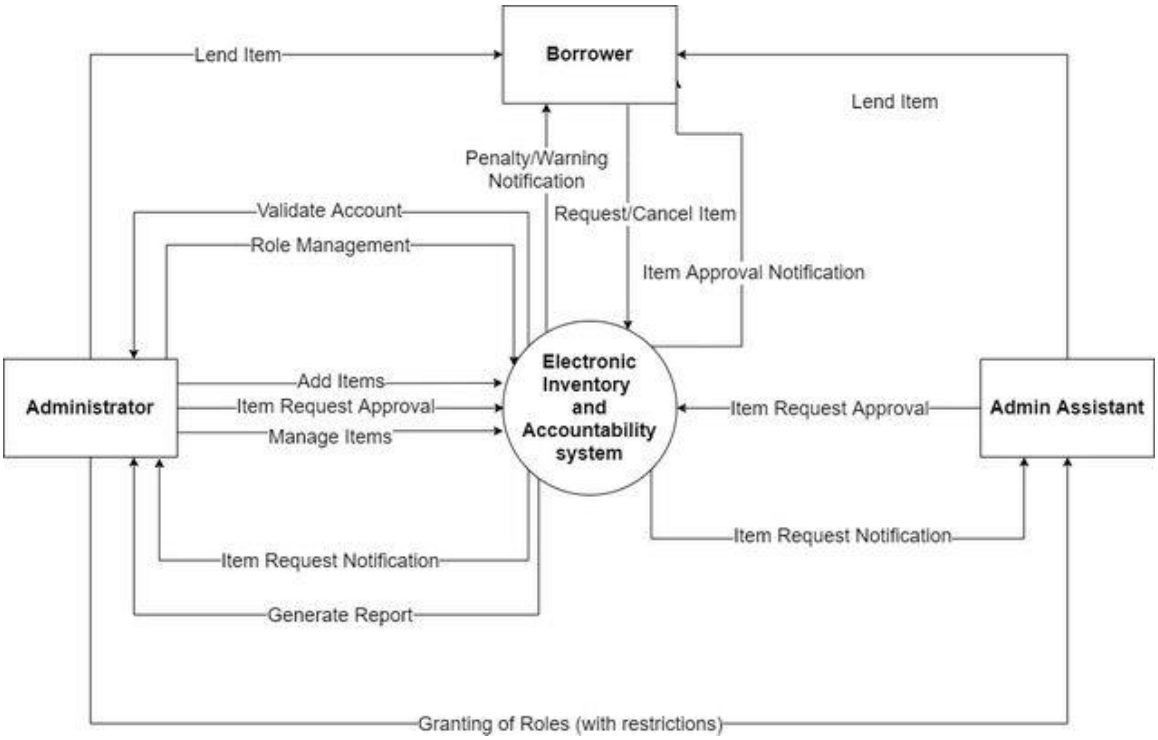


Figure 2 – Context Diagram

2.4.1.2 Data Flow Diagram

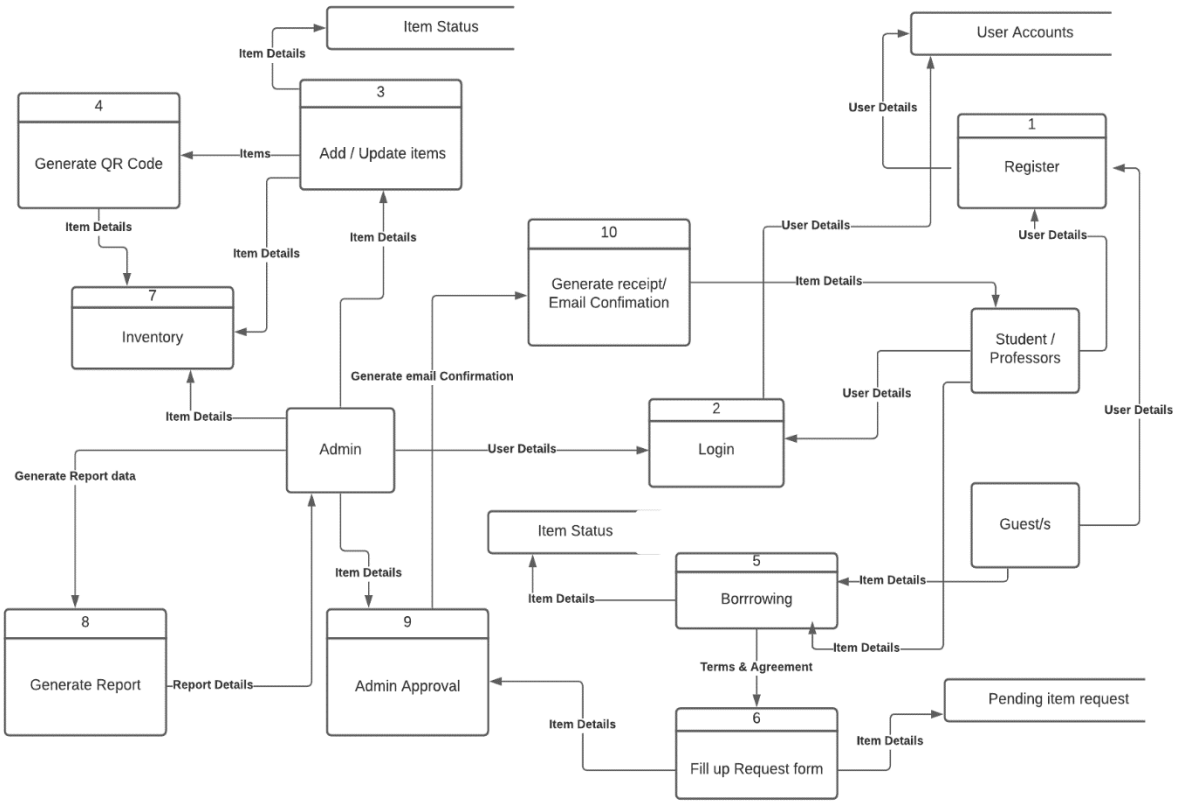


Figure 3 – Data Flow Diagram

2.4.1.3 Process Flow Diagram

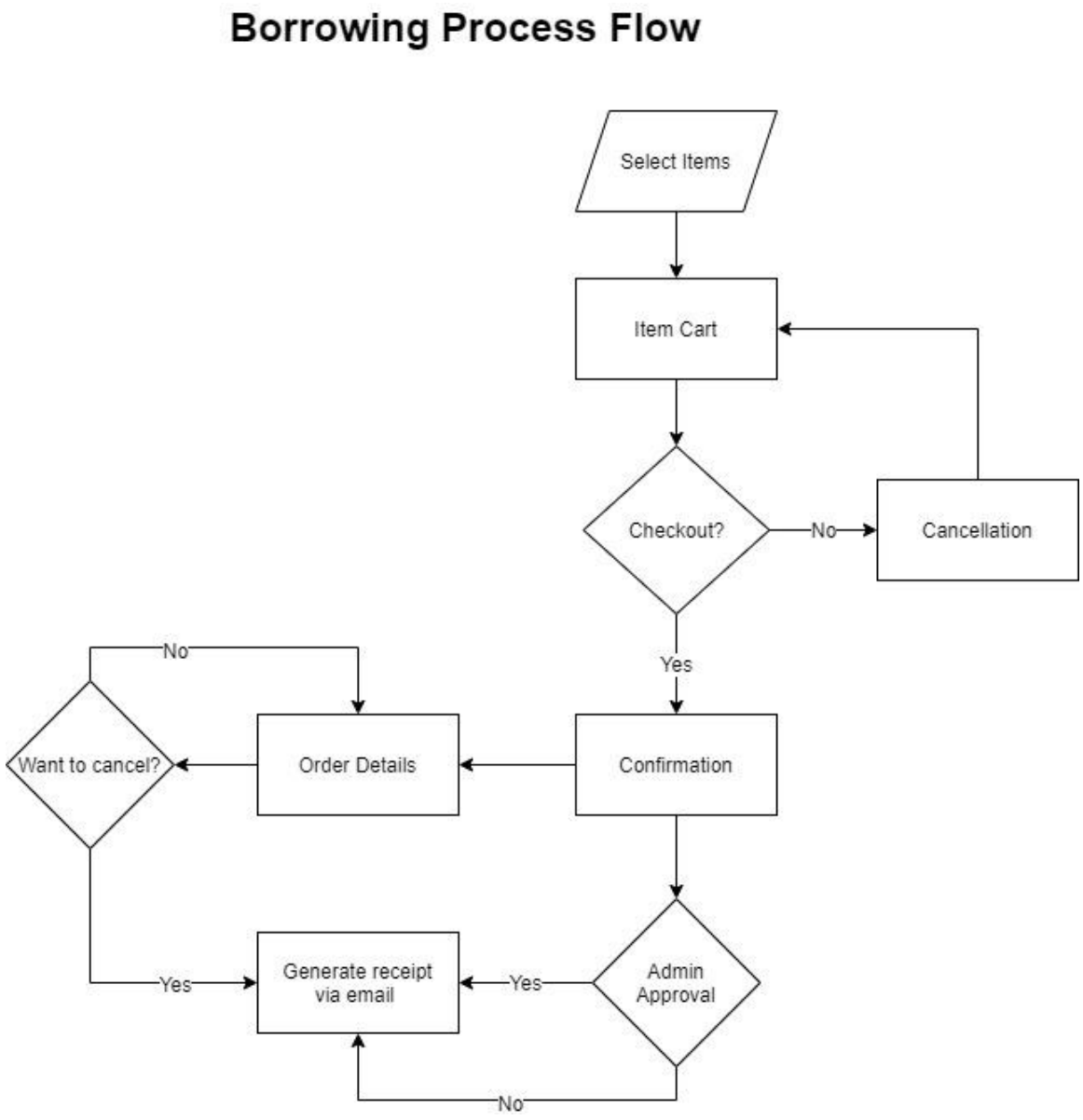
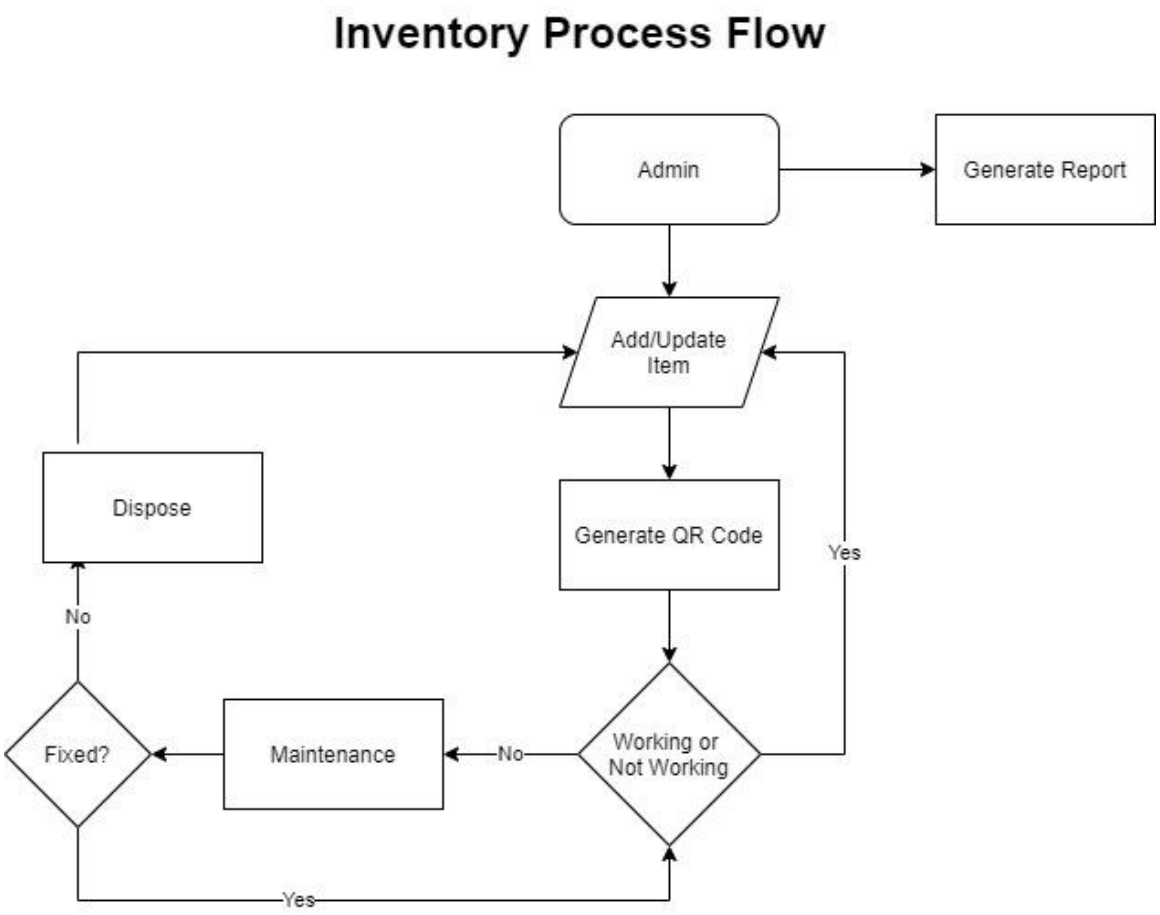


Figure 4 – Process Flow Diagram



2.5 PROBLEM ANALYSIS

This analysis identifies the problems that occur in this project. This also identifies the causes and the main problem of the project. This section was divided in to four (4) parts which includes the *Fishbone Diagram, Problem Requirements, Requirements-Feature Matrix* and *Conclusion and Recommendation*.

2.5.1 Fishbone Diagram

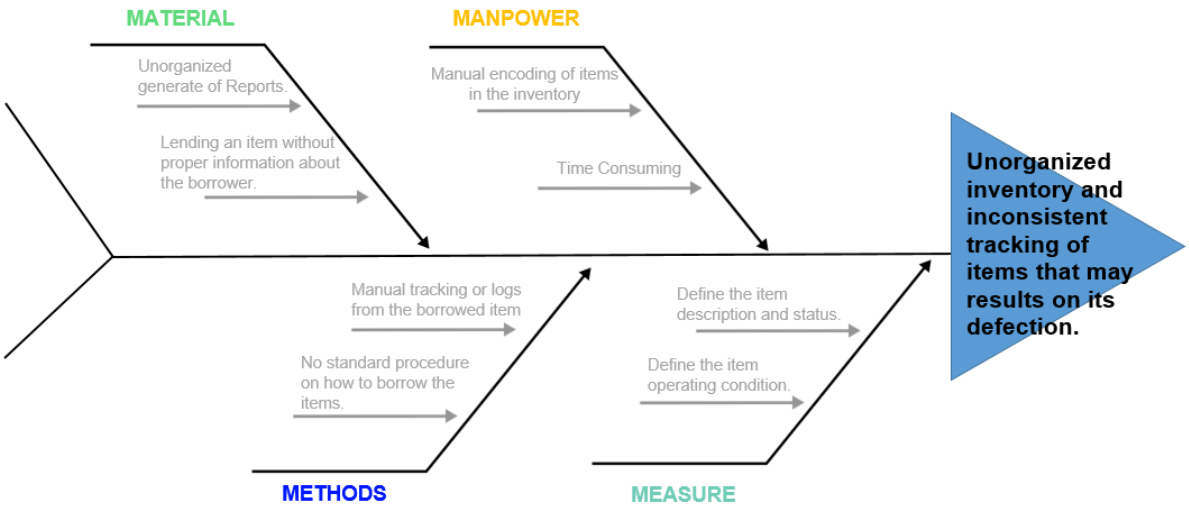


Figure 5 – Fishbone Diagram

2.5.2 Problem Requirements

PROBLEM	REQUIREMENTS
Unorganized format of records and reports	➢ Generate accurate and organize report such as (Weekly Inventory, Monthly Inventory and Annually Inventory)
Untracked Borrowers and their accountability	➢ Make a terms and conditions in every borrowing transaction. ➢ Gather some contact details with a consent to the user such as (full name, year & section, email and contact number)
Item lost / Item Defection	➢ Monitor the Item inventory ➢ Check Item Status - Working or Defective ➢ Check the availability. ➢ Check borrowed item after they use

Table 3 – Problem Requirements

2.5.3 Requirements-Feature Matrix

REQUIREMENTS / FEATURES	THE SYSTEM MUST BE ABLE TO MONITOR THE ELECTRONIC ITEMS	THE SYSTEM MUST BE ABLE TO RECORD ALL TRANSACTIONS	THE SYSTEM MUST BE ABLE TO MANAGE THE ITEMS	THE SYSTEM MUST GENERATE ACCURATE INVENTORY REPORTS	THE SYSTEM MUST BE ABLE TO ORGANIZE USER'S RECORDS
CHECK ITEMS INFORMATIONS	/			/	
INSERT NEW ITEM			/		
APPROVE REQUESTS					/
APPROVE NEW USER					/
GENERATE DAILY AND WEEKLY REPORT		/		/	/
GENERATE MONTHLY AND YEARLY REPORT		/		/	
TRACK THE ITEM	/	/	/		

Table 4 – Requirements Feature Matrix

CHAPTER 3

PROPOSED SYSTEM DEFINITION

3.1 METHODOLOGY

3.1.1 Research Design

This research is a Quantitative type of research design because it used a questionnaire to know the purposes and to make the system more efficient.

Quantitative research is the process of collecting and analyzing numerical data. It can be used to find patterns and averages, make predictions, test causal relationships, and generalize results to wider populations (Bhandari,2020).

3.1.2 Sources of Data

The source of data in this research was collected from the client whom is the school Administrative Aide and gathered data from online surveys and questionnaire that are responded by the students from Polytechnic University of the Philippines – Taguig Branch.

3.1.3 Research Instrument

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)

Table 5 – Research Instrument

The research instrument that will be used is the online questionnaire. The questionnaire will be based on system functions and compatibility to the users. Also, the other basis of this survey is the ISO/IEC 25010, it is defined as cornerstone of a product quality evaluation system. And also known as quality model which determines quality characteristics will be taken into account when evaluating the properties of a software product.

For the respondents instrument the researcher will be using Likert Scale which is used to allow the individuals to express how much they agree or disagree with a particular statement.

3.1.4 Data Gathering Procedure

This research conducted both survey and interview to collect more data and information to make the study efficient. The first step used was to meet the client and take notes the demand and its expectation for the system to be develop, also the suggestions of the users. Due to pandemic and to implement physical distancing the researchers used online platform, For the users which is the PUP students and faculty members researchers used google form for survey and questionnaire, and for the client interview it uses google meet and zoom meeting in order to get what are the needed features of the system.

3.1.5 Ethical Considerations

The researchers and the proposed system seek the permission of the respondents in participating in this study. A formal letter will be given to the research participants that indicates the protection of privacy and personal information of the respondents are held confidentiality in compliance with the Republic Act. No. 10173 or the Data Privacy Act., The participation to this study is voluntarily basis, which means the participants who agree to participate has the right to withdraw from the study.

3.1.6 Proposed System Architecture

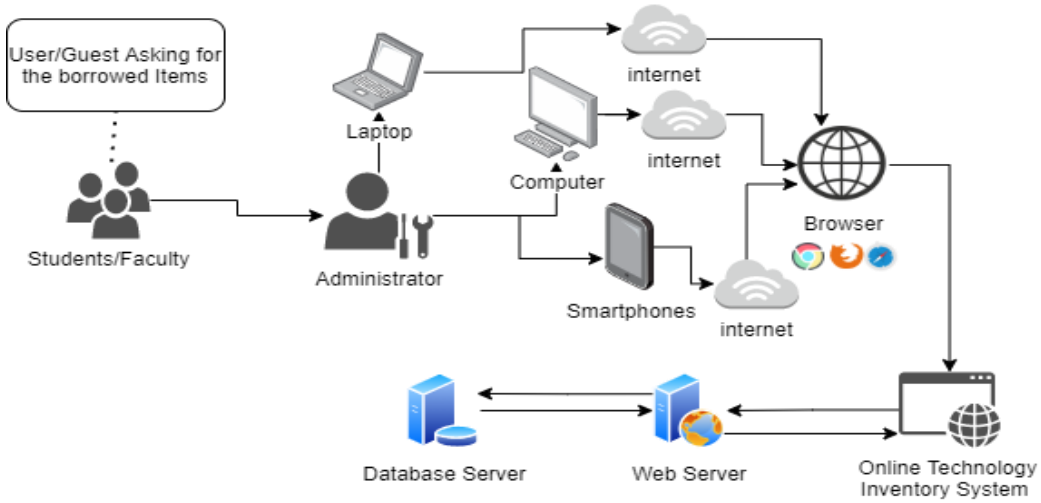


Figure 6 – Proposed System Architecture

In the figure it shows how the admin interacts to the system. the users/guests will communicate to the administrator to request an item to borrow, the administrator is the one who will manage the system through any devices.

The admin will approve the request then he/she will input the borrower's information to the system, then using a smartphone the admin will scan the QR Code of the item, and then the system will process the data and after processing the system will update the list of inventories of the borrowed item. The system is very efficient and reliable, it can be use anywhere and anytime.

3.2 FUNCTIONAL SPECIFICATIONS

This part identifies the system boundaries of the newly -developed and proposed system which illustrates by use case diagram, detailed use case diagram and the activity diagrams.

3.2.1 System Boundaries

Considering the data and processes that the group has gathered, the system will be used by the administrative Aide of PUP-Taguig as Electronic Inventory and Accountability System.

This system will handle all the electronic item information and transactions made by the borrowers. The use cases helped the developers to identify the requirements needed of the system. It has a clear picture of how each subsystem interacts with each other, all the necessary flow of transactions and brief descriptions of the system's major functionalities.

3.2.1.1 System Use Case Diagram

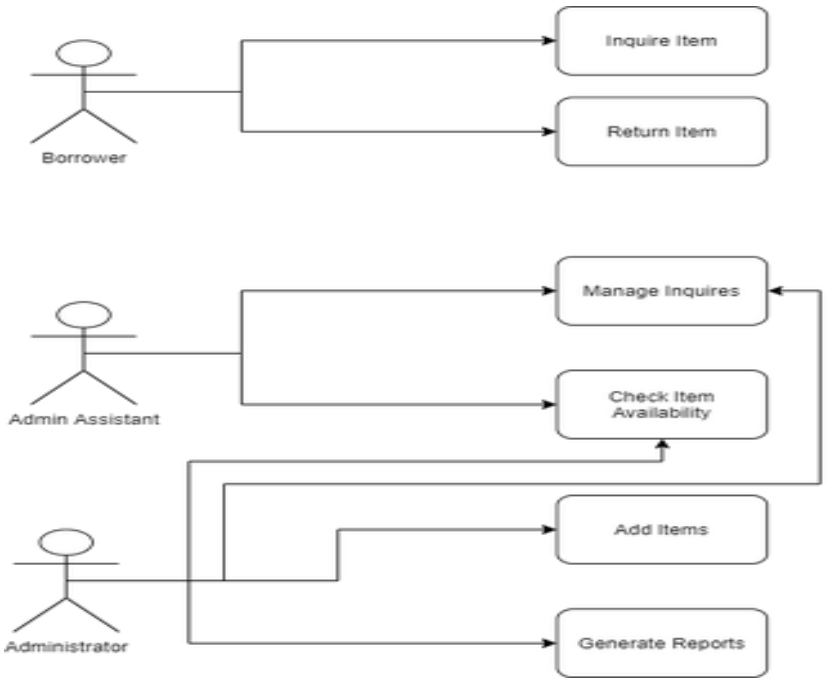


Figure 7 – Use Case Diagram

3.2.1.2 System Detailed Use Case Diagram

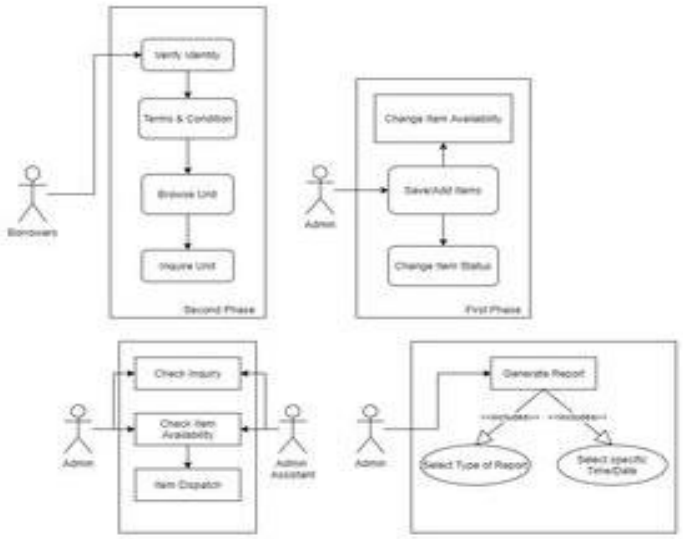


Figure 8 – Detailed Use Case Diagram

3.2.1.3 System Flow

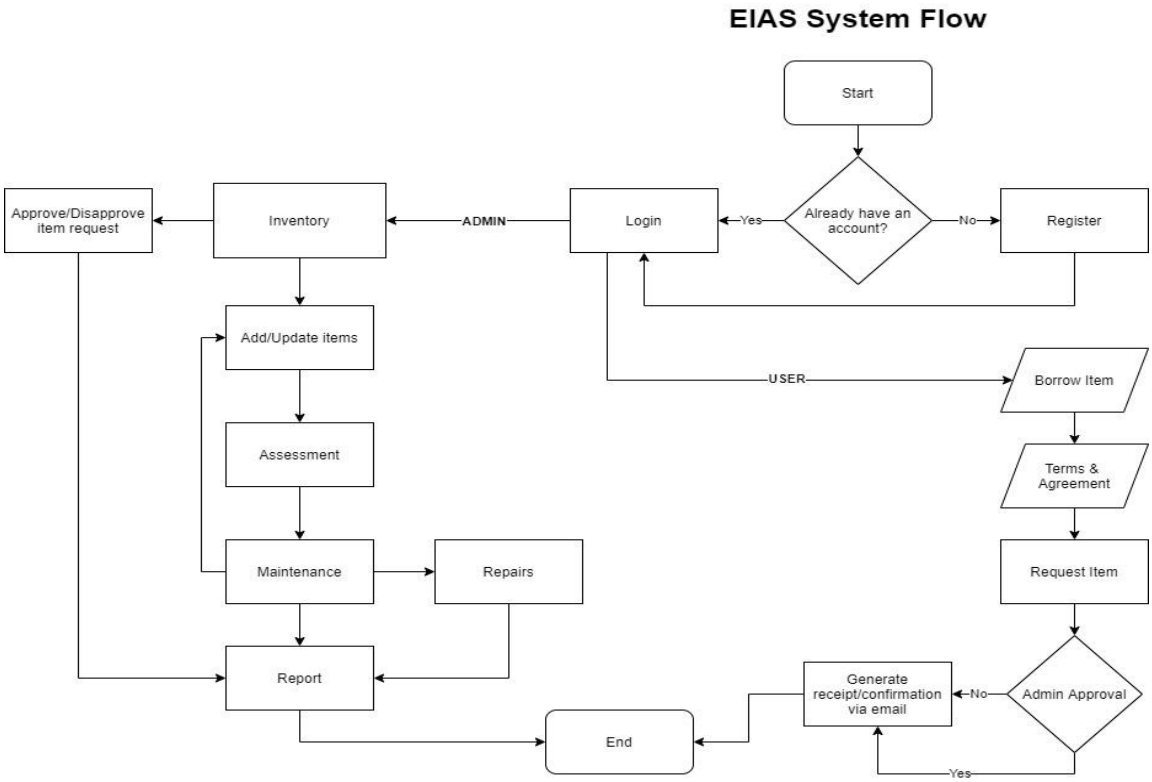
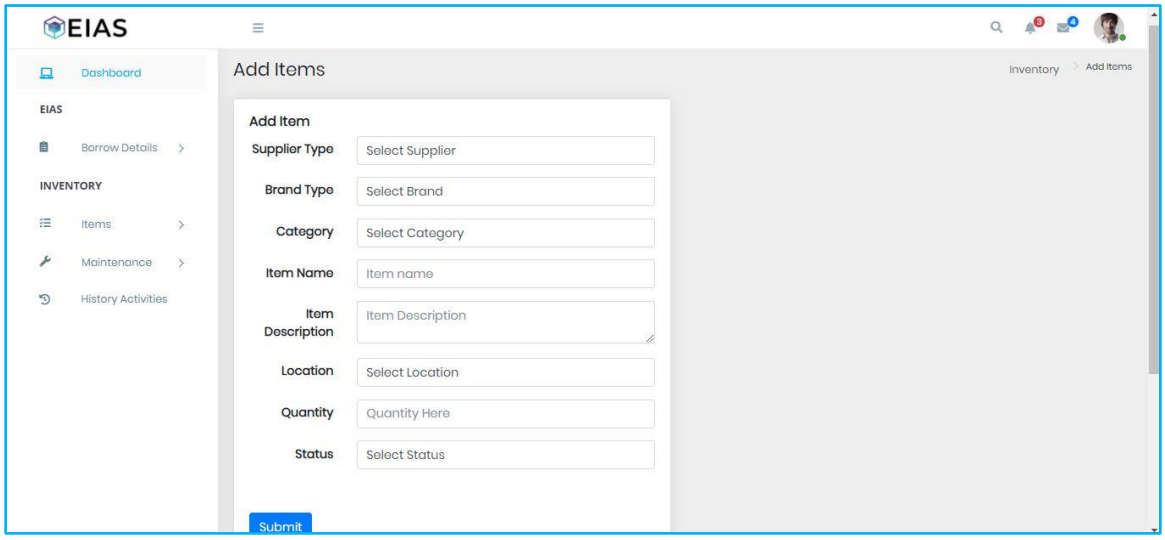


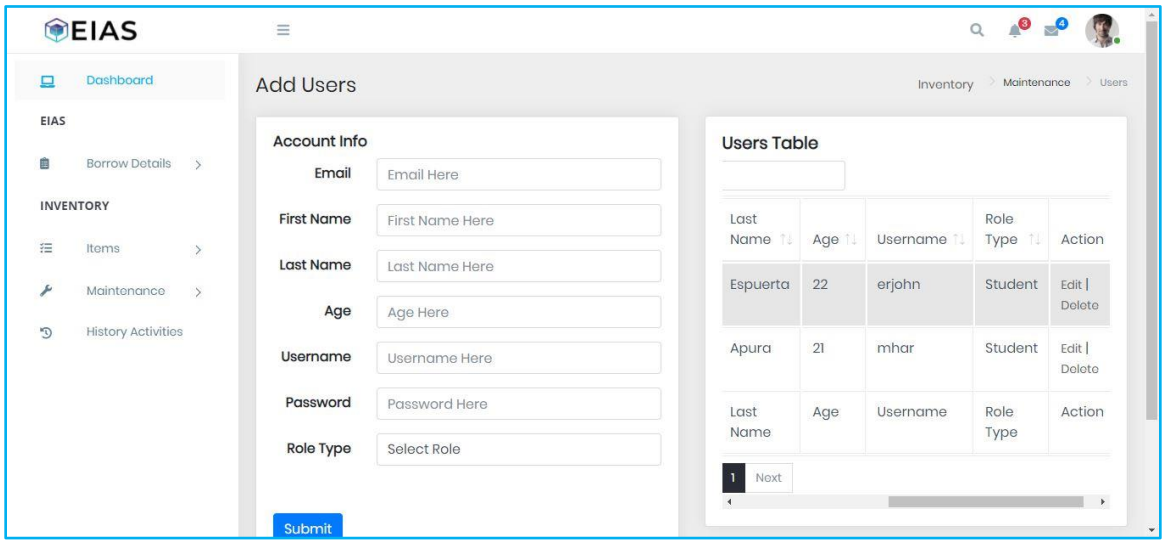
Figure 9 – System Flow

3.2.2 System Prototype



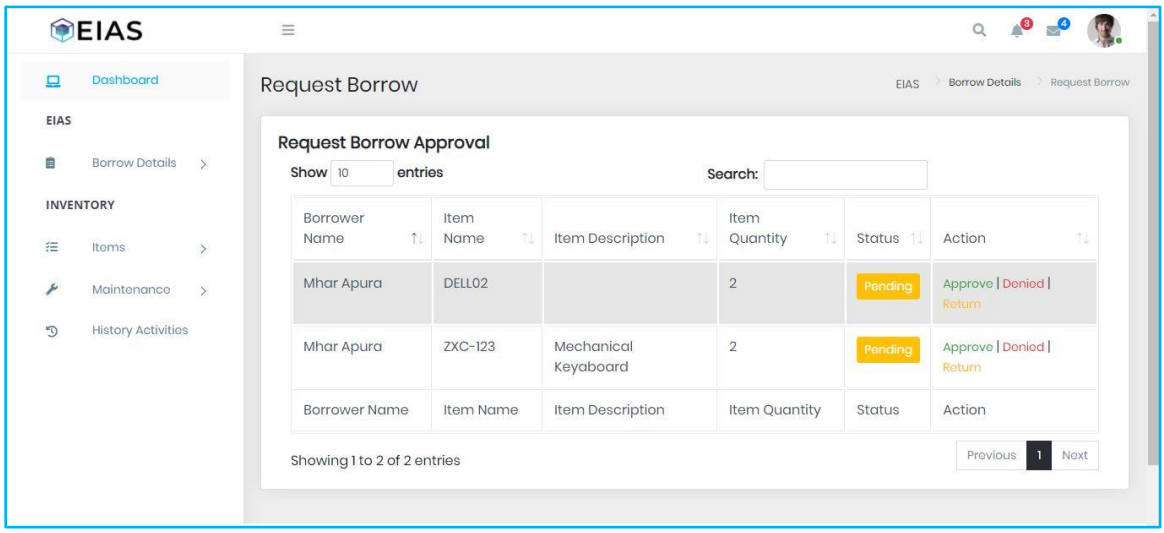
Name: Add Items

Description: This page allows the admin to add an item to the system



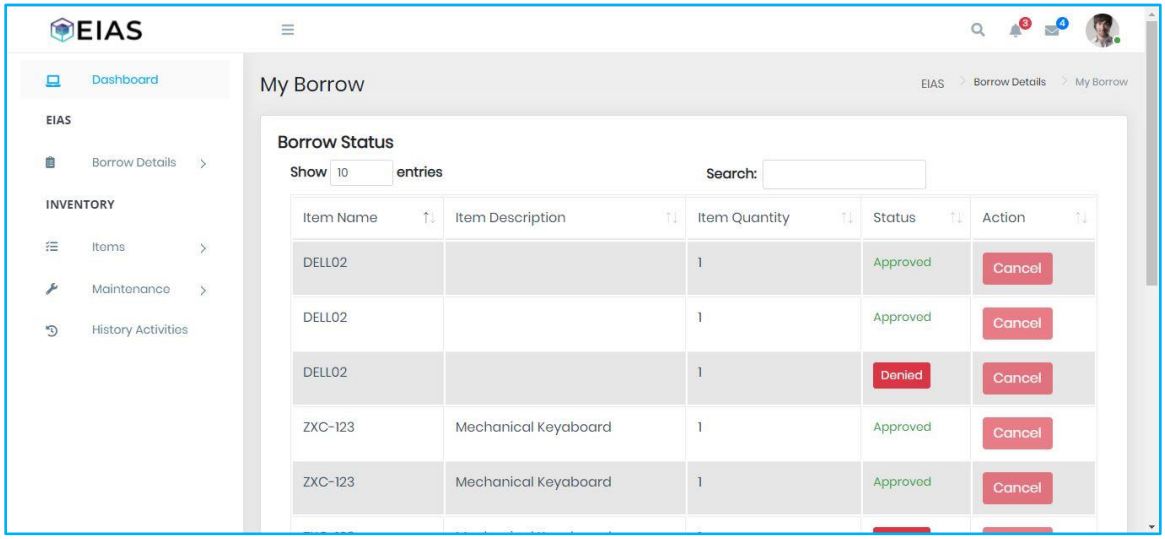
Name: Add Users

Description: This page allows the admin to add new user to the system



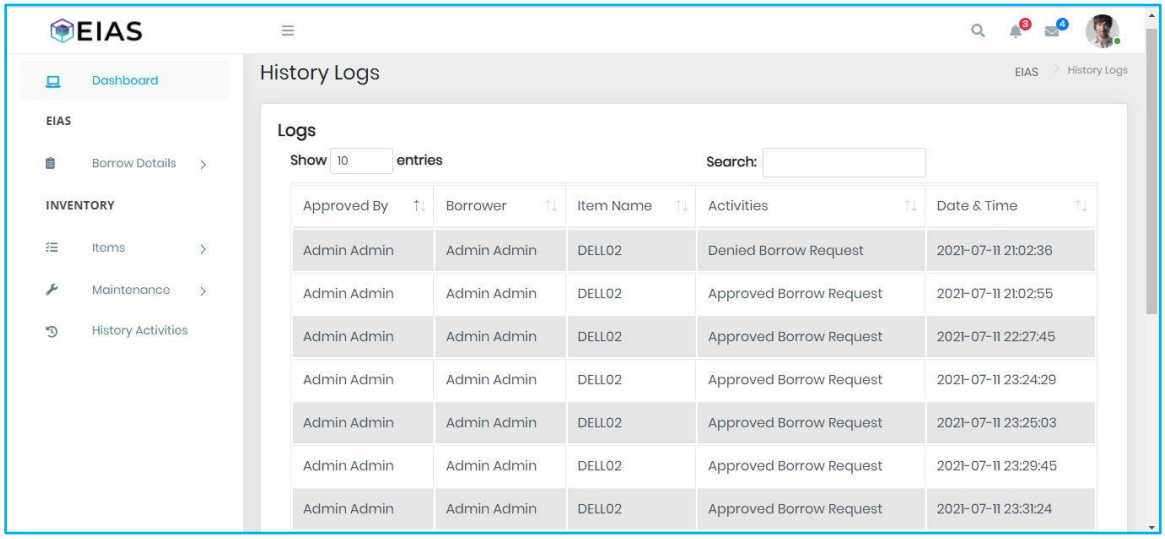
Name: Approval of borrow requests

Description: This page allows the admin to see borrow requests



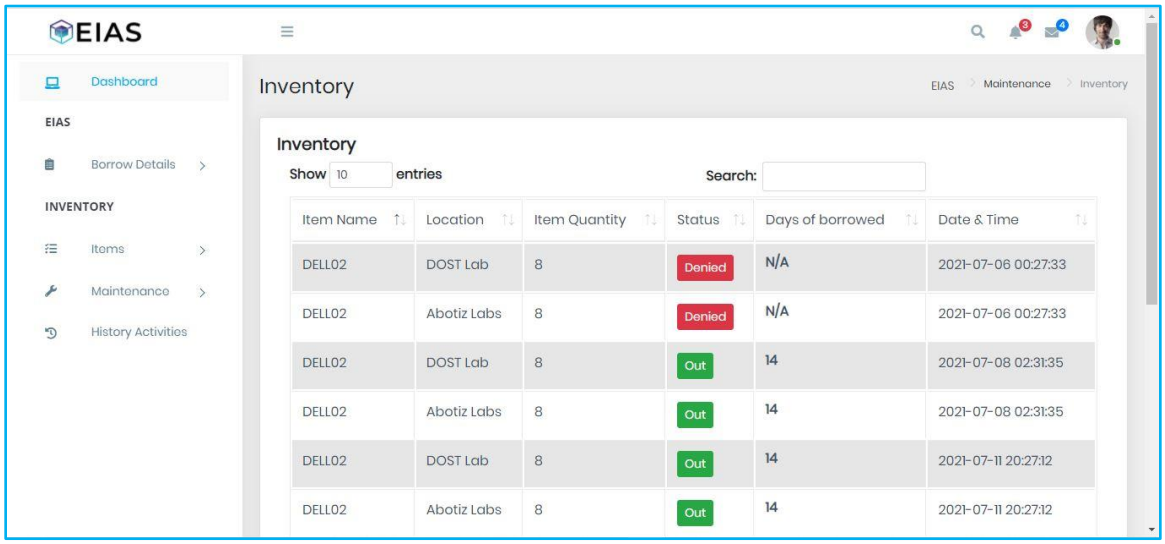
Name: Status of borrowed item

Description: This page allows the admin & users to see the status of the borrowed item



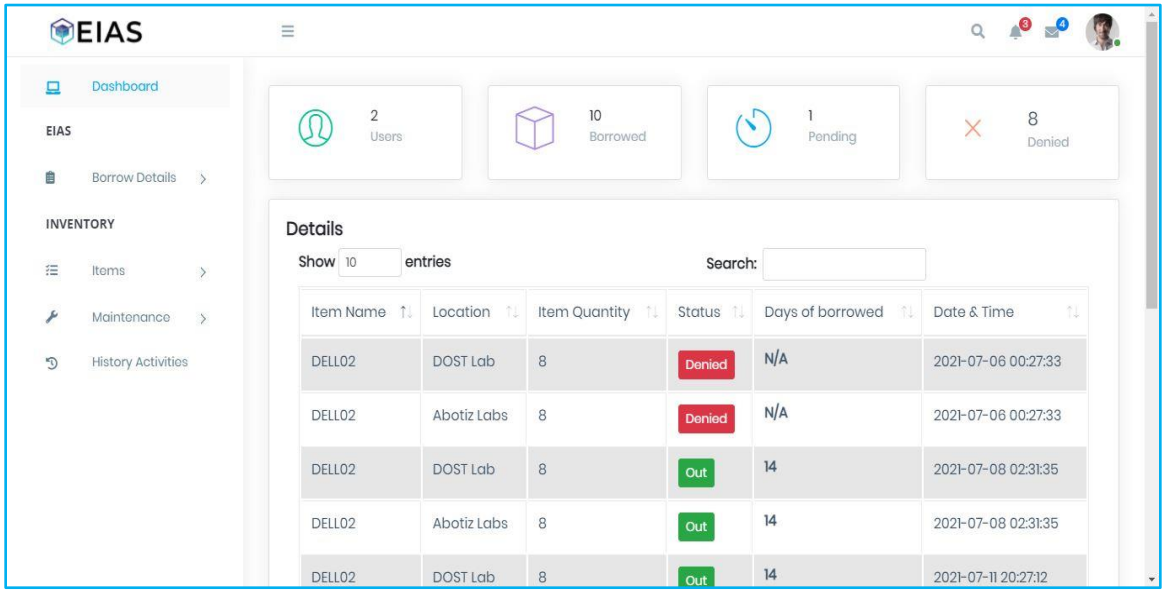
Name: History Logs

Description: This page allows the admin to see the history of transaction



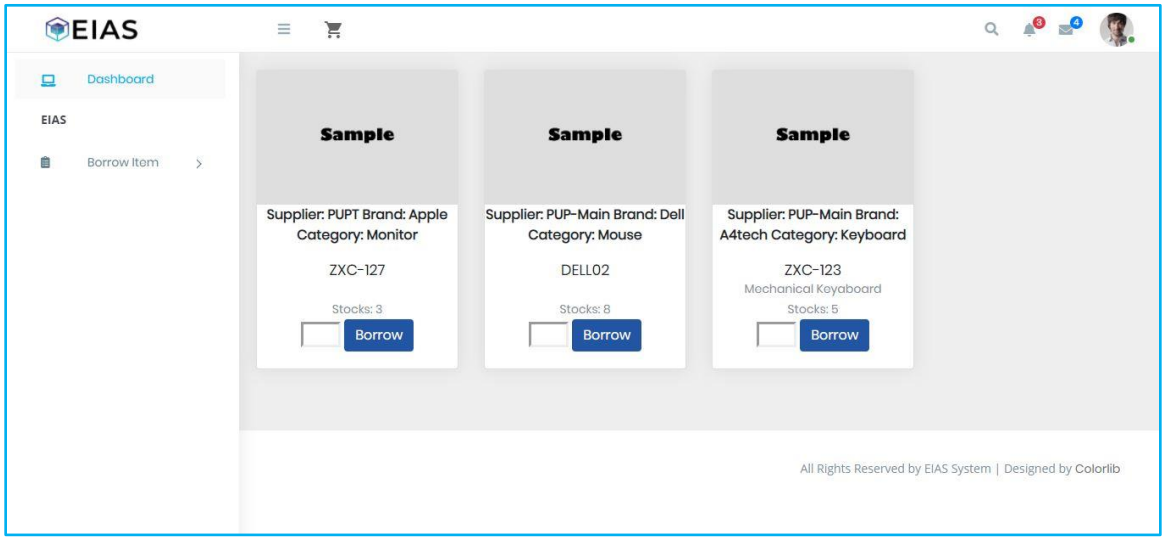
Name: Inventory

Description: This page allows the admin to manage the inventory



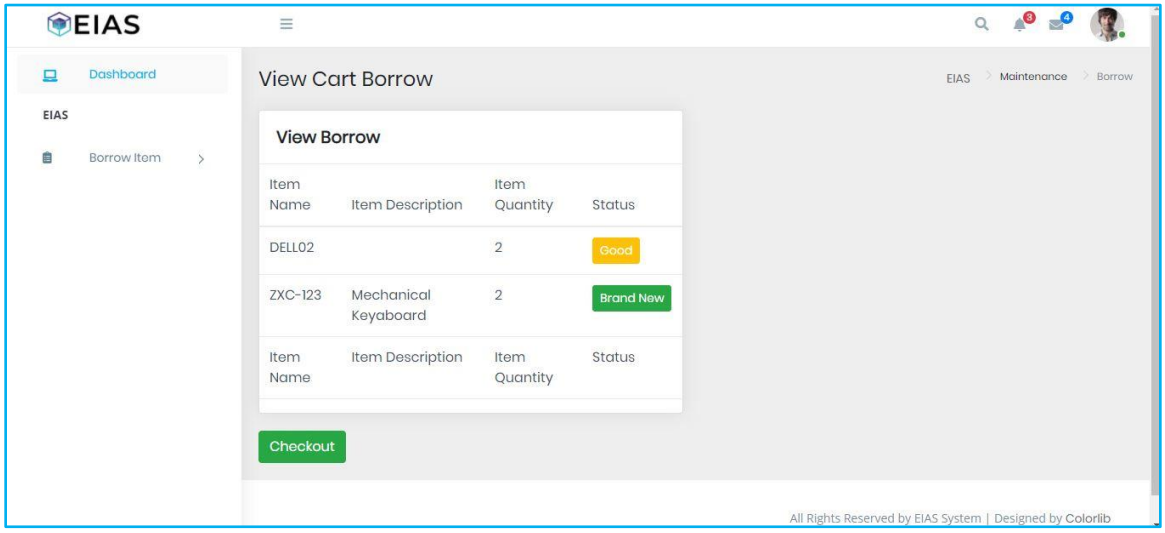
Name: Dashboard

Description: This page allows the admin to view the summary of number of items



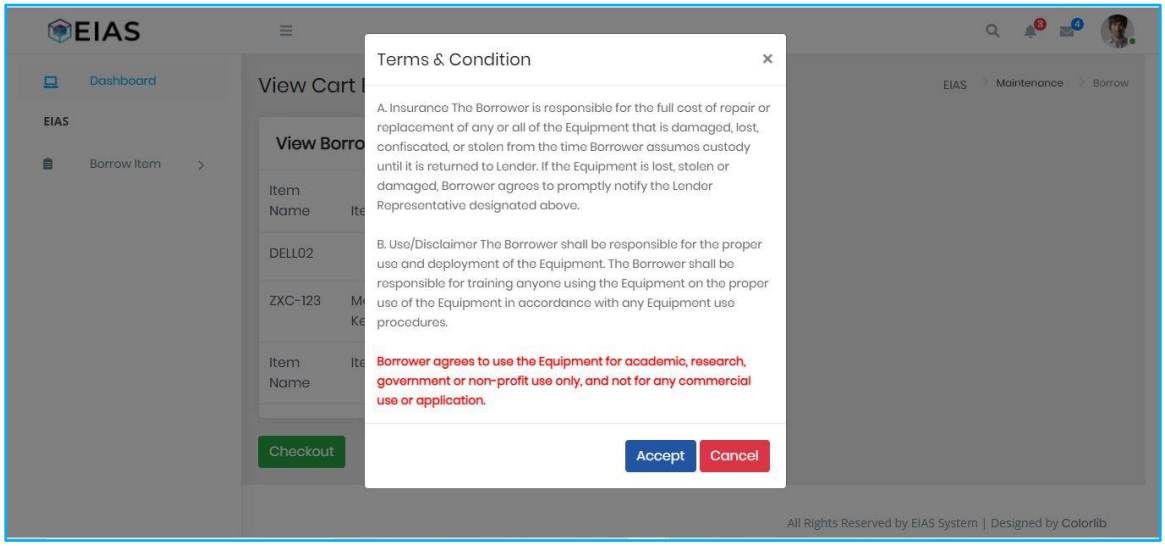
Name: Borrowing Page

Description: This page allows the borrower to borrow an item



Name: Item Cart Page

Description: This page summarizes and confirms all the item the users want to borrow



Name: Terms & Condition

Description: The user must agree before proceeding

3.3 TECHNICAL SPECIFICATIONS

3.3.1 Database Design

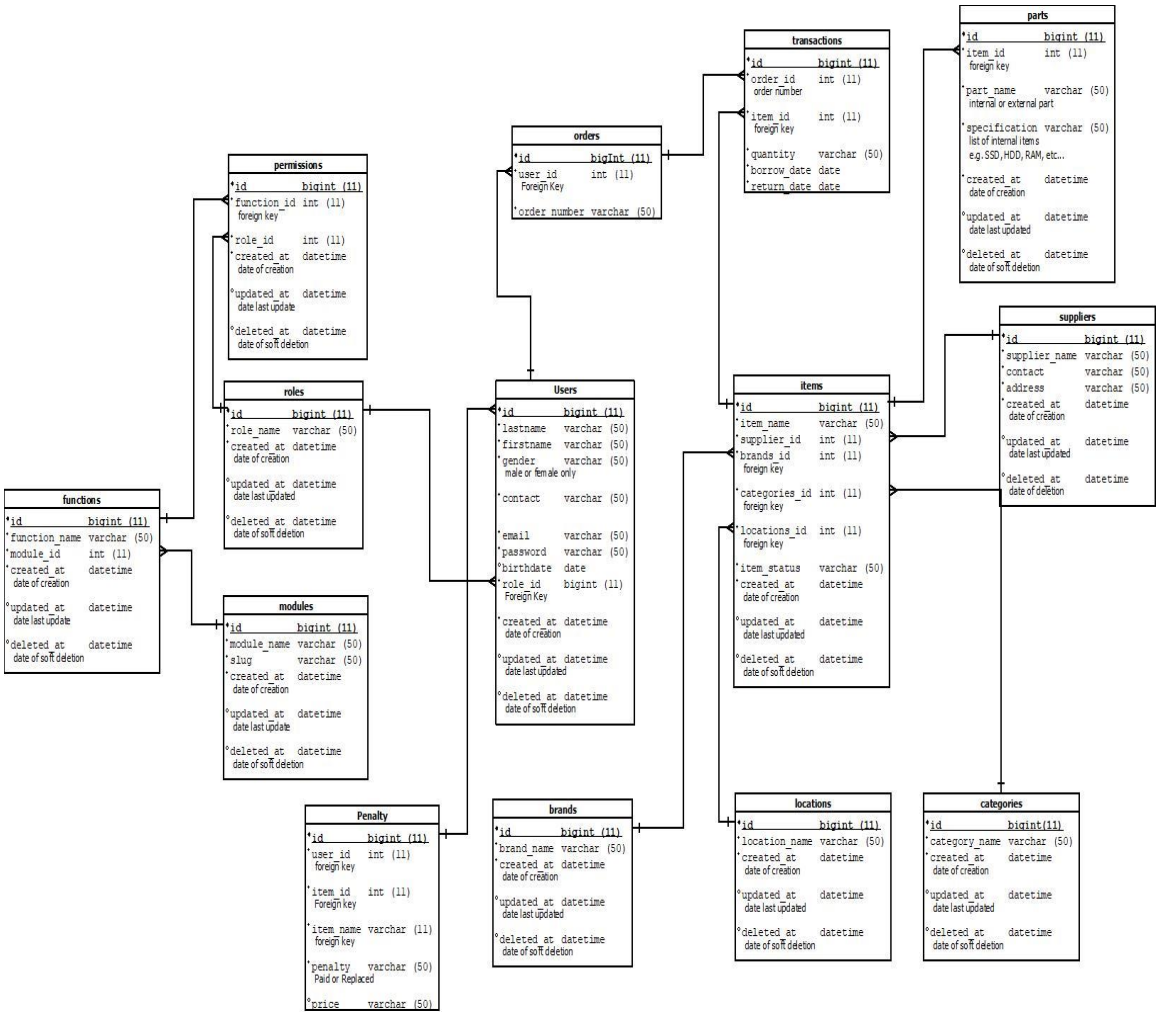
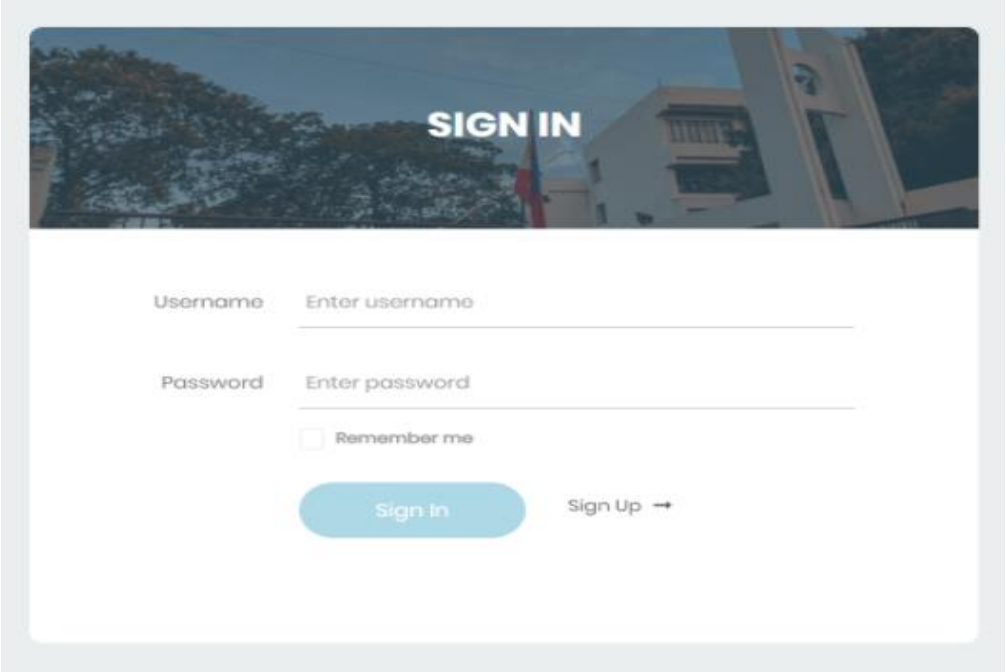


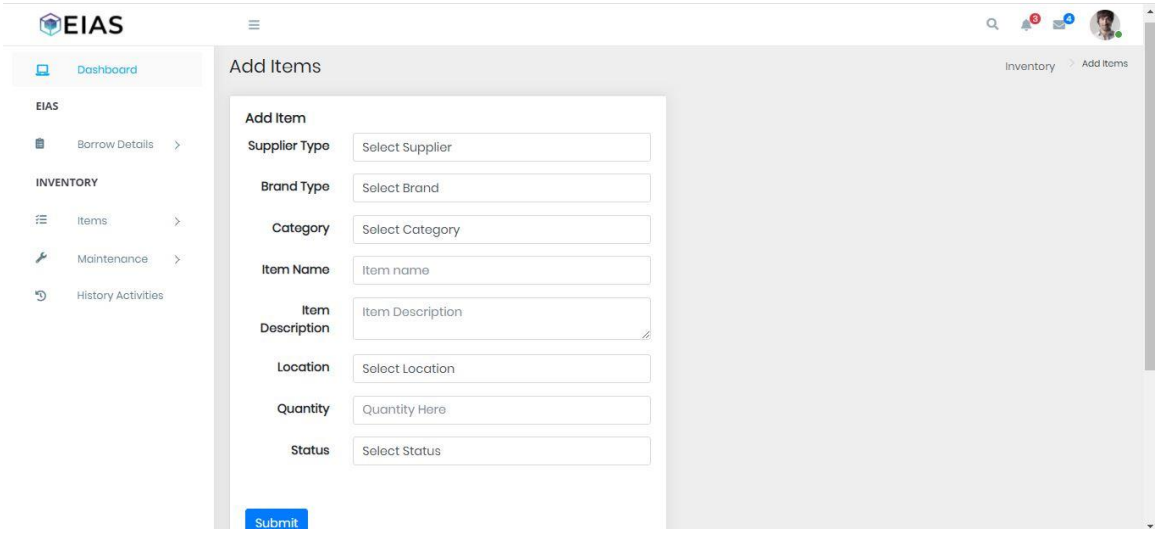
Figure 10 – ERD

3.3.2 Screen Design



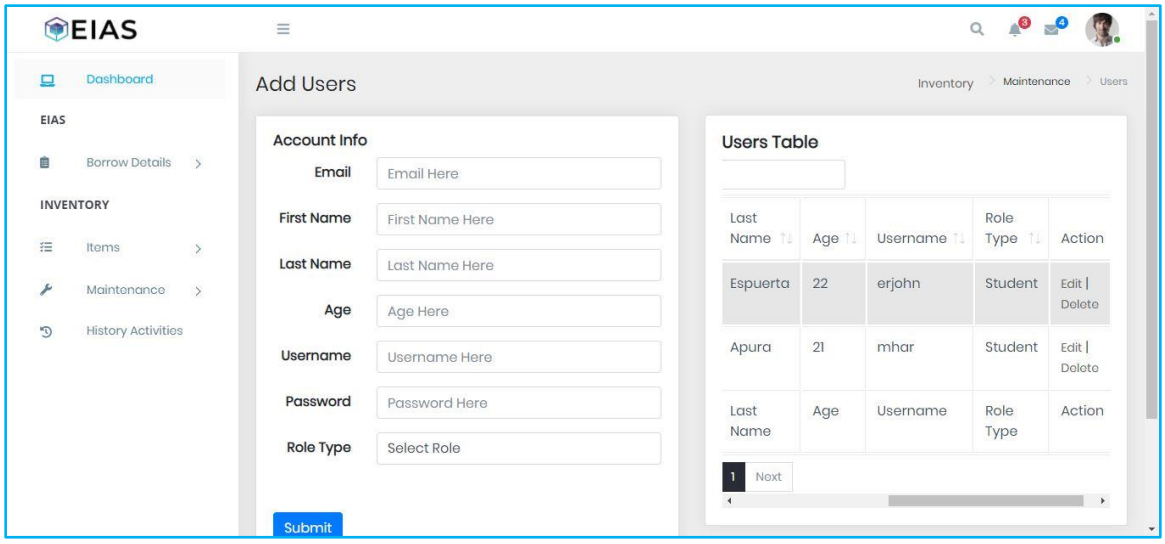
Name: Login Page

Description: This page allows the admin and users to log in to the system



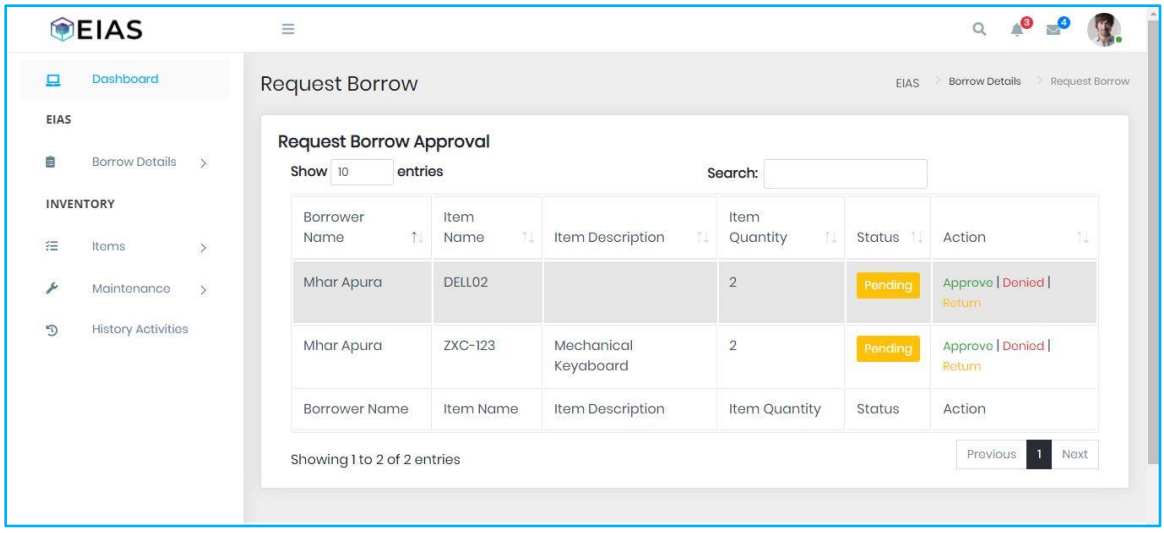
Name: Add Items

Description: This page allows the admin to add an item to the system



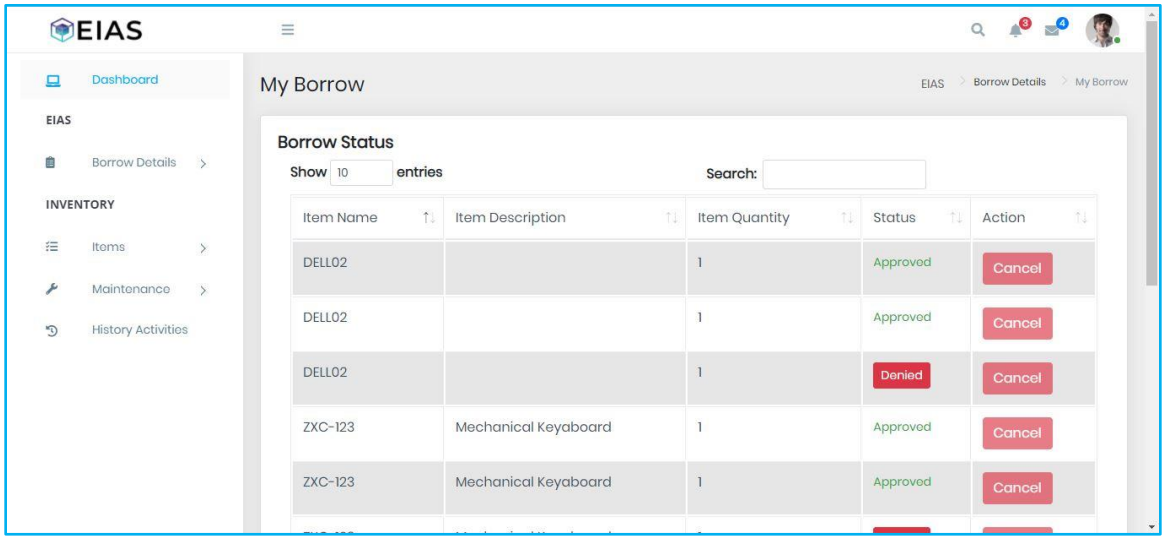
Name: Add Users

Description: This page allows the admin to add new user to the system



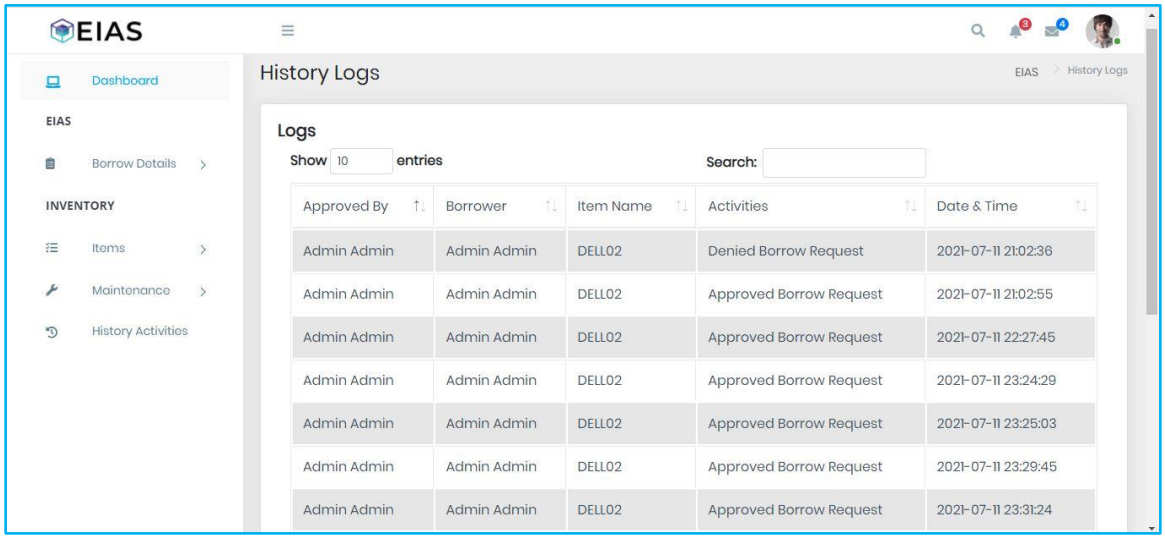
Name: Approval of borrow requests

Description: This page allows the admin to see borrow requests



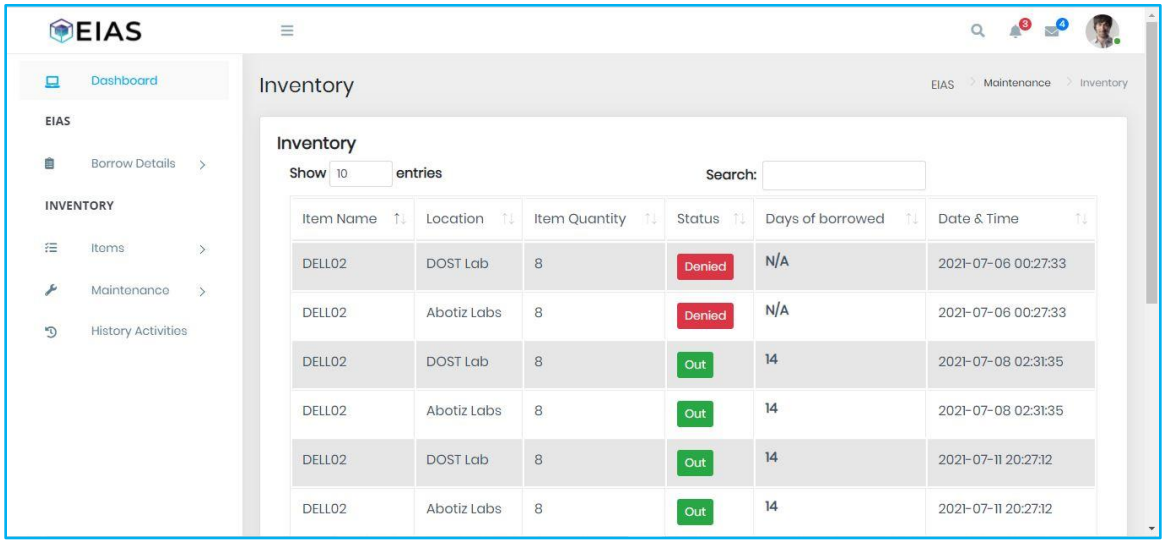
Name: Status of borrowed item

Description: This page allows the admin and users to see the status of the borrowed item



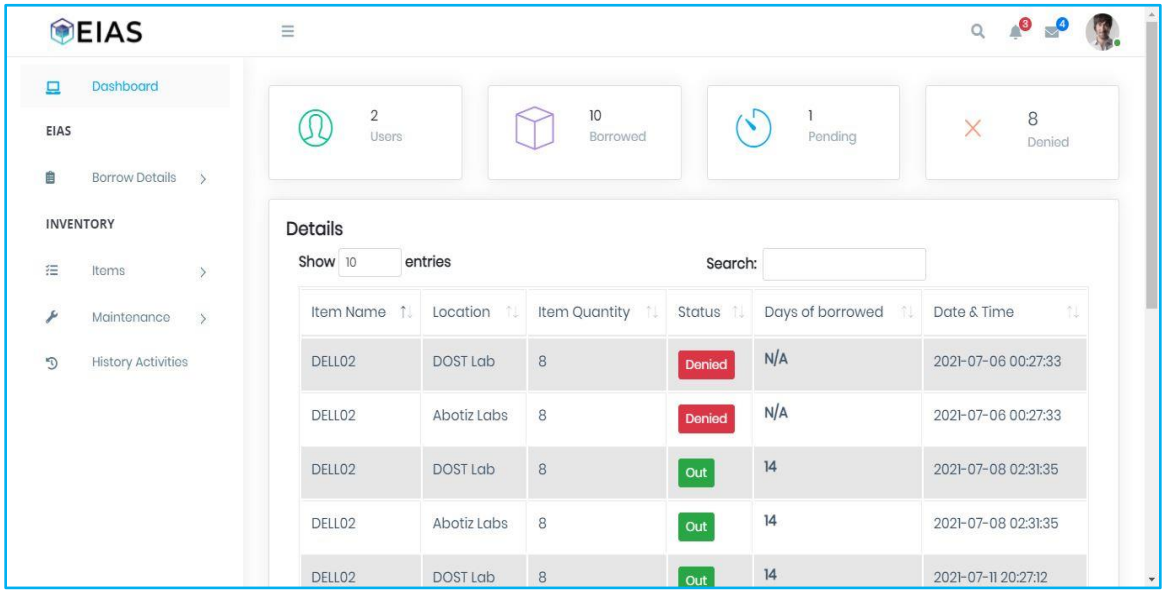
Name: History Logs

Description: This page allows the admin to see the history of transaction



Name: Inventory

Description: This page allows the admin to manage the inventory



Name: Dashboard

Description: This page allows the admin to view the summary of number of items

3.4 SYSTEM REQUIREMENTS

3.4.1 Hardware/Software/Peopleware

3.4.1.1 Hardware Requirements

CLIENT SIDE			
	Processor	**RAM**	**Disk Space**
Desktop PC	Intel Dual Core or Higher Version	2GB	250 GB

Server SIDE			
	Processor	**RAM**	**Disk Space**
RAD	AII Intel or AMD – 2ghz	2GB	10GB

Table 6 – System Requirements

3.4.1.2 Software Requirements

Clients Devices

- **Cross-platform web browser**

Web Server

- **Bluehost.com**

Development End

- **MY SQL**
- **Any text editor – Browser Interface**
- **Xampp**

3.4.1.3 Peopleware

- **Admin**
- **Student/Guest**

3.4.2 Security Requirements

- The admin is the one who can add, edit, delete and modify the Inventory and can approve and disapprove the pending Borrowing Request
- Email Notifications for borrowing request

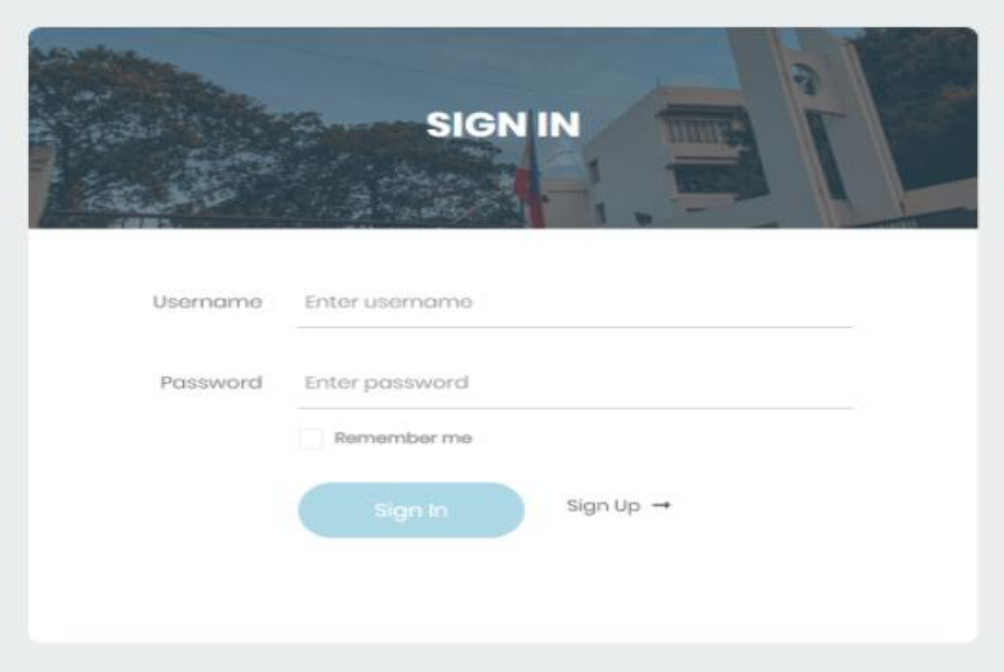
CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 USER INTERFACES

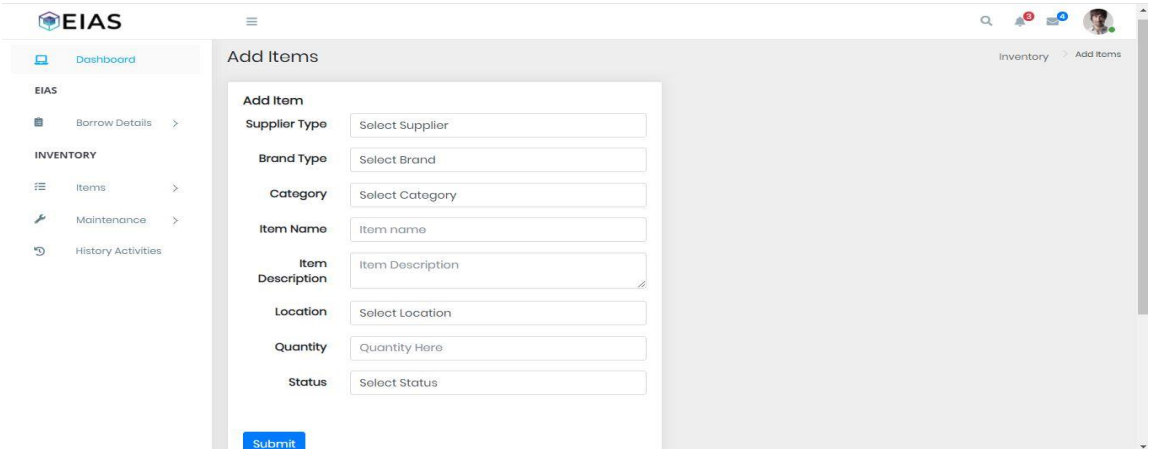
The following figures show the output of the study. Figure 11 to 17 shows the physical design of the web application.

Figure 11: Log In Page



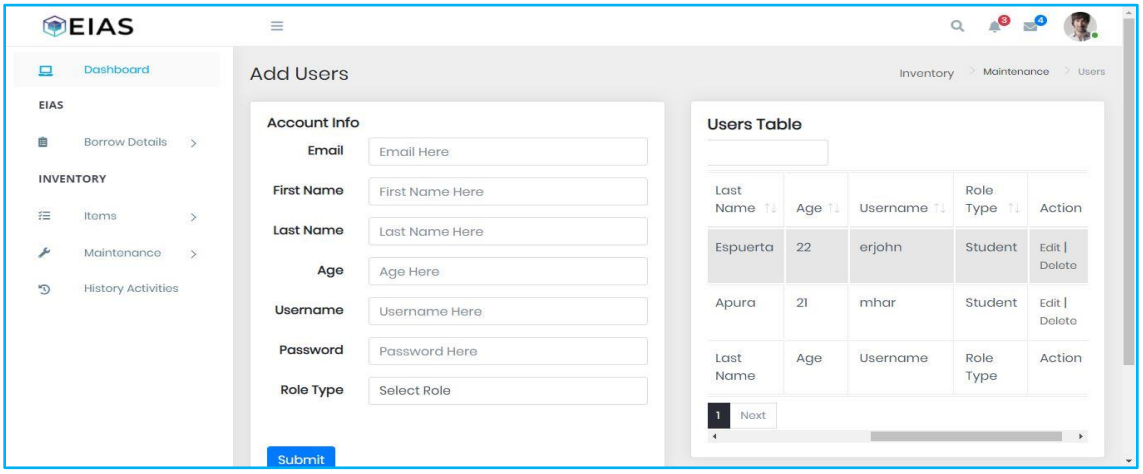
The log-in page is the first page that the user and client will see upon visiting the web application.

Figure 12: Add Items



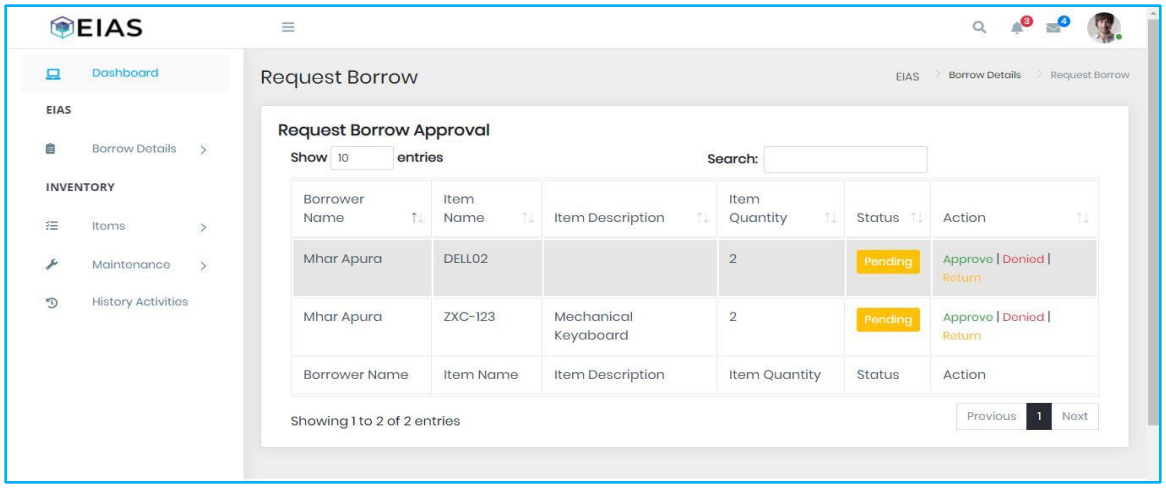
The Add items page is for the client or the admin. It is used to add any items in the system, including the items brand type, category, and the items status.

Figure 13: Add Users



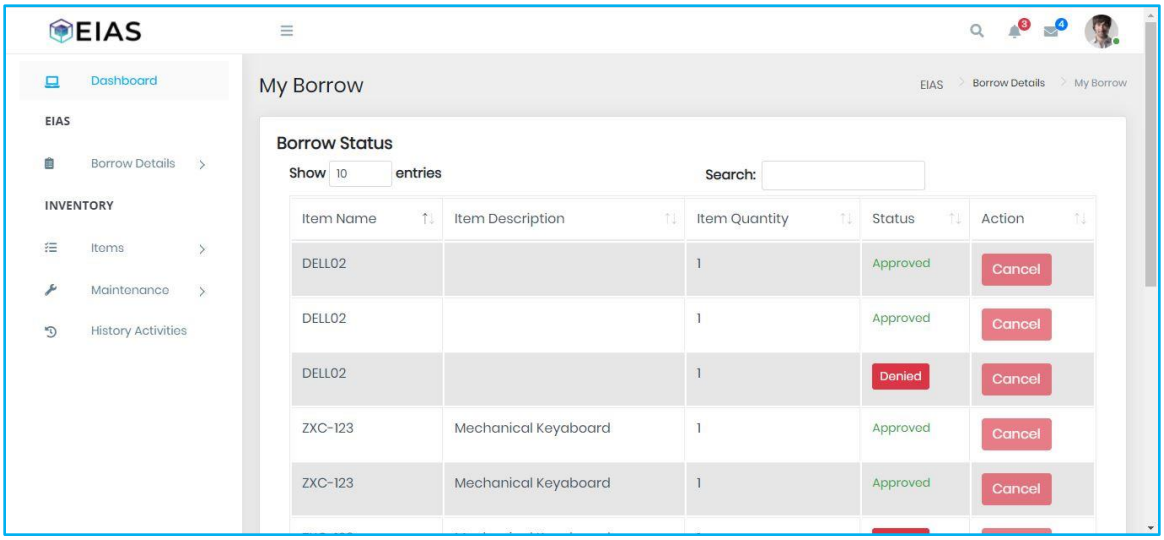
The Add Users page is for the client or the admin. It is used to add users in the system, including the role type.

Figure 14: Approval of borrow requests



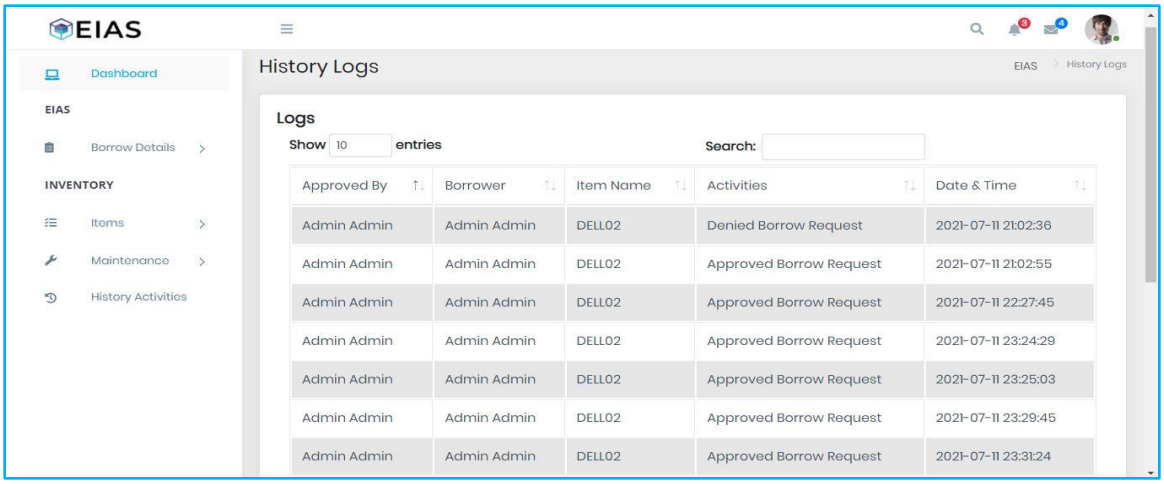
The Approval page is for the client or the admin. It is used to view the pending requests of the students.

Figure 15: Status of Borrowed item



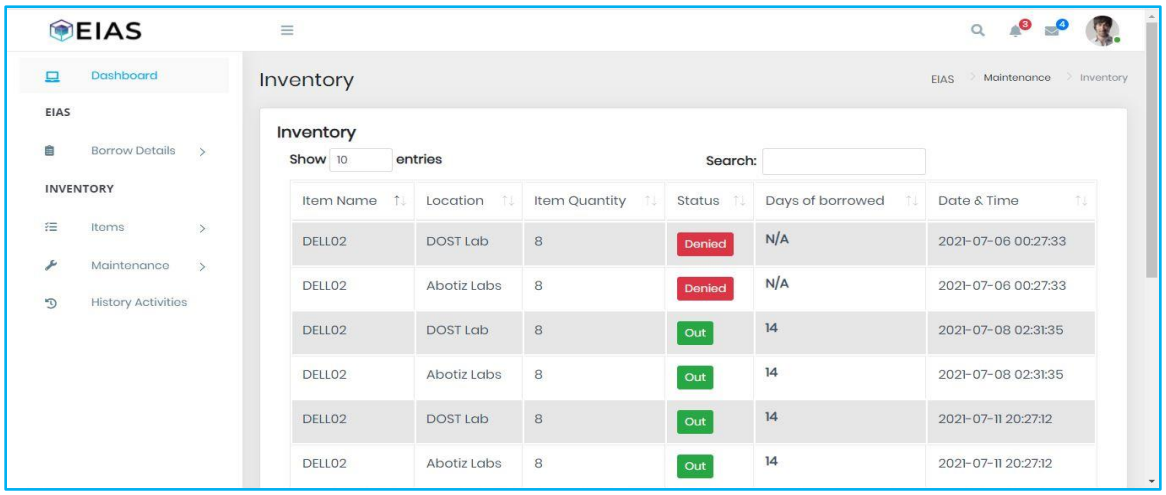
This page is for the client or the admin. It is used to view the status of the borrowed items of the student if its approved or denied.

Figure 16: History Logs



This page is for the client or the admin. It is used to view the history of transaction that have been made.

Figure 17: Inventory



This page is for the client or the admin. It is used to view and manage the inventory of the items.

4.2 RESULTS

The following figures show the results of the findings of the study after testing the system. The survey used was based on the ISO 25010 and the rating was based on the Likert scale which is mentioned before, that ranges from one (1) to five (5). The Likert Scale used is shown below.

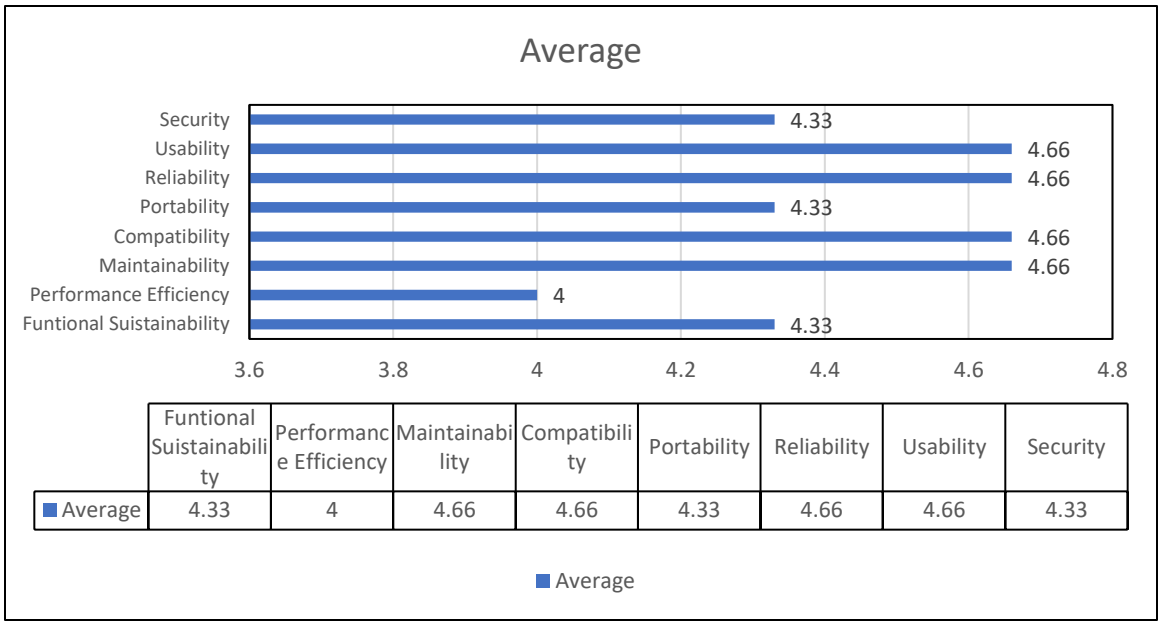
Table 7

Likert Scale (ISO 25010)

Numerical Rating	Interpretation
4.41-5	Strongly Agree
3.51-4.40	Agree
2.61-3.50	Neutral
1.71-2.60	Disagree
1-1.70	Strongly Disagree

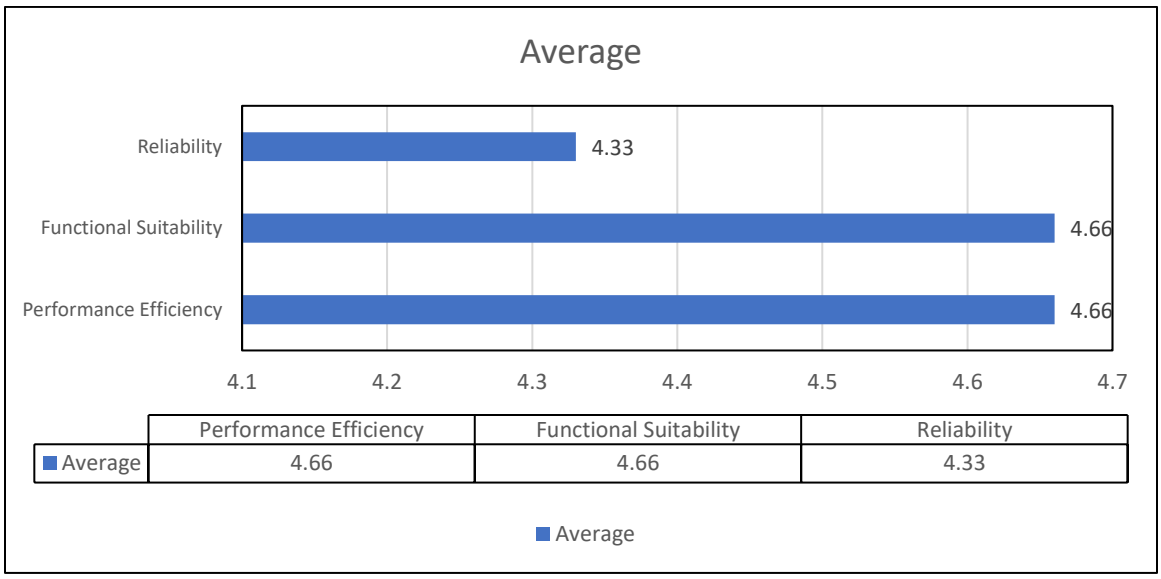
The following categories included in the ISO 25010 and its results are shown in the figure below.

Figure 18. Efficiency and Effectiveness (With Computation)



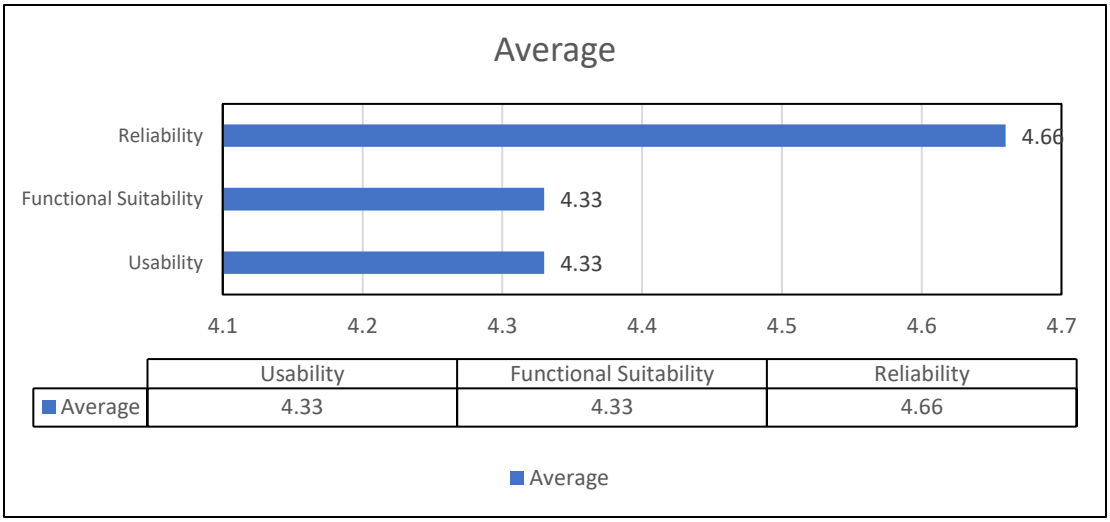
$$\frac{4.33 + 4 + 4.66 + 4.66 + 4.33 + 4.66 + 4.66 + 4.33}{8} = \mathbf{4.45}$$

Figure 19. Performance Sufficiency (With Computation)



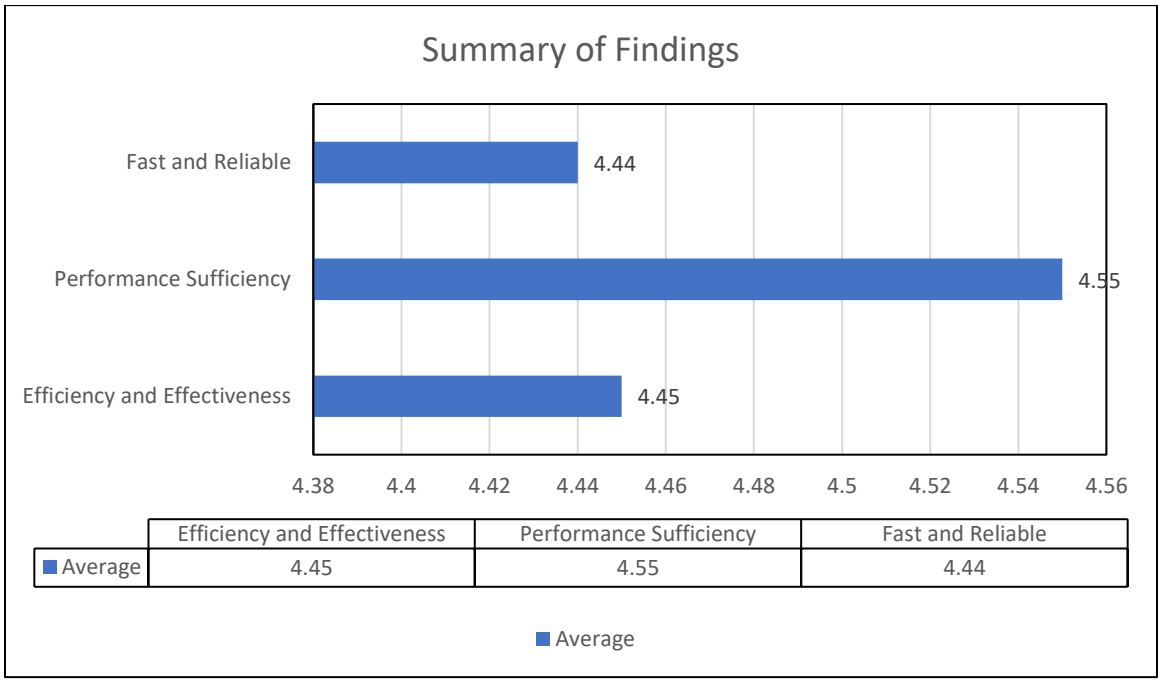
$$\frac{4.66 + 4.66 + 4.33}{3} = \mathbf{4.55}$$

Figure 20. Fast and Reliable (With Computation)



$$\frac{4.33 + 4.33 + 4.66}{3} = \mathbf{4.44}$$

Figure 21. Summary of Findings (With Computation)



After calculating the averages for each category, the system's overall rating is calculated by multiplying the averages by the number of categories contained in the criteria. The formula is shown in the table below.

Figure 22. Computation for Final Rating

$$\frac{4.45 + 4.55 + 4.44}{3} = 4.48$$

Hence, the final rating for the ISO is 4.48, which lies in "Strongly Agree" in the Likert Scale of the ISO.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary of Findings

Based on the data gathered, some characteristics of the system still gained a low rating. With that, the system will still need further improvements. The system needs to improve in terms of its performance efficiency, security, and portability.

Conclusion

Despite of the low rating on the system's performance efficiency, security, and portability, in the overall rating, the result is still high. Therefore, the system is still efficient and effective, and is ready for full implementation.

Recommendation

Based on the findings, the system needs to improve and to increase its performance efficiency, security, and portability. We recommend that this project will be used by the administrative aide, especially for the DOST and Aboitiz room wherein the reports for the inventory will be needed. Lastly, future researchers can think of a way on how to put order function, instead of approving individual item it can be put in an order where there are multiple items to approve.

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