Asset and Linen Monitoring Information System Framework for UTAR Hospital

By

TAY YAN BIN

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ABSTRACT

The proposed project is developed and designed an Asset and Linen Monitoring Information System Framework by using the Frappe Framework ERPNext for UTAR Hospital, addressing the need for efficient monitoring and tracking asset and linen inventory management. The traditional monitoring method of manually searching and checking assets and linens inventory used in hospital may be time-consuming and prone to human errors. It is leading to unnecessary losses on missing assets or linens and inefficiencies of monitoring and tracking asset and linen. This system offers a user-friendly interface with a dynamic dashboard that streamlines operational hospital and enhances management of asset and linen. It is allowing administrators and staff to monitor assets and linens effectively in real-time data collection. The integrated features of real-time alert and role-based access control fall short in existing system, which are played a crucial role in maintaining operational efficiency and system data security. This project aims to fill this gap by implementing a comprehensive system that tracks and monitors assets and linens as well as sends timely notifications for PPM of asset and updates on newly remarked items. It keeps all the relevant department personnel of UTAR Hospital informed promptly to take action on the notification and make decision. It is implemented the Frappe Framework ERPNext to develop a secure and efficient system supporting those functionalities. Through the proposed project, the management of assets and linens in UTAR Hospital has been enhanced, reducing losses on missing assets or linens and improving operational hospital efficiency. By implementation of the system, it assists the administrator and manager of UTAR Hospital to better monitor and track the assets and linen inventory in real-time.

Area of Study: Inventory Management, Enterprise Resource Planning (ERP)

Keywords: ERPNext, Frappe Framework, Real-time Monitoring, Role-based Access Control, User-friendly system, UTAR Hospital

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LIST OF ABBREVIATIONS

UTAR	Universiti Tunku Abdul Rahman
SMS	Short Message Service
PDF	Portable Document Format
PPM	Planned Preventive Maintenance
IT	Information Technology
ICT	Information and Communication Technology
CPU	Central Processing Unit
ERP	Enterprise Resource Planning
FYP	Final Year Project
PC	Personal Computer
DB	Database
CRM	Customer Relationship Management
HR	Human Resource
RFID	Radio-Frequency Identification
SDLC	Software Development Life Cycle
IP	Internet Protocol
OS	Operating System
ID	Identifier
VM	Virtual Machine

URL	Uniform Resource Locator
EPC	Electronic Product Code
RAM	Random Access Memory
GB	Gigabyte
DHCP	Dynamic Host Configuration Protocol
HTML	HyperText Markup Language
ms	Millisecond
CMD	Command Prompt
LAN	Local Area Network
QR	Quick Response

CHAPTER 1

Introduction

The background of this project, problem statement and motivation of the project, project objectives, project contributions and the scope of the project will be presented in this chapter.

1.1 Project Background

In the figure 1.1.1, there is the overview of UTAR Hospital. UTAR Hospital, which is a specialized hospital in Kampar, wholly owned by the UTAR Education Foundation and without profit. It is providing affordable and holistic healthcare services by enmeshing Western Medical & Medicine services with Traditional & Complementary Medicine (T&CM) services [1]. UTAR Hospital which is to provide healthcare services to populace and the society, particularly citizens of Kampar. UTAR Hospital offers a wide range of assets and linens, including IT equipment, several linens, medical equipment and machinery that contribute to the operational of daily hospital. With UTAR Hospital official opened, many assets had been employed while linens are sent incoming and outgoing from UTAR Hospital, proper management of assets and linens is an important part of managing hospital. Thus, an effective monitoring information system is needed to monitor and track the large number of asset and linen that is available at UTAR Hospital.

Figure 1.1.1 Overview of UTAR Hospital

However, the management of the asset and linen poses a problem especially by traditional ways that require manual tracking. Such method causes inefficiency, data errors, and added operational costs, thereby compromising on the efficiency of the hospital in delivering service timely and record accurate. As the need for a solution to the problem of UTAR Hospital, the proposed project aims to develop an asset and linen monitoring information system framework for UTAR Hospital by using ERPNext. This project is to enable hospital administrator better monitor over UTAR Hospital management and operation. The system dashboard for tracking and monitoring management of the assets and linens should be provided for the UTAR Hospital, ensuring real-time visibility to enhance operational efficiencies. It is the needed of implementation a user-friendly dashboard, offering hospital management in easily accessing critical information of asset or linen.

An integrated monitoring information system is developed in this project for comprehensive solution to track and management of assets and linens using ERPNext. It must significantly be improving the operation and productivity of UTAR Hospital. This system development must be of high standard for UTAR Hospital, where operation must be enhanced by this system to support management of the Hospital that is monitoring and tracking assets and linens.

Frappe is a fully open-source software framework and free to use for building to make designed application easier [2]. Maintain a complex system with thousands of features will only need a few developers as it is using less code to configuration and basics built in. This is the framework behind ERPNext system and Frappe applications such as Frappe HR, Frappe Project and Frappe Chat, which can be seen as quite generic in terms of making database-driven application. Thus, it helps developer build the front-end faster.

ERPNext which is saving time and effort by handling the creation of data models, connecting information to control actions, and providing user-friendly interface. It has several built-in features that are easily for modern web application. For instance, generating PDFs, sending emails as well as SMS messages and creating webpages [3]. This is allowing staff of UTAR Hospital can share the specific information among various departments by ERPNext. Through its simple interface, administrators and staff can streamline everything about the hospital with efficient functions. This makes it easier for UTAR Hospital management to meet real-time needs so that they can achieve optimal outcomes.

1.2 Problem Statement and Motivation

In the modern world, the effective management of hospital facilities plays a critical role in the overall efficiency and maintain quality of the monitoring information system. As the number of assets and linens used grows, manually inventory with numerous items becomes highly inconvenient and slow. It is also challenging for administrator and management, when they come to tracking and managing the assets and linens needed by the UTAR Hospital. They are hard to quickly and effortlessly view the real-time information of hospital facilities through the records that as the lack of a user-friendly system dashboard in UTAR Hospital. This traditional approach involves large volumes of paperwork and manual data entry which are likely to result in human errors. For instance, misplaced documents, overlooking entries or even incorrect recording of data. These mistakes can cause wrong records in the inventory, and lost track of asset or linen such as the loss of a

specific medical facilities or a set of towels might lead to management complications at the UTAR Hospital. Moreover, the time taken to correct these mistakes and reconcile the records information the inefficiency.

Since hospital is a constantly evolving environment, knowledge of status of assets and linens at any point of time is very important. It is to ensure the management and inventory assets, and linen are reliability and safe of the data records in real-time. However, UTAR Hospital lack of possess a capability system. Thus, it has experienced a high amount of time consumption in updating or retrieving detailed information of the large amount of assets and linens. This is also making Planned Preventive Maintenance (PPM) activities of asset to be a candidate for oversight. Due to the lack of real-time monitoring, the UTAR Hospital administrator and managements which are hard in a position to decide organization for the facilities, causing underutilization of assets and linens or overstocking them. Besides, lack of maintenance asset will lead to equipment failure or malfunction, posing a threat to safety while using and interrupt the hospital operation.

By recognizing the need to solution, the problems of UTAR Hospital to asset and linen. This project purposes to develop an asset and linen monitoring information system framework is to assist UTAR Hospital, streamlining the management and operation of UTAR Hospital. Through monitoring with the use of ERPNext dashboard, this project aims to track and manage assets and linens, ensuring real-time visibility and enhancing operational efficiency. The integration of user-friendly dashboard can provide UTAR Hospital administrator and management an easy approach towards accessing key information necessary for making decisions regarding asset and linen management and status.

With the aid of implementing such a revolutionary concept in UTAR Hospital, the operational workflows of the hospital had been optimized, the lifespan of assets and linen UTAR Hospital inventory had been prolonging, and the service provided by hospital is elevated. At UTAR Hospital, this system is intended to streamline

processes related to managing inventory for assets and linens, so as it is to reduce reliance on manual methods, minimize chances of human mistakes as well as losses on missing assets or linen, increasing overall efficiency and effectiveness of monitoring and tracking assets and linens. This system responds to a key operational requirement, ensuring appropriate tracking and managing of asset and linen that contributes better monitoring information system.

Furthermore, the initiative is in line with the commitment of UTAR Hospital to use technologies in enhancing its inventory management and convenient. This comprehensive asset and linen monitoring information system will be implemented and designed for improving service quality and standard enhancement of the UTAR hospital. This proposed project enables the hospital staff of UTAR to perform their work in a convenient manner with relevant system, hence, boosting the management, operation, and efficiency of the hospital.

1.3 Project Objectives

The project objective aims to develop an Asset and Linen Monitoring Information System Framework that is capable of tracking and monitoring the assets and linens for UTAR Hospital by using ERPNext.

1. To design and implement a solution for tracking and monitoring assets and linen at UTAR Hospital using ERPNext

The project objective is to design a centralized and structured solution to effectively track and monitor hospital assets and linen using ERPNext, replacing traditional manual data entry and tracking processes. ERPNext is selected due to its user-friendly interface, open-source flexibility, and low-code environment. It allowed hospital staff with minimal programming knowledge to manage and maintain the system independently. By utilizing ERPNext, the system offered features such as structured item registration, role-based permissions, filterable record lists, and visual operation dashboard for hospital management manages the asset and linen. Furthermore,

training sessions had been conducted for UTAR Hospital staff to ensure long-term usability and system adoption, and user manuals had been prepared to guide them through the key functions and features. These supporting efforts can help users understand how to use the system effectively, manage asset and linen records of their department, and respond to daily operational needs without the need for constant technical support. This implementation ultimately enhances workflow visibility and contributes to more organized and reliable hospital resource management.

2. To develop real-time data dashboard for enhanced data accuracy and availability

Another critical objective is making real-time access to accurate data on asset and linen status information available for the management of the UTAR Hospital. It focused on developing a real-time dashboard that provides availability and up-to-date information on assets and linen records to support informed decision-making within UTAR Hospital. The dashboard serves as the visual interface where provided the reporting and alert system notification functionality, enabling administrator and related department to track key up-to-date information and potential problem. This is supporting data-driven decision processes that allow administrator and relevant department to respond in real-time. Administrator and relevant department of UTAR Hospital enable quickly do the changing conditions and make informed decisions about resource allocation or any other kinds of operational adjustments. The asset and linen data information had been fetched from the database to ensure all relevant data are available in real-time. For instance, timestamp, specific unique tag, types, locations, and department with the latest time modified to become more accurate. It can maintain data information accuracy and availability in a high standard for performing the tasks of asset and linen monitoring and tracking such as analysis the data of asset and linen and overview the status of them. The system also included generate QR code features for enabling rapid identification and view details of linen and assets using mobile phones. Each item has a unique QR code, which allows user to scan and get item information in real time, reducing human error and enhancing precision. Real-time database synchronization ensures that data such as timestamp,

item type, location at the time, and department responsible is always up to date and accessible.

3. To implement role-based access control to ensure data security and confidentiality

The objective of project is to protect the data entered in the system and keep the information confidential, the role-based access has been offered into the system. Different levels of access are granted according to user roles and their duties to safeguard sensitive information and maintain operational integrity. Super administrator had the full access to the system that is able to access detail dashboard on the asset and linen inventory, hospital staff list, maintenance schedule, and utilization statistics. On the other hand, access of normal departmental staff is only be limited to relevant dashboards for their operations such as general service department, IT department. Such role-based access ensures that every staff can handled only data relevant to their responsibility, enhancing security and confidential. Furthermore, the delete or remove record of data feature is only be accessed by super-administrator and each department manager, while all other roles only have ‘Create’, ‘Edit’, ‘Write’ features to relevant department data and ‘View’ access to information related to other departments.

1.4 Project Contribution

The contribution of this project is to provide a comprehensive and innovative approach to hospital management, integrating monitoring information system technology to make the tracking and monitoring asset and linen experience smoother and more efficient for UTAR Hospital.

1. To Provide Data Visibility Easy and Quickly

In this project, the development of the asset and linen monitoring information system framework is able to provide data visibility to UTAR Hospital management by facilitating them with real-time data on the assets and linens, along with item location

and status information. A hospital that is lacking in assets or visibility would find it hard to correctly manage for activity because they can neither perform operations effectively nor avoid those stolen or lost asset or linen. Asset or linen stolen imply failure in the execution of the daily inventory amount. This may further cause delay in day-to-day operation due to erroneous inventory. The capabilities in real-time tracking and monitoring are enabled to take inventory more quickly by hospital management, thus reducing search times for an effectively efficient work process. This provides enhanced visibility into the data and supports proactive maintenance checking by datetime as the system can provides a dashboard showing details of every asset and linen.

2. To Provide Alert System Notification

The system can optimize asset and linen reliability by automating alert system notification and scheduling. Alert system notification is generated for maintenance of some asset or remarked assets and linens, timely maintenance interventions can avoid unexpected equipment failures and downtime. In such a manner, the alert system notification had been sent to the relevant department and administrator. The disruption in the operations of the hospital had been minimized by the timely action of administrator and management like focus on tasks related to asset maintenance inspection and remarked asset or linen. Such a proactive approach increases the usage of the hospital asset and linen that are always important to good working condition, enhancing the engagement and management of UTAR Hospital.

3. To Enhance User-Friendly Dashboard

The development of a user-friendly dashboard interface is empowered hospital staff across different departments to access relevant information and perform necessary actions intuitively. Customized views and functionalities tailored to specific roles are enhanced operational efficiency by providing actionable insights into asset locations, maintenance schedules, inventory levels, and compliance metrics. This streamlined access to critical data supports informed decision-making and promotes collaborative efforts among hospital teams.

In short, an asset and linen monitoring information system framework is significantly help in improving the hospital management on UTAR Hospital. It is able to enhance hospital operational, increase convenience as well as create a user-friendly and more efficient hospital management system for UTAR Hospital.

1.5 Project Scope

The scope of this project is to develop an asset and linen monitoring information system framework for UTAR Hospital using ERPNext as the core system. The system had been designed to track and monitor asset and linen inventory efficiently by leveraging MariaDB as the database to store and manage all asset and linen records. The information is updated into the database using RFID mobile readers and RFID gantry, ensuring real-time data synchronization. Additionally, users also had the ability to scan QR codes using a mobile phone scanner to retrieve basic asset or linen details, providing quick and accessible information without requiring manual data entry.

As ERPNext provided only limited built-in tracking and monitoring features. Therefore, custom scripts and server scripts had been added to enhance the capabilities of system, ensuring that specific requirements for asset and linen management at UTAR Hospital are met. These scripts can optimize the automation of tracking workflows, refine data processing efficiency, and introduce additional functionalities that are unavailable by default in ERPNext. The system had been deployed on an Ubuntu server, ensuring seamless data integration and real-time updates.

In addition to real-time tracking, the system had been included a role-based access control policy to manage different levels of user access. The system also featured automated notifications and alerts that cab notify relevant departments when assets require maintenance or linens are due for checking, ensuring timely action and improved resource management.

In conclusion, this project required a deep understanding of ERPNext, MariaDB, and the Frappe framework to ensure smooth integration and system efficiency. On the software development side, knowledge in writing custom and server-side scripts had been necessary to extend existing functionalities of ERPNext. Moreover, the system fetches and retrieves accurate, reliable data from the database, which is updated via the third-party hardware tools, RFID mobile reader and gantry. By implementing these features, the system aims to enhance inventory tracking, reduce manual workload, and improve the overall efficiency of asset and linen management at UTAR Hospital.

1.6 Project Organization

This section is going to give a list of details of the proposed project in the following thesis outline of the chapter. Chapter 1 being the introduction chapter of the proposed project, which include the problem statement and motivation, objective of developing this project, scope of the project, the contribution of this project, and the background of this project. It provides a mention of the project and objectives, timeline and projected result.

Chapter 2 is the literature review. This chapter will also expose other projects carried out using other frameworks like the proposed project. These sources will be searched from the online from journals, websites, articles, and books. In this chapter, strength, weakness, limitation will be discussed with the difference between the system and the solution as well as the fact that there is existence of similar projects will be discussed according to the literature reviewed.

Chapter 3 is the method and approach of the project. All the system requirements such as software and hardware that must be used in the development of this project will be discussed in this chapter. It will include about how requirements are gathered, information is processed, the system architecture, functionalities, estimated cost and project milestones are planned.

Chapter 4 focus on system design, which includes system architecture, use case diagrams, activity diagrams, and database design. This chapter explains how different components of the system are structured and interact to achieve the desired functionalities.

Chapter 5 will deal with the preliminary work, which will be all about system implementation and operation. It is focusing on software and hardware setup, implementation details, system operation, and implementation challenges. It provides an overview of the system execution, configuration, and any challenges encountered during development.

Chapter 6 focuses on system evaluation and discussion, which includes system performance evaluation, testing setup and results, project challenges, and objectives evaluation. It has been covered the testing, basically where tests on different features of the system are going to be taken in consideration for functionality, usability, database as well as the network. This chapter ensures that the project objectives are evaluated based on the outcomes achieved.

Chapter 7 is the project conclusion and recommendation which summarize the whole proposed project and recommendation for future enhancement. The outcome of performance on the system and the needs of hospital to improve this system will be drawn to conclusion. Possible areas for improvement and further research are discussed to provide direction for future work.

CHAPTER 2

Literature Reviews

2.1 Hospital Management System

As the increasingly competitive and rapidly changing healthcare sector, the influence of patients is increasing day by day [4]. Hence, there is a strong need for more efficient and effective management of hospital system. The rapid development of information and communication technology and the everywhere power of the Internet have had a considerable effect on business and services in global environment of today [5]. User-friendly hospital management system is becoming increasing recognised for its ability to enhance operations, improve management, control costs and boost efficiency.

Hospital information system is in high demand to enable hospital administrator and staff provide real-time and accurate visibility data. Large hospitals, which manage large amounts of inventory data, requiring reliable and secure monitoring information system [6]. Effective hospital management system involves the accurately handling and control of information records to ensure smooth and efficient operation of hospital. Data will be fetched data from database, which allowing collection of data in real-time, process the data and then display the latest update data to management of hospital.

Integration of monitoring information system in hospital can considerably improve the efficiency of workers in the hospital. Recognised for the system ability to enhance productivity with high accuracy, speed and convenience, it plays a crucial role in the management of hospital [7]. Hospital management system aims to improve the efficiency and effectively of hospital operational by integrating technology into traditional hospital management method. It assists in reducing the need for manpower and saves time in inventory management and asset or linen tracking.

Regarding inventory management systems, three of the inventory management system web applications is reviewed, namely "Odoo" [8], "Zoho" [9], and "NetSuite" [10]. All three system are comprehensive inventory management solutions designed to streamline stock control and improve efficiency.

2.1.1 Review on Odoo

Odoo is an open-source ERP software suite that offers a wide range of applications to manage various business processes [8]. It provides modules for ERP, CRM, inventory management, accounting, and more. The modular approach of Odoo allows hospitals to customize and integrate different modules according to their specific requirements.

Inventory Management [11]:
The inventory management modules of Odoo enable hospitals to streamline procurement, manage inventory levels across multiple departments or locations, and optimize supply chain operations. It supports features such as batch tracking, serial number tracking, and integration with third-party logistics providers for efficient inventory management. Odoo offers extensive customization capabilities through its open-source framework, allowing hospitals to tailor workflows, reports, and interfaces to meet specific operational needs. It supports scalability, making it suitable for hospitals of varying sizes and complexities.

CRM [12]:
Odoo CRM can be utilized for managing patient relationships, tracking interactions, and maintaining comprehensive patient records. Hospitals can use CRM functionalities to enhance patient engagement, manage appointments, and improve communication with patients and caregivers.

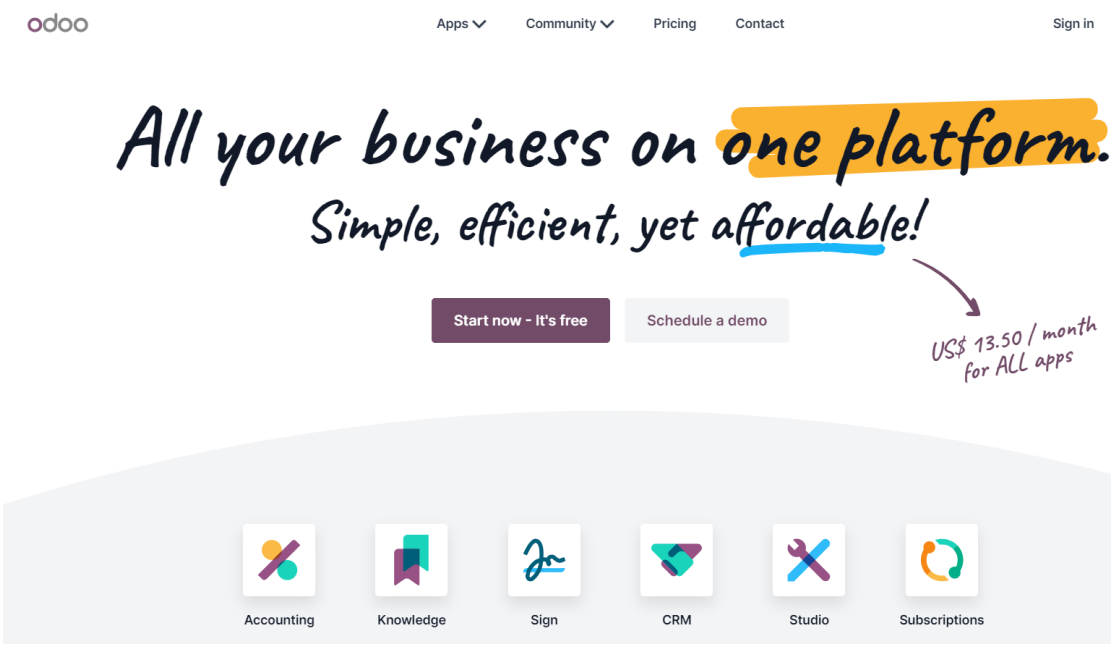


Figure 2.1.1.1 Odoo's website image with featured apps

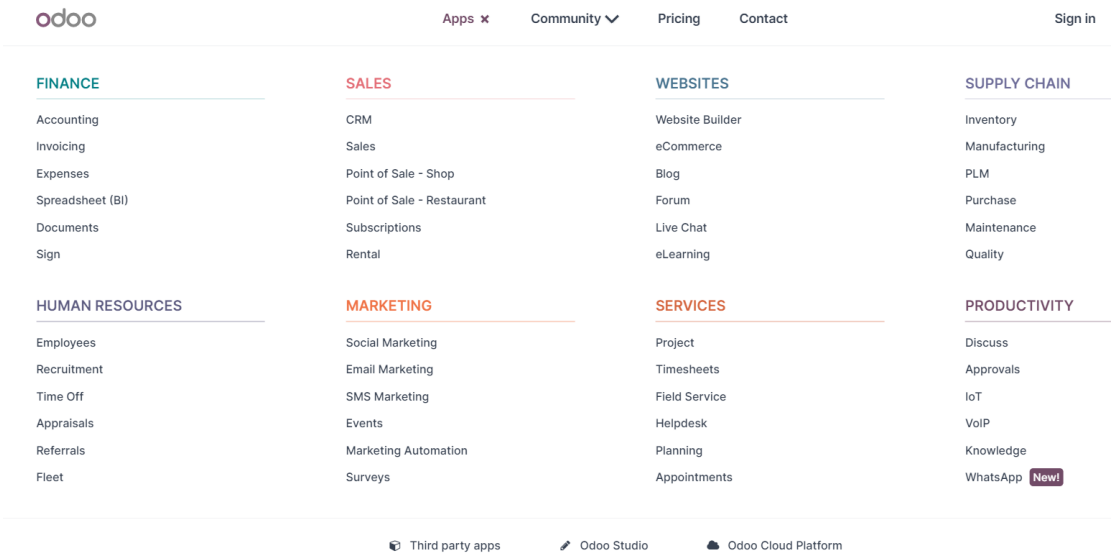


Figure 2.1.1.2 All the apps provided in Odoo

2.1.2 Review on Zoho

Zoho is a cloud-based software suite that offers a suite of applications for CRM, finance, collaboration, HR management, and more [9]. It is designed to cater to small and medium-sized hospitals looking for integrated solutions to streamline their operations. Zoho allows for customization through its low-code platform, enabling

hospitals to modify workflows, reports, and data fields to suit specific operational needs. However, the scalability of Zoho for larger hospitals with complex operational needs may be limited compared to enterprise-level solutions.

Inventory Management [13]:
Zoho Inventory provides hospitals with tools to manage stock levels, track orders, and optimize inventory operations. It supports features such as batch tracking, multi-warehouse management, and integration with e-commerce platforms for seamless inventory control.

CRM [14]:
Zoho CRM helps hospitals manage patient relationships, track patient interactions, and improve patient engagement through personalized communication and follow-ups. It integrates with Zoho Inventory to provide real-time updates on patient-related inventory needs.

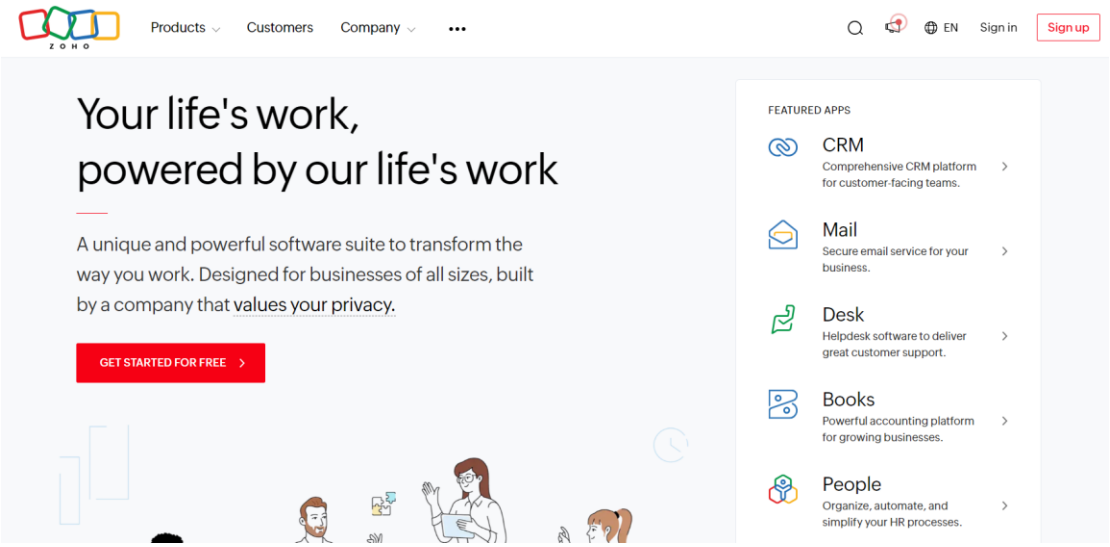


Figure 2.1.2.1 Zoho's website image with featured apps

2.1.3 Review on NetSuite

NetSuite, owned by Oracle, is a cloud-based ERP system designed for managing business operations such as financials, ERP, CRM, and e-commerce [10]. It

caters primarily to medium-sized hospitals and large healthcare organizations seeking a comprehensive solution for enterprise management.

ERP [15]:

NetSuite offers robust ERP capabilities, including procurement, order management, inventory control, and supply chain management. Hospitals can track inventory levels across multiple facilities, manage vendor relationships, and optimize supply chain operations.

CRM [16]:

NetSuite CRM module integrates with its ERP system to manage patient relationships, track interactions, and improve patient satisfaction. It supports marketing automation, customer service management, and patient data analytics to enhance patient care and engagement.

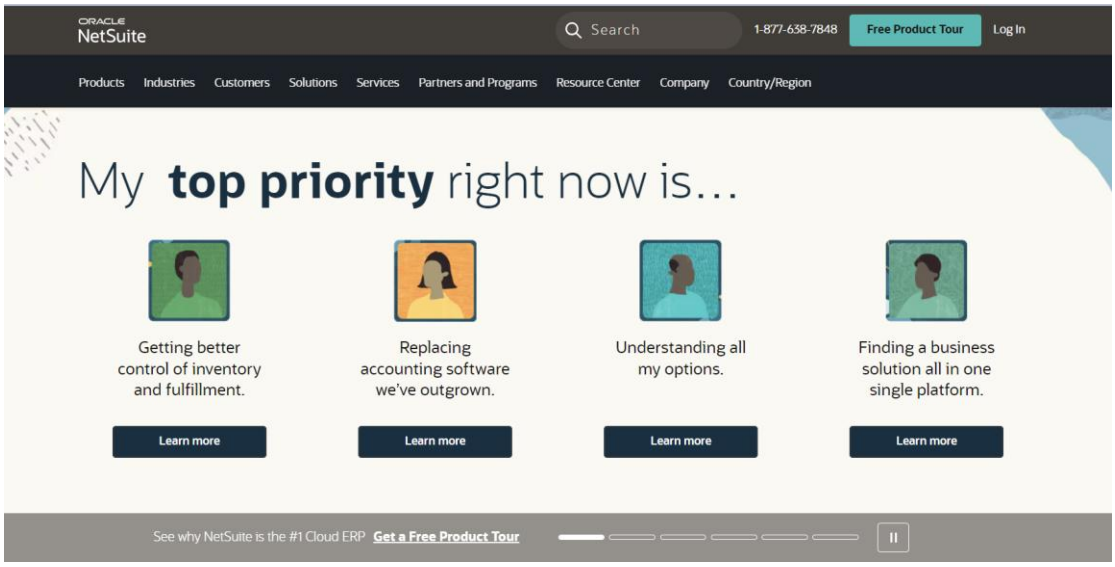


Figure 2.1.3.1 NetSuite's website image

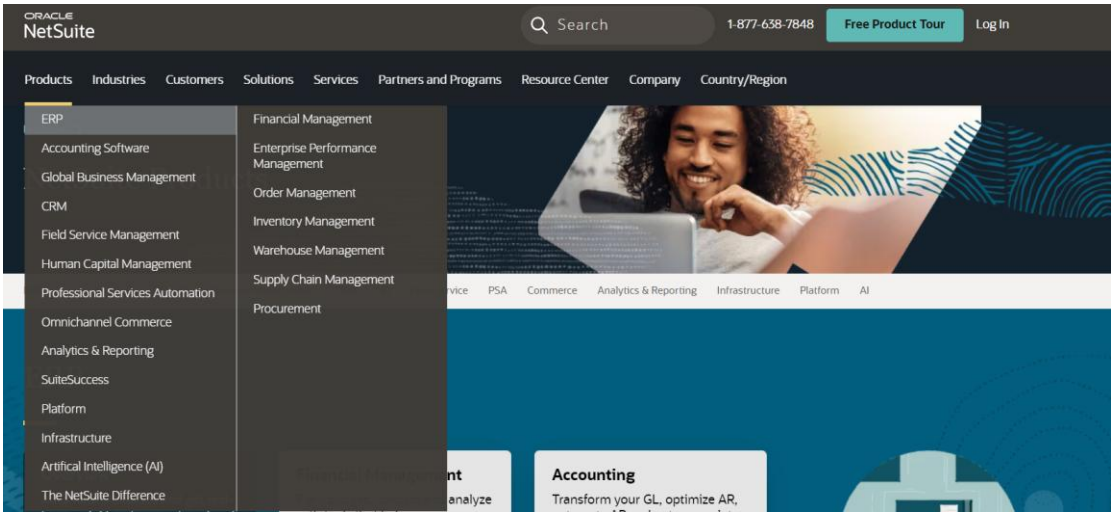


Figure 2.1.3.2 All the product provided in NetSuite

2.2 Limitation of Reviewed Inventory Management System

When reviewing the systems such as Odoo, Zoho and NetSuite exhibit limitation in term of easy setup and configuration. This limitation develops difficulties for users to have a straightforward setup process such as technical expertise or additional configuration steps. It makes the systems difficult to access and slow to deploy. Furthermore, all reviewed systems offer low or no-code customization functionality. This allows users easy to customize the functionalities, workflows, and interfaces of system without extensive programming knowledge. It promotes flexibility and adaptation to specific hospital needs through easy configuration rather than deep technical modifications.

Moreover, a more cost-effective approach is further exacerbated by the limitations of these systems in licensing and implementation fees. Hospitals opting for Odoo, Zoho or NetSuite must consider the total cost of ownership, including initial licensing fees and ongoing costs associated with maintenance and upgrades. It is making hard for hospitals with limited budgets to implement and maintain an inventory management system.

Scalability is a crucial factor in determining the long-term viability of inventory management systems for hospitals. Odoo and NetSuite are provided scalability, which capable of efficiently handling increasing data volumes, expanding user bases, and complex transactional demands. However, Zoho exhibits limitations in scalability. The limitation of scalability makes Zoho difficulties in maintaining system performance and responsiveness as hospital operational scale grows, which poses challenges in scaling up to meet the growing needs of hospitals. Additionally, all reviewed systems are offering strong community support. It is essential for open-source and community-driven software frameworks because it fosters development, supports customization, and improves software quality.

The limitations of the inventory management system had been reviewed and the limitations highlighted for enhancement to enhance the user-friendly, performance and operational efficiency within hospital management system. Considering these limitations, the proposed inventory management system emerges as a superior choice. Its comprehensive feature set and robust framework enable hospitals to customize workflows, interfaces, and functionalities with ease by leveraging low or no-code customization. The proposed inventory management system aims to provide an efficiency, effectively, and user-centric inventory management within hospital operations.

System / Functionality	Odoo	Zoho	NetSuite	Proposed System
Easy Setup and Configuration	✗	✗	✗	✓
Low / No-code Customization	✓	✓	✓	✓
Zero Licensing and Implementation Fees	✗	✗	✗	✓

Scalability	✓	✗	✓	✓
Community Support	✓	✓	✓	✓

Table 2.2.1 Summary of reviewed systems and proposed system

2.3 Proposed Inventory Management System

The proposed inventory management system is designed to streamline and improve inventory operations according to hospital needs. At its core, the system features a detailed dashboard that offers real-time visibility into inventory details, locations, and statuses, ensuring effective management of hospital assets and linens. It is different with the other system that might lack a strong tracking and monitoring function, this system consists real-time data collection for monitoring and tracking asset and linen. This functionality helps hospital administrator and staff to reduce losses of missing asset or asset, misplaced items and unnecessary workforce on paperwork.

Additionally, the system offers an intuitive interface which allowing user to easy navigation and use it. Hospital administrator and staff from various departments can quickly access the inventory data to monitoring and manage the asset and linen efficiently. This user-friendly design reduces training time on the system, boosting efficiency of using the system. The system also includes a robust system notification feature that provides timely alerts for asset maintenance, preventing interrupt in hospital operational. Moreover, the system helps hospital administrator and staff in monitoring and tracking asset and linen across multiple locations where important for hospitals with complex structures, allowing for centralized control of asset and linen inventory across different hospital departments or facilities.

Furthermore, the system offers security and compliance through role-based access control to protect the information data of hospital asset, linen and user,

ensuring the security of information within hospital system. By integrating these advanced features, the proposed monitoring information system aims to offer effective and efficient asset and linen monitor within UTAR Hospital.

2.3.1 Review on Frappe and ERPNext

Frappe Framework is an integrated web application framework primarily used for the development of robust business applications [17]. It basically provides the developer with an environment for the development of applications without much manual coding. The database used in this Python and JavaScript web framework is MariaDB which flexible and easy to integrate [18]. It is allowing user to easy maintenance and scalability of application such as ERPNext. Frappe comes with a user-friendly framework, an easy-to-use interface, and forms along with dashboards, all of which are customizable. These attributes make it play a crucial role in developing ERP system where improve the scalability, security, and efficiency of system. This modularly architected framework allows the development of complex applications and keeps them maintainable and adaptable to changeable business needs [17].

ERPNext is a robust open-source ERP solution built on the Frappe framework that offers an integrated suite of tools to maintain business operation [19]. This system includes a variety of applications for accounting, human resources, inventory management, CRM, and so on [18]. As the modular design of the system, organization can easily extend and design the system to their specific needs, thus, it is applicable for different types of business models. One of the key advantages of ERPNext is flexibility. It can be configured to efficient the workflow of many other departments within an organization with relative ease and thereby provide a single platform for operational management [19]. This flexibility is useful in Small and Medium Enterprises (SMEs) where the needs of various departments may be different, thus the customized solution is user-friendly to the user. With ERPNext strong on features, user-friendly in design, and customizable to a wide range, it can improve the effective and efficient of management system of company.

2.3.2 Review on QR Code for item

QR code which stand for Quick Response code is a two-dimensional barcode that stores information in a black and white square grid. In 1994, a Japanese Auto Parts Company Denso Wave developed it [20]. Its functionality is the same as that of a barcode but much faster as it reads the information within a few seconds. A QR code can stores data in numeric, alphanumeric, byte or binary and kanji format. Originally it is created for application in the tracking of automation, QR code is being implemented today in an immense range of industries, including retail, payment, and supply chain management. A QR code provides digital information, such as a website, product information, or inventory levels, immediately when read by a reader or smartphone scanner [20].

QR codes have been a highly popular inventory management tool due to their low cost, ease of implementation, and high data storage capacity [21]. In inventory management systems, QR codes offer a very effective way of tracking goods where real-time availability and accuracy are crucial. Unlike traditional manual hand record information, QR codes can effectively to carry more details information and can be read from generic mobile phones without the requirement of expensive scanning hardware [21].

In this project, every registered asset and linen item is generated a unique QR code through their id. When hospital staff scan the code using a mobile device, they can instantly view the key details of item like its type, location, and status. This can speed up their daily tasks and helps reduce mistakes from manual data entry. Integrated with the real-time database of system, the QR code feature makes it much easier for users to manage and track the status of item. Their simplicity, low cost, and flexibility make QR codes an ideal tool for modern inventory systems, helping hospital operation more efficiently while improving accuracy, security, and satisfaction.

CHAPTER 3

System Methodology

In the process of development, the project process which is dividing into several stages. There is system development of project, system requirements of project, functional requirements, project milestones and estimated cost.

3.1 System Development Models

In this section of the chapter, four different types of system development models are going to be evaluated and analyzed to choose the most appropriate model for implementation into this proposed project. These system models are also known as System Development Life Cycle (SDLC), which is dividing the development process into seven different phases. For instance, planning, analysis, design, development, testing, deploying software [22].

3.1.1 Waterfall Model

Waterfall model which is also called Linear-Sequential Life Cycle Model. It is an easy and simple way of system development based on a step-by-step process stage, which is also the logical approach of the SDLC process [23]. For example, it much likes the steps of cascading waterfall, the process flows logically from one step to the next step. Waterfall model can be easily understood and implemented by following basic sequential logic in software development, where each phase must be completed before the next phase starts. Phases proceed in a strictly sequential order without overlap [23].

Waterfall model is one of the earliest models in the software development process, presenting the process in a linear and sequential manner. The model is best suited for the project who requirement has been clearly and fixedly documented as definition and technology of project related are stable and well-understood. Since the

order of the stages during processing is strictly controlled in the project without overlapping, hence the project can avoid errors as much as possible.

Although it is structured, the Waterfall Model has a few limitations. One of its key drawbacks is its rigid framework, which makes it difficult to accommodate changes once the development process has begun. Any changes to project requirements often require revisiting earlier stages, resulting in increased risks and potential delays, particularly in complex or object-oriented projects. Furthermore, the model is less suitable for long-term or continuous projects, as its sequential nature prevents iterative feedback and adaptation. The integration of all components at the end of the process can be challenging, making it difficult to detect and resolve technical or business issues early in the procedure.

In conclusion, the Waterfall Model is the most effective when project requirements are well-defined, clear, and fixed. It provides a systematic development process that ensures clarity and organization. However, its limitations should be carefully considered, especially for projects that require flexibility or are subject to frequent changes, where alternative development models may be more suitable.

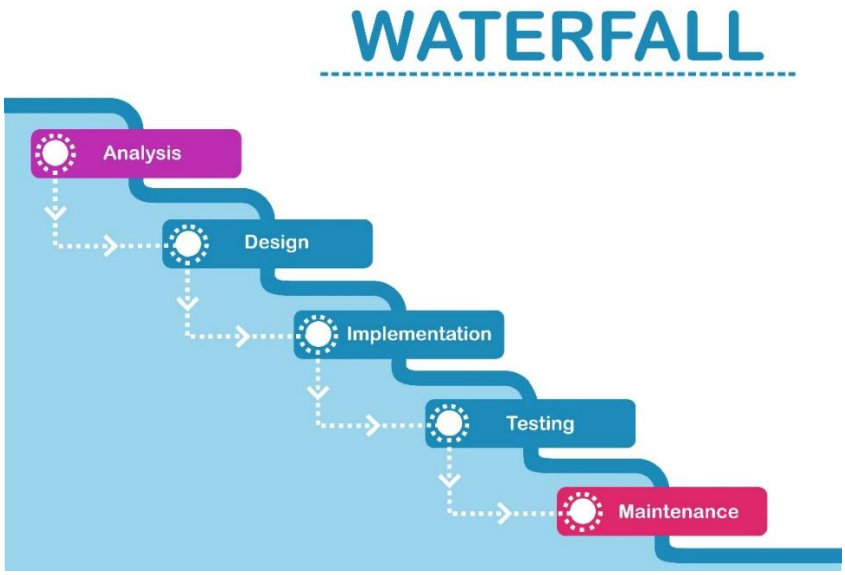


Figure 3.1.1 Waterfall model

3.1.2 Iterative Model

Iterative model initiates development with a basic implementation, dealing with a small set of requirements and progressively improving the system through repeated cycles [24]. The iterative model starts with an initial version of the software, making successive refinements. The portions of design, development, testing and implementation of the system are involved in every cycle, and each iteration is making the project better until it is ready for deployment. Detailed requirements at the earlier of a cycle are unnecessary, as this model produces supporting incremental development and adjustment. Each cycle produces an updated version of the software that facilitates continuing improvement.

The Iterative model is suitable for breaking down large application development into smaller pieces [25]. The pre-condition in working effectively with this model is a well-defined system requirement that needs to be clearly understood. The core requirements must be nailed down early in the development process. Since this is an evolving model, it requires a lot of resources, thus, this model would only be suitable for large projects. Also, the progress of the project depends on the management of risk factors. In addition, the continuous cycle of modifications and enhancements can lead to increased development time and resource consumption. Poorly managed iterations may introduce scope creep, where additional requirements are introduced beyond the original plan, potentially affecting project timelines.

In conclusion, the Iterative Model is well-suited for projects where requirements are flexibility at the beginning and where continuing improvements are necessary. It provides early visibility and adaptability, making it a preferred approach for complex systems that require continuous refinement. However, proper planning and scope management are essential to avoid unnecessary delays and inefficiencies.

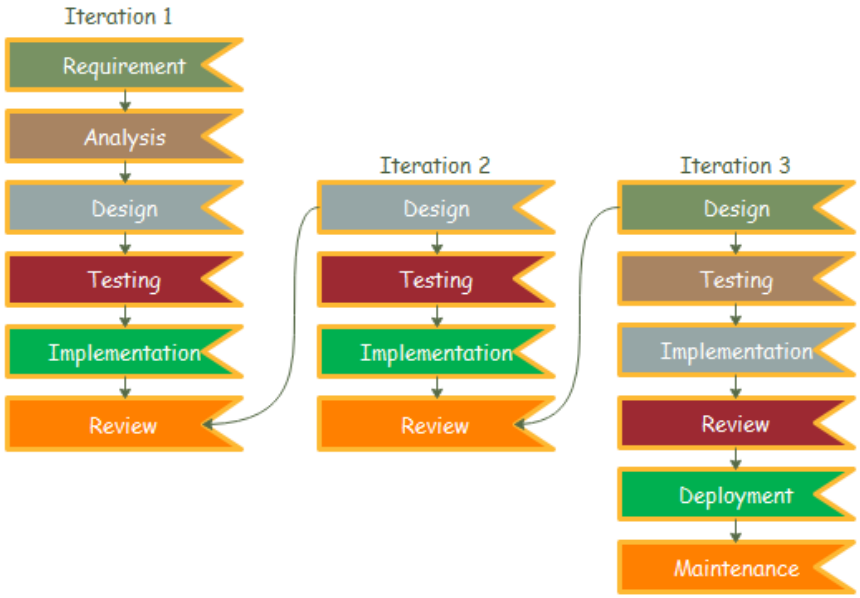


Figure 3.1.2 Iterative model

3.1.3 Agile Model

Agile model in system development focuses on satisfying the customer by directly involvement in evaluating the software. It is an iterative model whereby development in small increments, emphasizing quick turnarounds and the frequency of adjustments [26]. Agile model requires light upfront planning and works toward providing functional software at the end of each iteration. This model is best for small and short-term projects [26]. It provides more emphasis on teamwork and feedback at the end of each cycle of development. By collaborating closely with customers, which is allowing software teams easy to handle associated risks and feedback.

Agile model involves frequent testing and incremental adjustment. Therefore, it can detect problems early in the development phase of the program to reduce the chance of occurring major failures. On the other hand, this model may face challenges in situation with complex dependencies and involves more risk. The emphasis on constant iteration and adaptability can lead to a lack of comprehensive documentation, making it difficult to track progress and maintain consistency. Additionally, Agile model requires high team collaboration and engagement, which may be difficult in projects with large teams or geographically distributed members. The reliance of

model on frequent feedback also means that unclear or evolving stakeholder requirements can result in shifting priorities, potentially impacting deadlines. Therefore, the scope and functionality of the delivery should be strictly managed to maintain control and meet deadlines with careful adjustment.

The Agile Model is best suited for dynamic and fast-paced projects where requirements are expected to evolve. It promotes flexibility, collaboration, and faster delivery, making it ideal for software development environments that prioritize adaptability over rigid planning. However, successful implementation requires strong communication, discipline, and a well-structured workflow to maintain efficiency and project alignment.

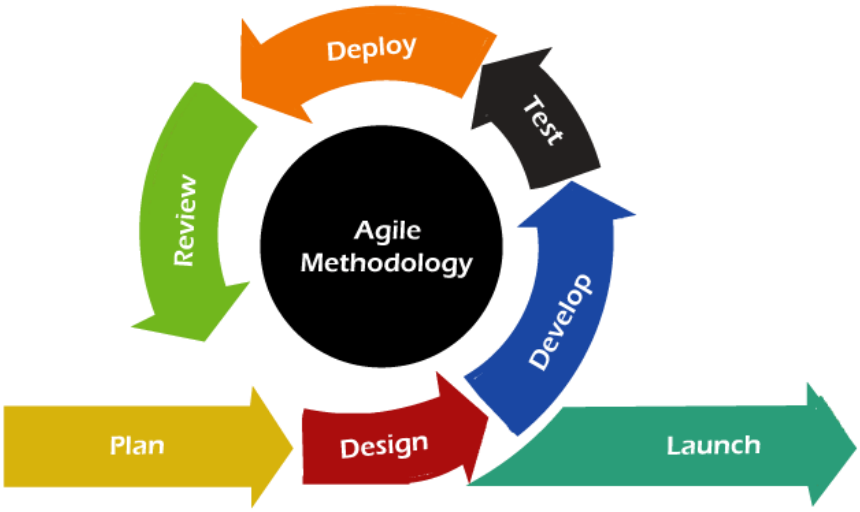


Figure 3.1.3 Agile model

3.1.4 Selected Model

The system development model selected to develop the asset and linen monitoring information system framework for UTAR Hospital is Agile model with an emphasis on continuous feedback, flexibility, and iterative design. The Agile model chosen for this project as agile allows changes and updates at any stage of development, making it suitable for projects that require refinements based on real-

world testing and stakeholder input. The Agile system development model is divided into six phases which are plan, design, develop, test, deploy, and feedback.

During the planning phase, the objectives had been finalized when discussions with the project supervisor are carried out to make sure that they are aligned with the requirements of UTAR Hospital. The setting up of the development environment involves the necessary installation of software tools, which is the Frappe framework, ERPNext on the development machines. Throughout this phase, requirements are continuously reviewed to accommodate any modifications requested by the hospital.

In the design phase, the system architecture, data flow, and user interfaces are planned. The primary focus is on designing asset and linen dashboards to provide real-time information for administrators and department managers. These dashboards are structured to display asset and linen tracking details, the availability, and status updates, ensuring seamless data retrieval and monitoring. Additionally, the system included alert feature to notify hospital employees of specific conditions, prompting timely actions.

The development phase focused on implementing core system functionalities, including front-end interface development using ERPNext and integrating asset and linen monitoring features. The system is built iteratively, ensuring that each feature is tested and refined before proceeding further.

During the testing phase, the system underwent accurate validation to ensure reliability, performance, and seamless functionality. The testing process included unit testing, where individual components are assessed for correctness, followed by integration testing to verify smooth communication between different system modules, such as the database and asset tracking functionalities. Additionally, user acceptance testing is conducted, allowing hospital staff to interact with the system and provide feedback on usability and effectiveness. Any bugs, inconsistencies, or requested modifications are addressed iteratively, ensuring that the system met

operational requirements before deployment. Through this phase, the ability of system to retrieve and update data accurately, trigger automated alerts, and maintain stable performance is thoroughly tested, guaranteeing a robust and efficient solution for asset and linen monitoring at UTAR Hospital.

In the deployment phase, the system is installed on the UTAR Hospital server. Essential configurations, including user role-based access control, are implemented to define permissions for hospital administrators, department managers, and staff. Additionally, necessary software and security settings are deployed to ensure data integrity and system stability.

Hospital staff underwent training sessions on system usage, covering aspects such as monitoring dashboards, updating asset and linen records, and responding to automated alerts. System integration tests are also conducted to verify seamless operation within the infrastructure of hospital.

The feedback phase played a crucial role in refining the system. Continuous input from hospital staff allowed for the real-time identification of usability issues, feature improvements, or new requirements. This iterative feedback loop ensured that the system evolved dynamically to meet the operational needs of hospital. After all the feedback from hospital management are handled and the system is launched in the UTAR Hospital to support their operation.

3.2 System Requirements

3.2.1 Software

Software tools played a crucial role in the project in terms of creating and developing an asset and linen monitoring information system framework for UTAR Hospital and hence need to be carefully selected. These software tools provided many different features to handle challenges during the development process. This helped

ensure a thorough approach to building and launching the system. These software tools included Oracle VM VirtualBox, Ubuntu server, Frappe framework, ERPNext and MariaDB.

Oracle VM VirtualBox:

Oracle VM VirtualBox is cross-platform virtualization software used to create and manage virtual environments. Since the system is hosted on the Ubuntu server, VirtualBox is required to launch the virtual machine before accessing the system. Every time the system is used, the VirtualBox must be started to initialize Ubuntu, retrieve the IP address, and access the web-based ERPNext system. This ensured smooth operation and allowed developers and users to interact with the system seamlessly.

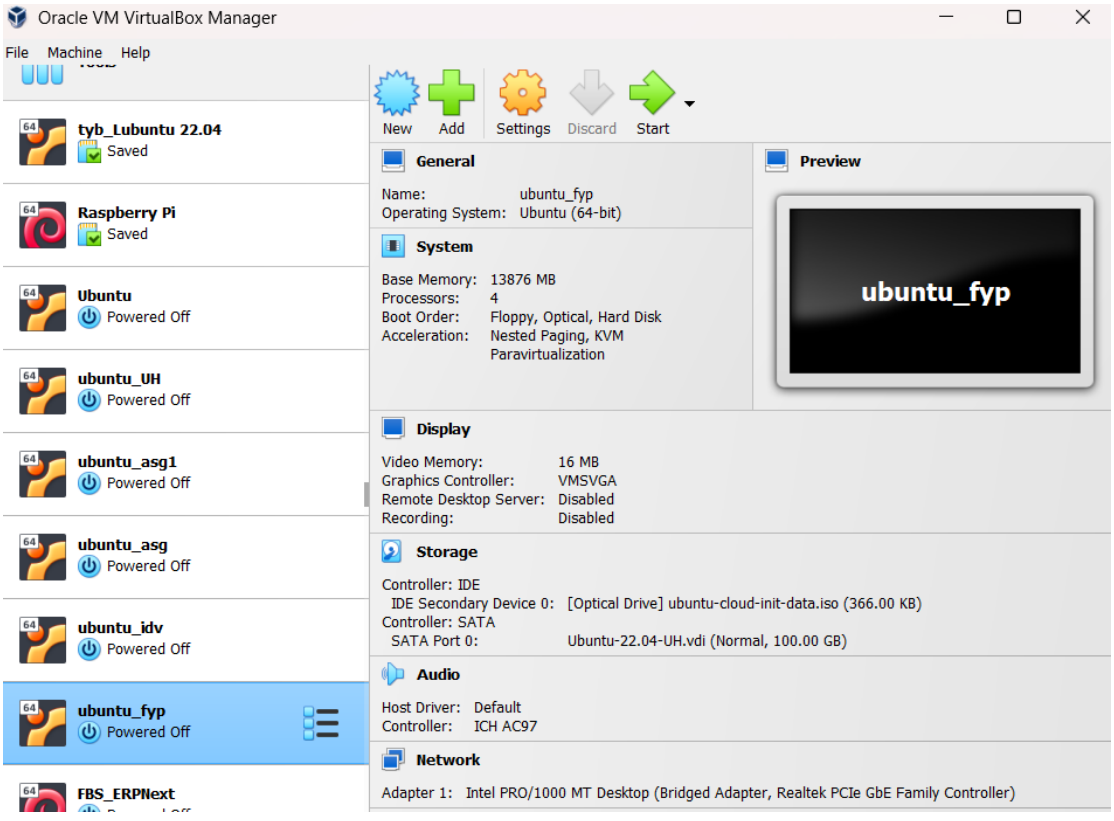


Figure 3.2.1.1 Oracle VM VirtualBox

Ubuntu Server:

Ubuntu Server is a user-friendly OS in Linux-based designed for efficiency handling and management of server tasks or services [27]. This will ensure everything keeps on running while requests are being processed. It is applied in running the Frappe Framework ERPNext web server, which provided an enterprise resource planning solution for managing hospital assets and linens. The setup had been helped in efficiently processing and managing various business operations through the ERPNext application.

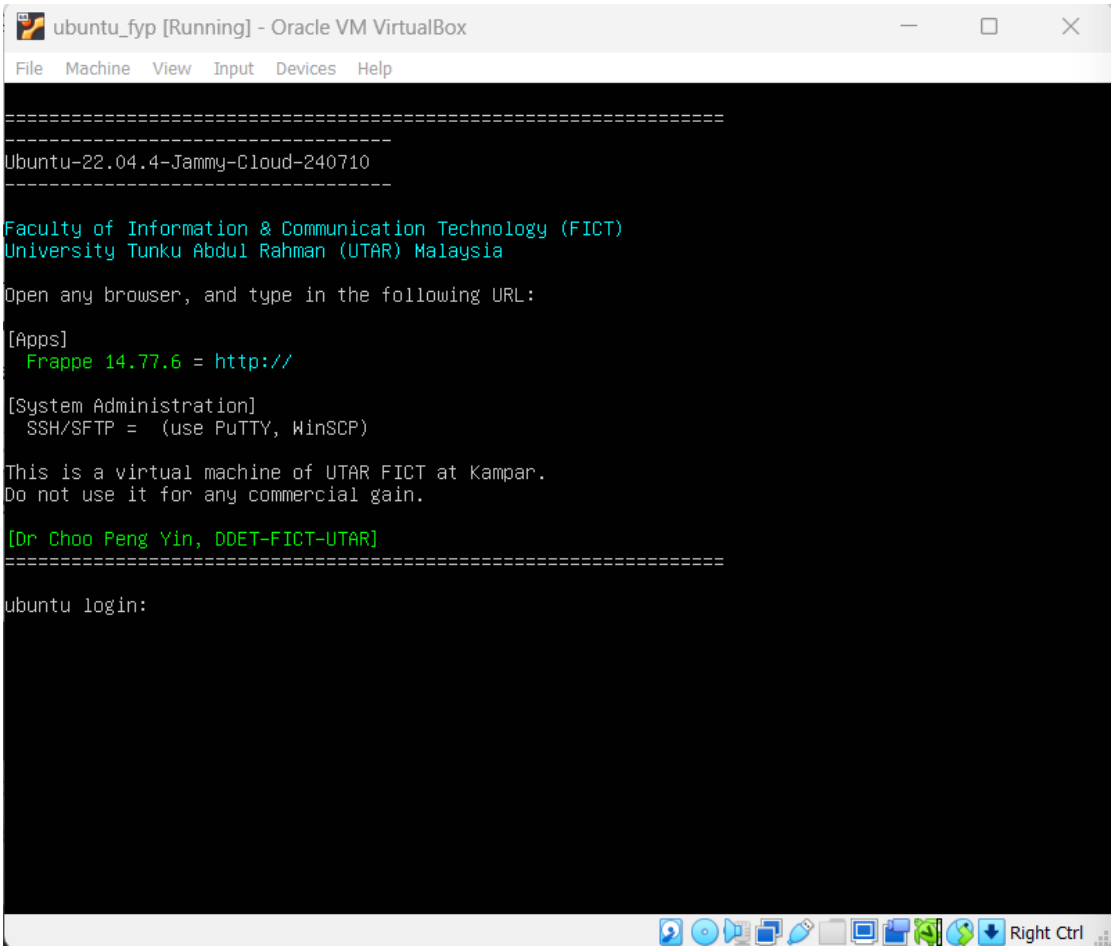


Figure 3.2.1.2 Ubuntu server

Frappe Framework:

A fast development and iterative design-backed web application framework; it is used to build the core functionalities of the system. It provided an overall strong base for developing an Asset and Linen tracking system, fully rich in all the demanded

features. For example, data management, user authentication and integration with ERPNext.

Figure 3.2.1.3 Frappe framework

ERPNext:

It is open-source ERP software integrated with the Frappe framework, providing modules for inventory, asset tracking, and reporting that make up the backbone of functionality. The primary function will work as the backbone, supporting all background operations of the system to make everything run smooth. For instance, update the latest status information of asset and linens, inform remarked asset or linen and asset PPM to user through system notification and display real-time dashboard.

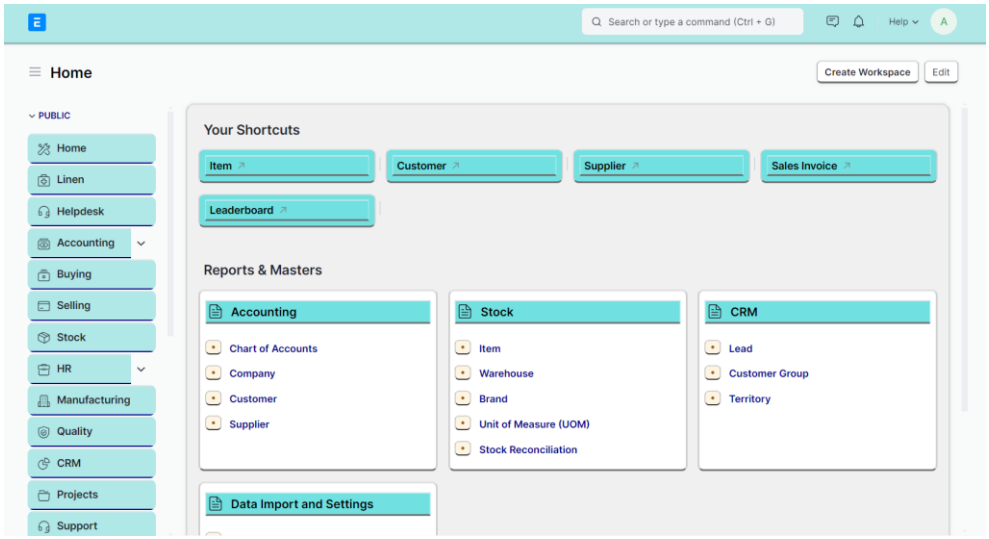


Figure 3.2.1.4 Overview of ERPNext website

MariaDB:

It is a robust and reliable database management system running for storing and managing data related to assets and linens. It would provide reliable and efficient data storage, retrieval, and manipulation, thus supporting the database needs of the system.

Figure 3.2.1.5 MariaDB

3.2.2 Hardware

Hardware tool in this project includes a desktop and android mobile device, which are the primary tools in all development and design processes.

Laptop:

The laptop which is offering all the functionality required to build and enhance the project, as it is the key tool for project software development and designs processes. It enables the configuration of the Oracle VM VirtualBox, Frappe framework, ERPNext, and Ubuntu Server, ensuring smooth execution of the project. Additionally, it also performs the role of a performance indicator of a project evaluating proper functionality and efficiency. By preventing interruptions, it allows in testing, debugging, refining the system and development to ensure that the project is completed.

Furthermore, some requirements are needed to launch the system in laptop smoothly. First, the laptop should at least consist of 4GB of RAM, a 64-bit CPU with 2 cores, and 40GB of available storage to install and run Oracle VM, Frappe

Framework, ERPNext, Ubuntu Server and database. Moreover, it is recommended that the laptop operates on Windows 10 or Windows 11 to ensure compatibility with Oracle VM. Additionally, the resources will be used to run Oracle VM, ensuring the laptop is met the minimum requirements for the installation. These specifications are essential to maintain a stable and efficient development environment.

Figure 3.2.2.1 Laptop

Laptop Specification:	Processor	:	Intel(R) Core(TM) i5-1035G1 CPU @ 1.00GHz 1.19 GHz
	Operating System	:	Windows 11 Home Single Language
	System Type	:	x64-based processor
	RAM	:	20GB
	Manufacturer	:	Acer Inc

Table 3.2.2.1 Laptop Specification

Smartphone:

An Android mobile device is an essential tool used for QR code scanning and quick asset and linen information retrieval. By using a built-in scanner or accessing tools like Google Lens, hospital staff can scan QR codes assigned to each item and instantly view key details such as location, status, and type. This real-time data

retrieval enhances operational efficiency, reduces manual data entry, and allows for more accurate tracking. The mobile compatibility ensures that staff can access critical asset information anytime, anywhere, making the system more flexible and user-friendly.

Furthermore, a few requirements are needed for supporting QR code scan and quick asset and linen information retrieval. First of all, the mobile device must have a scanner feature, either through a dedicated scanner or access to applications such as Google Lens that can detect and decode QR codes. It is able user to quickly access the system and view the details linen or asset item information. Next, the mobile device must be able to connect to Wi-Fi to ensure access to the internal hospital network, which is necessary for logging into the system and retrieving real-time data.

Figure 3.2.2.2 Android mobile device

Smartphone Specification:	Model	:	Redmi Note 10s
	Processor	:	MediaTek Helio G95
	Operating System	:	Android 13, MIUI 14

	System Type	:	Octa-core processor
	RAM	:	8GB
	Manufacturer	:	Xiaomi Inc

Table 3.2.2.2 Smartphone Specification

3.3 Functional Requirements

Functional specifications of the proposed project, "Asset and Linen Monitoring Information System Framework for UTAR Hospital," outline the requirement that the users should be able to efficiently monitor and control the hospital assets and the linens. The system developed with the Frappe framework ERPNext and executed on the Ubuntu server. The web-based application that enabled the user to log in to the system, control and monitor the data of the asset and the linen in real-time in an easy-to-use framework. Every entry of the asset and the linen contains the necessary details such as the location, status, last updated datetime, and the remarks so that the hospital staff can quickly look up and update the data whenever necessary. An easy-to-use dashboard provided the users the access to the details of all the assets and the linens such as the location, status, latest datetime of the updated.

This will also enable filtering and search by predetermined items or linens in the system and access data with speed and accuracy. Users may also be able to filter and search for a definite item based on different parameters including item epc, type of item, ownership, or date of the last updating, so that data is retrieved efficiently. Furthermore, the system provided updates in real-time so that the users are able to obtain real-time data. Such functionality would assist in ensuring that the hospital administration receives appropriate inventory and tracing as well as tracking data for the movement and status of their assets and the linens.

To enhance asset and linen management, the system included a QR code generation for scan functionality. A unique QR code is generated to each registered

asset and linen and can be printed and affixed to the item. Staff can utilize a mobile scanner to quickly access asset or linen details manually without having to search the database. An instant read-out of important details by scanning the QR code eliminates manual entry mistakes and provides a more efficient tracking system.

Additionally, the system offered an alert and notification function that is enable users to be informed of a specific condition. Users are given notifications in real-time when essential conditions are fulfilled. For instance, when an asset is upcoming for maintenance, when an asset item needs to be moved from one location to another and so on. The system provides notify the notifications through the system notification feature or send by email, thus facilitating action in a timely manner by the user.

Moreover, to improve security and accountability, the system integrated role-based access control, in which administrators can assign users' roles and permission levels to job functions. Their role ensured the authorized individuals can only make alterations to asset and linen records, minimizing chances of data inconsistencies or unapproved updates. An audit trail function is made available to monitor activities of users, noting who makes the alterations to the asset and linen records, the alterations effected, as well as the date and time of change. This promoted accountability, transparency, and a consistent system of hospital management.

The system also provided dashboard and data analysis capabilities, allowing users to generate dashboard on status of items, updated records, and dispose of item. These reports may be filtered and exported to be used for record-keeping, administrative decision-making, and compliance auditing. Furthermore, data visualization dashboards also gave insight into usage patterns of assets and linen distribution patterns to aid hospital management in minimizing wasted resources.

Lastly, the system provided secure and dependable access with web-based and mobile accessibility. The system can be easily accessible by hospital staff from their computer or from mobile phones with the local network, providing operational flexibility and secure access.

Functional	Description
Real-time Tracking	The system displays current information, location and status of linen and asset with search and filtering features.
QR Code Generation and Scanning	The system generates unique QR codes for each linen and asset item, enabling quick scanning via mobile device
Automated Alert and Notification	The system sends notification for maintenance due, remark linen and asset, and when asset item is required to move from a department to another department via dashboard or email.
User Authentication and Role-Based Access Control	The system allows hospital staff to securely log in and access system features based on assigned roles.
Asset and Linen Data Management	The system enables users to add, edit, update, and delete asset and linen records in real-time.
Audit Trail and Activity Logging	The logs of system changes to records, tracking who made modifications and when.

Table 3.3.1 Description for Functional Requirements

3.4 Project Milestones

3.4.1 Project 1 Milestones

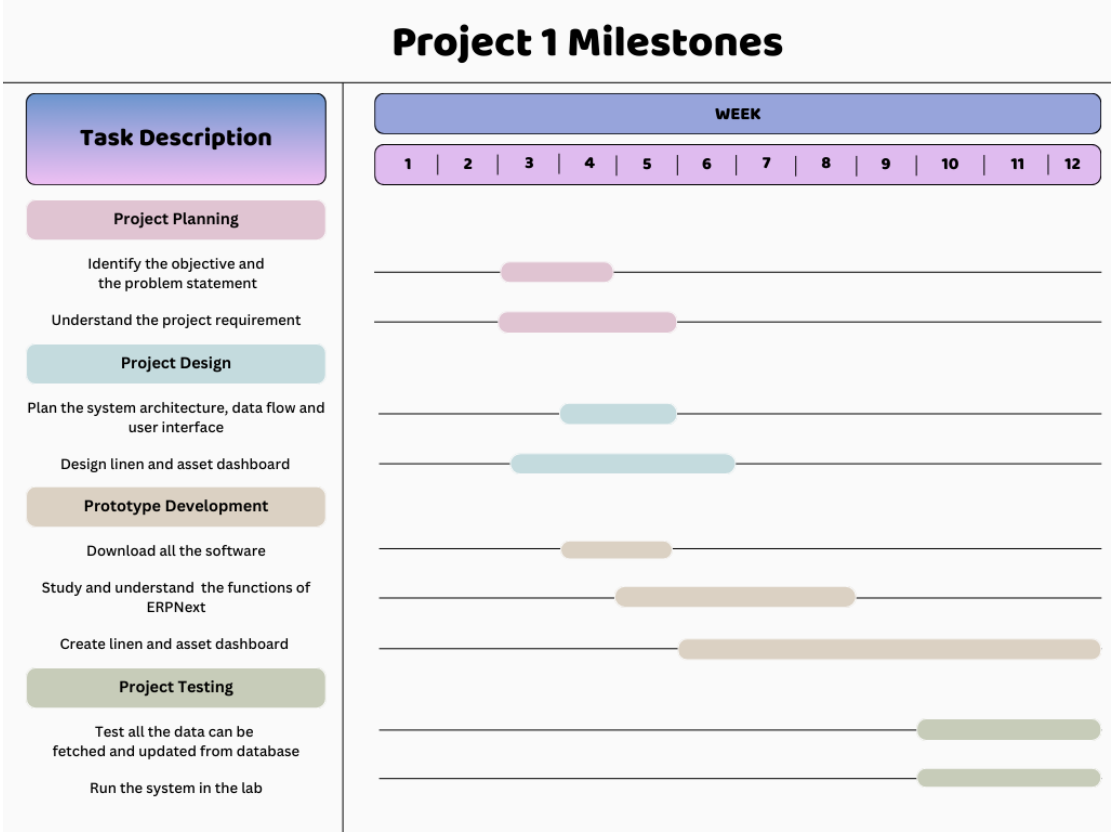


Figure 3.4.1.1 Project milestone for FYP 1

Figure 3.4.1.1 is a Gantt chart, clearly capturing the timeline and milestones for this duration of this 12-week Project 1. Project 1 started with the planning of the project, definition of the project objectives and problem statement with the supervisor during week 3, along with the understanding of the project requirements from UTAR Hospital and supervisor from week 3 to week 5.

Furthermore, from week 3 to week 6, the project concentration is on the design of the monitoring dashboard and plan the system architecture, data flow and user interface. This primarily involved designing the effective and efficient system.

During week 4 and week 5, the development phase of the project began with the download of all the software that would be needed. The next task will be to learn and understand the functionality of ERPNext that is happening from week 5 through

week 8. Creating and designing the linen dashboard will happen from week 6 until week 12.

Project testing which is in week 10 until week 12. At this phase, all the data will be tested to make sure it can be retrieved or even updated from the database and run executes. This structured schedule ensures every task operates within the allocated timeframe, thereby facilitating the smooth running and completion of the project.

3.4.2 Project 2 Milestones

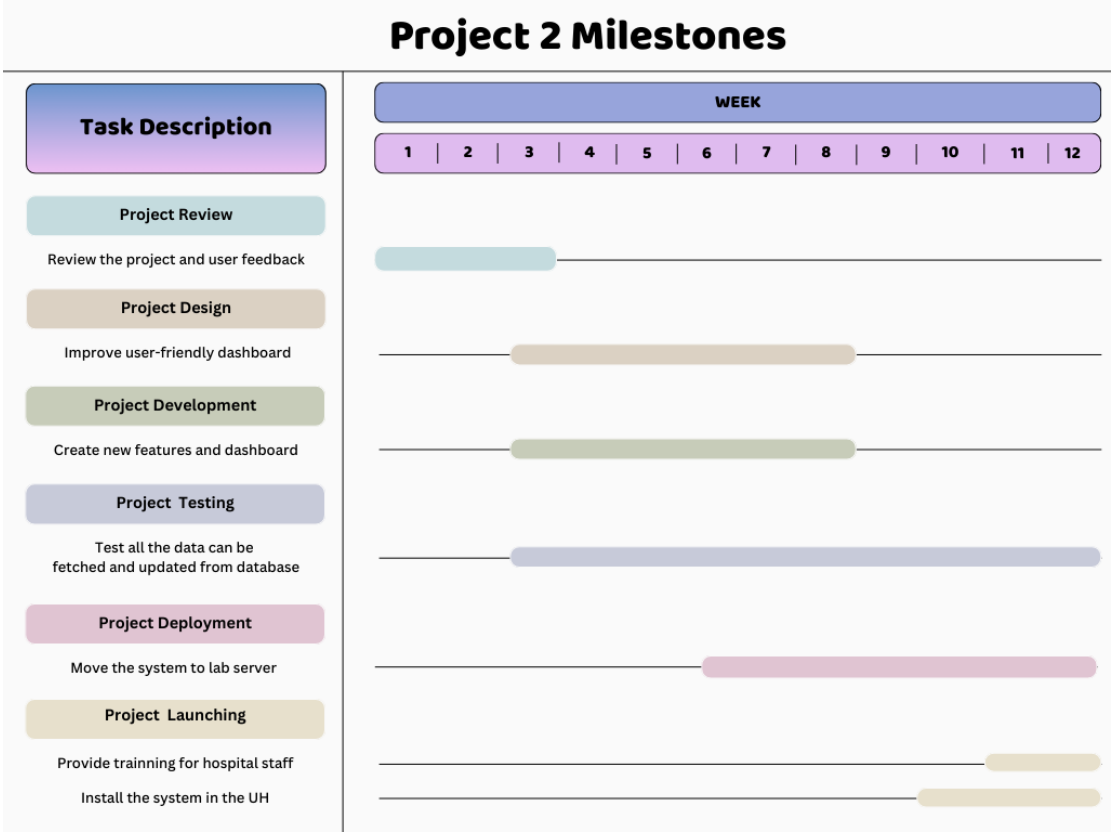


Figure 3.4.1.2 Project milestone for FYP 2

Figure 3.4.2.1 is the Gantt chart of Project 2 that explicitly displays the schedule, workflow and milestones of utmost importance for this stage of the Asset and Linen Monitoring Information System framework at UTAR Hospital. It is initiated from week 1 to week 3 by reviewing Project 1 results and gathering user feedback. By communicating with users, it is able to better understand the system

insufficient and improvement in its first use, and to adjust and optimize the function and interface of the system according to the real feedback.

Furthermore, from week 3 to week 8, the project concentration is on the development and design of the monitoring dashboard, and this primarily involved designing the user-friendly asset and linen dashboard, the features and details information. In all these steps, the system functionality is progressively advanced with a concentration on the improvement of the user-friendliness of the data monitoring dashboard by incorporating charts, list view and key data analysis cards to provide real-time monitoring of asset and linen data.

The system testing phase is planned between week 3 and week 12, both on functional modules such as fetching and updating and tracking asset and linen data. User feedback is collected in the phase of the testing, the system is looped back to the development and design stage to facilitate functional optimization and problem solving to ensure the reliability and stability of the system against actual usage.

The system is internally deployed and tested within the lab server between week 6 and week 12. Hospital staff of UTAR participated in the field test to further test the practicability and usability of the system by conducting test cases simulating actual operating conditions. The project will be in the deployment and launch stage at the end of the semester. The system will be deployed at the internal servers of hospital and staff will be trained appropriately to make the system operational daily. This structured schedule ensures every task operates within the allocated timeframe, thereby facilitating the smooth running and completion of the project .

3.5 Estimated Cost

There are without any costs to this project as all the tools and software utilized are open source and freely available. The system is developed using ERPNext, an open-source enterprise resource planning (ERP) system built on the Frappe

Framework. Both ERPNext and the Frappe Framework are distributed and accessible without any charge for a license.

Furthermore, the system is operated on Ubuntu Server. Ubuntu Server is a free download, install and use operating system based on Linux. The MariaDB database system for managing asset and linen information also open source and available provided without charge. Ubuntu Server is utilized by the project on a local machine in a VirtualBox virtual machine, which is downloadable at zero cost.

Additionally, for asset and linen tracking, a mobile device is utilized to scan QR codes. Users scanned the QR codes with the scanning functionality implemented through free mobile applications compatible with the system. The PC or laptop that deployed Ubuntu Server, mobile phones for scanning QR codes, QR Code printer and sticker are all contributed by UTAR Hospital. Therefore, there are zero hardware and software purchases to be encountered.

Since all essential tools and software are open-source items and hardware needed is contributed by hospital, there is without estimated cost needed to execute this project.

3.6 Concluding Remark

In the chapter 3, there is discussed the four types of system development models and agile model is selected since it is most suitable model for this proposed project. Furthermore, system requirement which outlines the software and hardware have been used in this project. Functional requirement is highlighted the actions that user can be done with the system when the project has been developed. Functional requirements outline what the system must accomplish to fulfil its objectives effectively. Moreover, the project milestones are showed the project timeline of the FYP 1 and FYP 2. Lastly, as all essential software and tools are open source and

hardware needed is contributed by hospital, therefore, without any estimated cost needed for project implementation.

CHAPTER 4

System Design

4.1 System Architecture

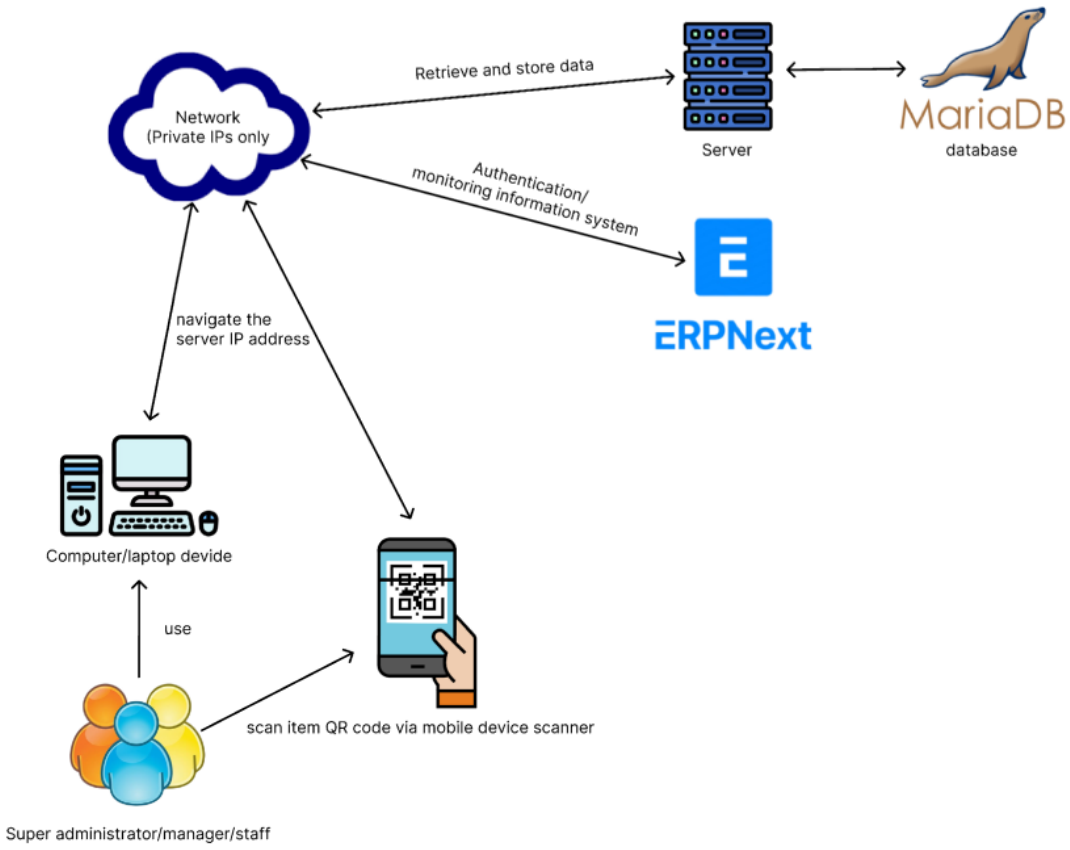


Figure 4.1.1 System architecture of the project

The system architecture of the proposed project “Asset and Linen Monitoring Information System for UTAR Hospital” is shown in Figure 4.1.1.This architecture is designed to provide a scalable, secure, and efficient framework system, specifically designed for monitoring and tracking hospital assets and linens, thereby enhancing the operational efficiency of UTAR Hospital. This architecture is designed to offer a more secure, scalability and efficient system framework. Several key components which consist in the architecture, each designed for a specific purpose within the system.

The Frappe framework ERPNext formed the backbone of the system, which integrated basic functionalities. For instance, user authentication, authorization, and advanced security features in the system. The role-based access control is included, which is one of the key functions in protecting UTAR Hospital sensitive data and information of hospital asset and linen items within the system. In this project, ERPNext is used to maintain and manage core functionalities regarding asset and linen monitoring on one platform for real-time data management and processing.

Server acts as the core of the centralization which hosted the ERPNext system, ensuring that all the data of asset and linen captured is processed, stored, and transmitted efficiently. All the updated information regarding assets and linens passes through the server to ensure in real-time the updated changes in the ERPNext system. It assisted hospital administrator and staff in monitoring and tracking the asset and linen of hospital with real-time data collection.

The system architecture of the project provided a robust foundation for its functionality, scalability, and security. The integration of a user-friendly interface with a dynamic dashboard, real-time data collection, and efficient monitoring capability ensures seamlessness and reliability in the use of the system. Full modularity and proper documentation ensure ease in future enhancements and maintenance, thereby making it a robust monitoring information system for asset and linen tracking and monitoring at UTAR Hospital. Figure 4.1.2 which has shown the Top-Down System Design of the project.

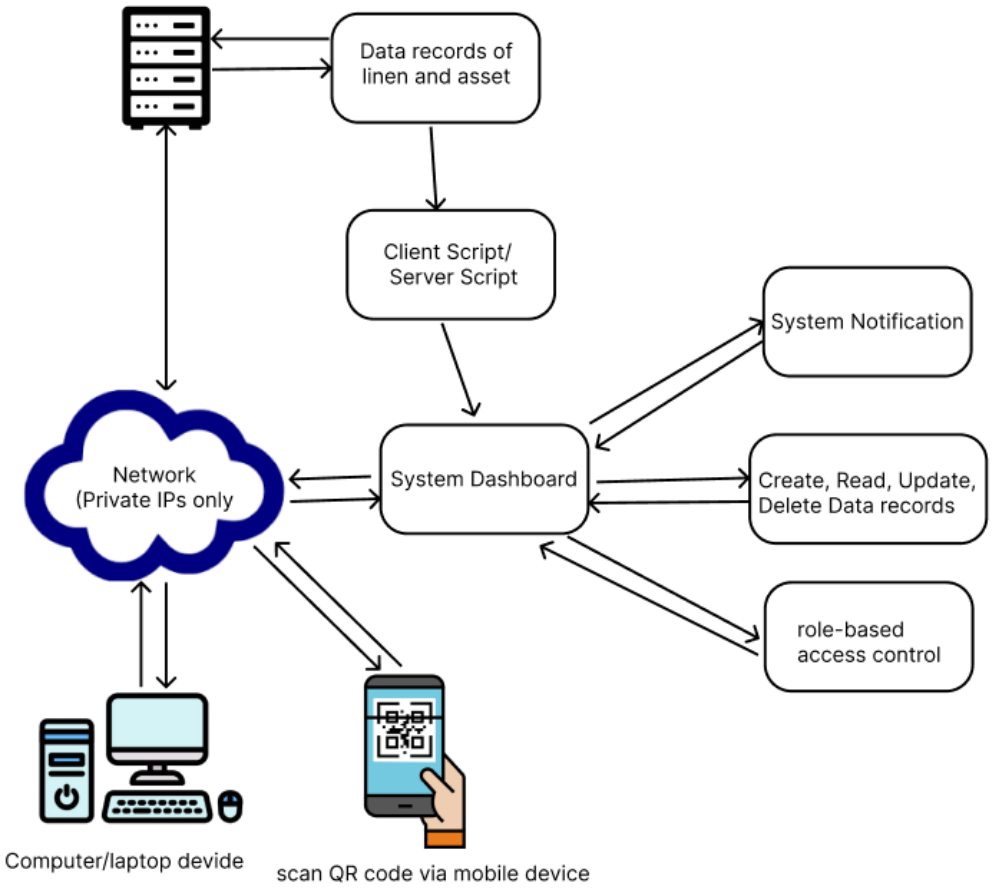


Figure 4.1.2 System design of the project

4.2 System Flow

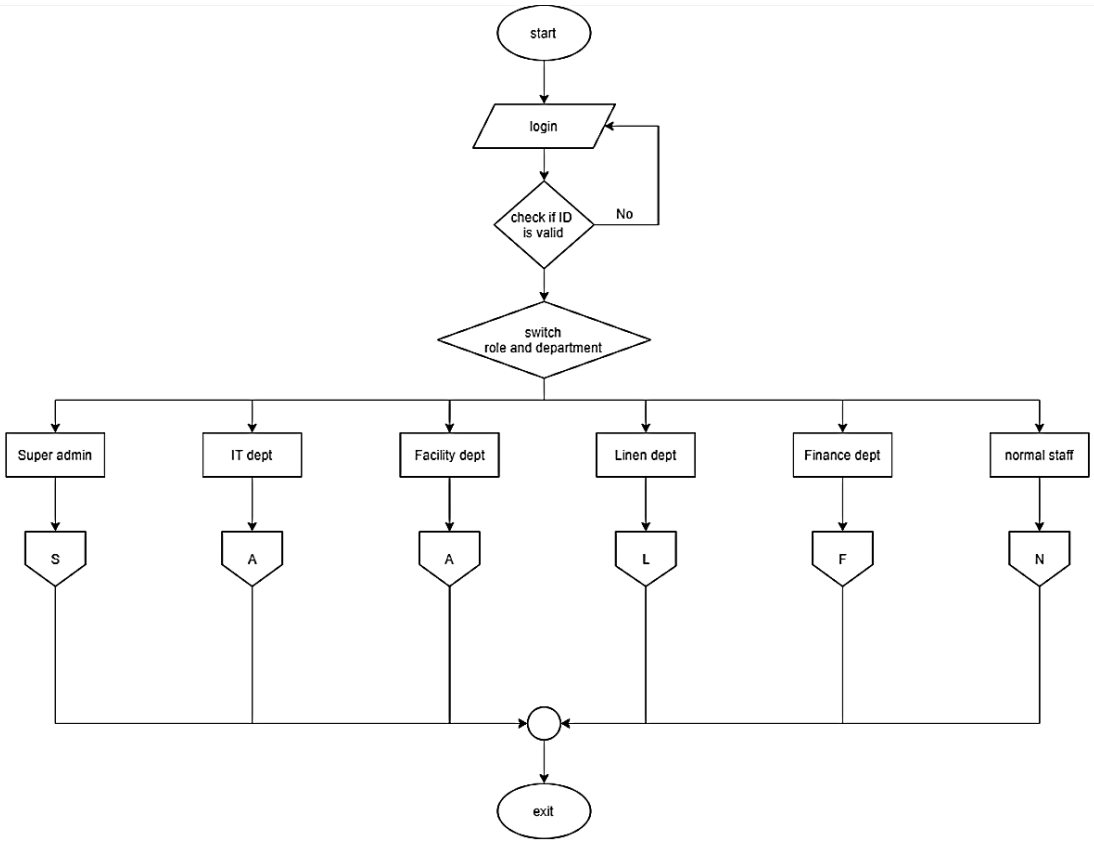


Figure 4.2.1 System flow for login

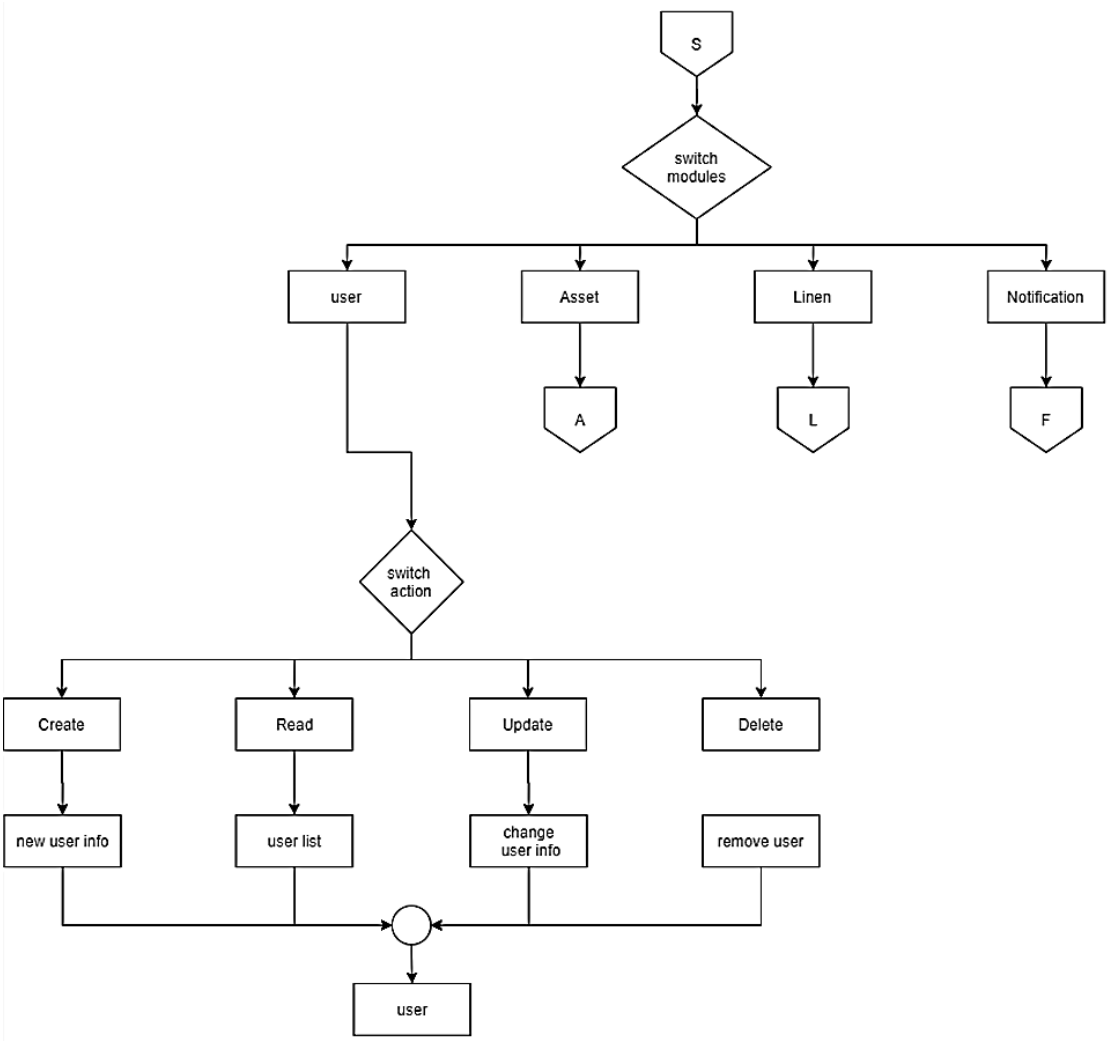


Figure 4.2.2 System flow for administrator and asset department dashboard

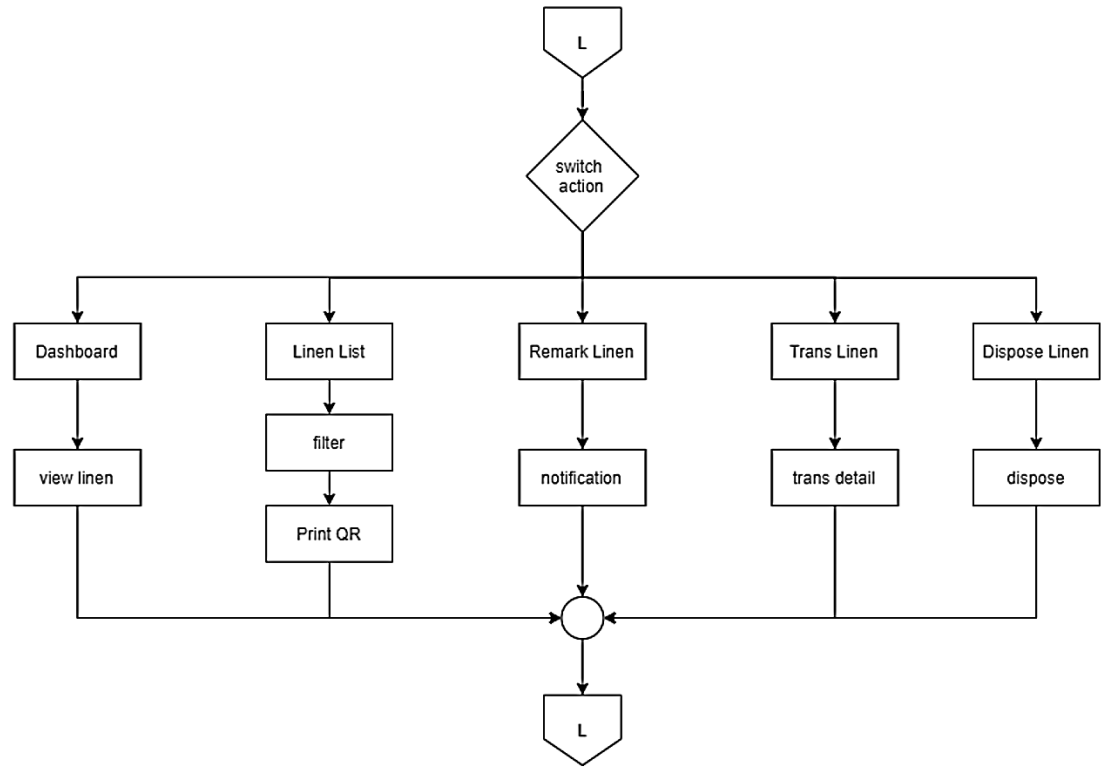


Figure 4.2.3 System flow for linen dashboard

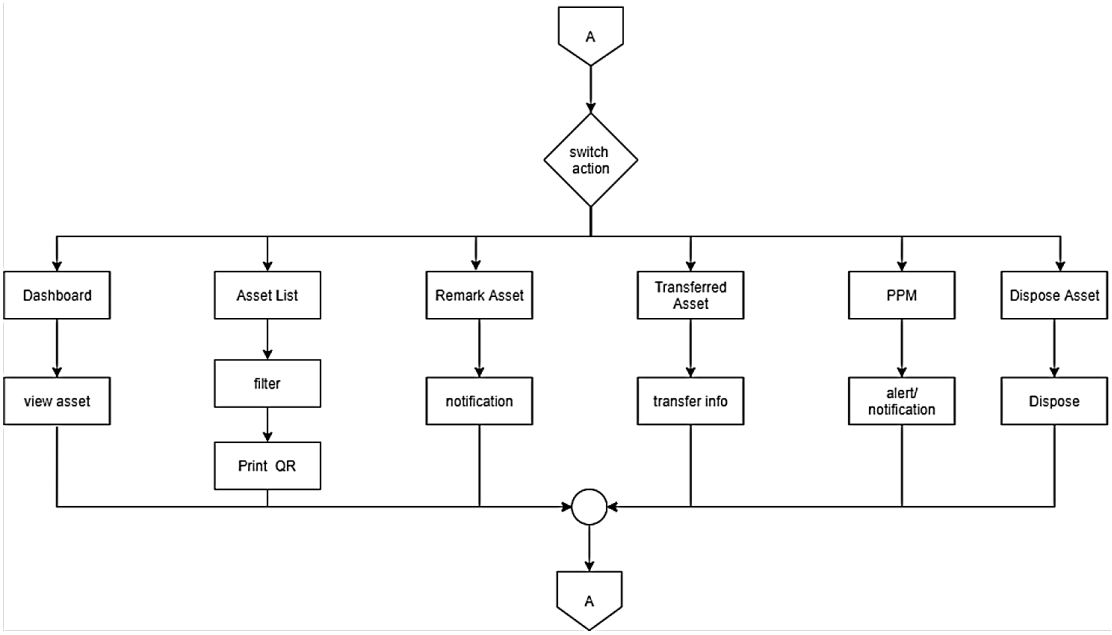


Figure 4.2.4 System flow for asset dashboard

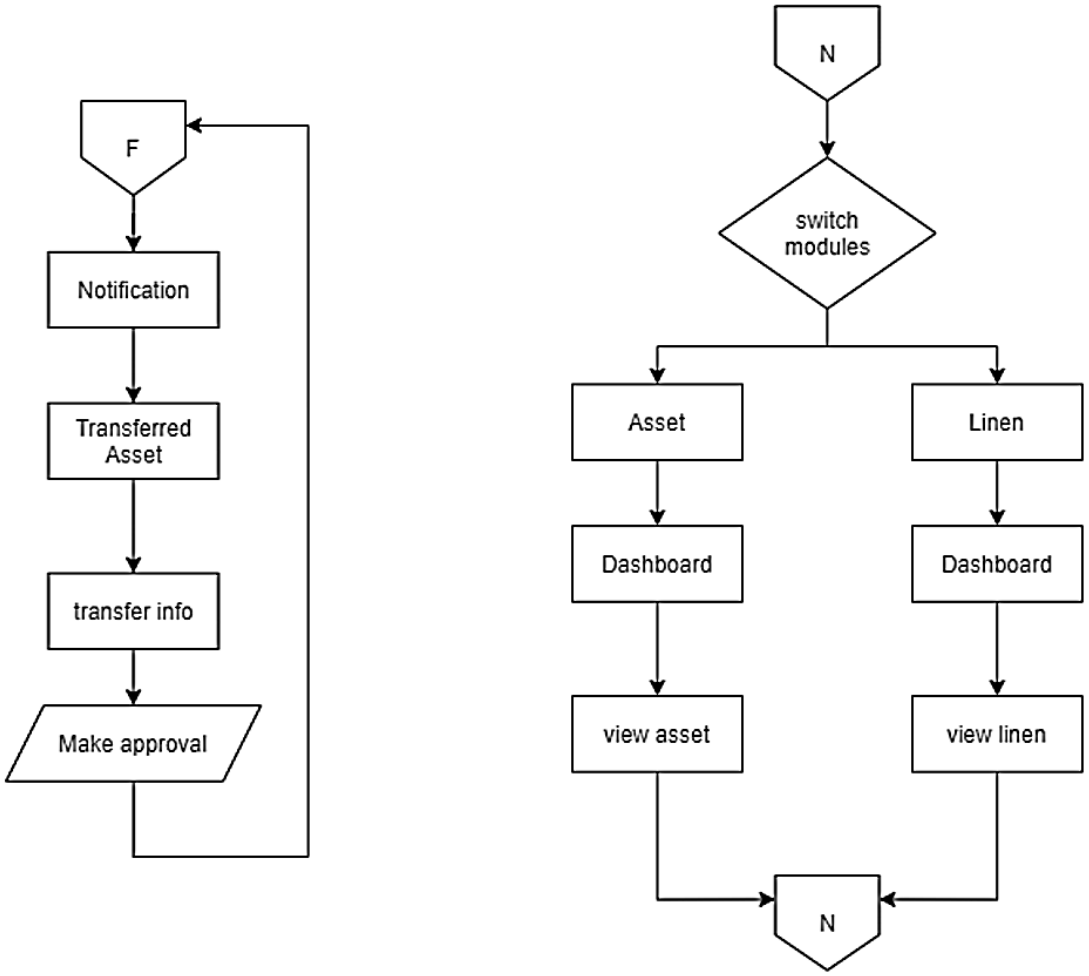


Figure 4.2.5 System flow for system notification and normal staff dashboard

The system flow of the "Asset and Linen Monitoring Information System Framework for UTAR Hospital" is structured to simplify the tracking of assets and linens within all departments of the hospital. This design integrated some major components in ensuring the system works effectively to provide the operational needs at the UTAR Hospital. This system implemented the frameworks with a Frappe framework ERPNext being installed on an Ubuntu server. It provided a user-friendly interface platform for monitoring and tracking assets and linens of UTAR hospitals in real-time.

System Components:

- User Authentication and Access Control

  First of foremost, the system offered a secure login process which authenticates users to ensure that only authorized people gain access to some special features. The system provided the functionality to manage users who must authenticate to the system using valid credentials to control their access based on the department and role level in the hospital. The system made accessible the protection of critical information, thus only those users in permission can access or change it.

- Departmental System Dashboard

  Only the super administrator is directed to the central control dashboard upon successful login. The other staff is presented with dashboards based on their department and role level. For instance, the department of IT, facilities, linen, finance, or general staff. Every department and different levels of positions have their own user specific dashboards and system functionality.

- IT and Facilities Management

  The system provided a user-friendly interface dashboard for the IT and facilities departments at UTAR Hospital which assist staff in monitoring and managing the assets of hospital much more effectively. It allowed creating, viewing, updating or deleting asset records with real-time monitoring. Users which are provided with filtering feature on the list of assets to get information about the history of a certain period and find information about their status. The system also supported transferring assets between departments and scheduling regular maintenance. Scheduled maintenance notifications and remarked assets are alerted through system notifications and sent to the relevant responsible person such as manager of relevant department and super administrator.

- Linen Management

  This dashboard is much like the IT and facilities management dashboard. Linen dashboard that deals with the tracking of linens belonging to UTAR Hospital. It offered the feature of viewing linen inventory, filtering of records, and getting the latest update about linen status. Besides, it also supported the ability to alert to remark problematic linen and keeps detailed records for more transparency and accountability.

- Asset Management

  The system enabled comprehensive asset management, allowing staff to register, update, and monitor hospital assets. Users can categorize assets based on type, location, and usage, ensuring accurate record-keeping. Asset conditions, depreciation tracking, and assignment to departments or personnel can be managed within the system.

- Asset Movement Tracking

  The system provided functionality to track asset movement within the hospital. Users can record asset transfers between departments, ensuring accountability and transparency in asset allocation. The system maintains a detailed movement log, allowing administrators and department managers to monitor asset locations and utilization.

- QR Code Integration

  To enhance efficiency, the system incorporated QR code functionality for asset and linen tracking. Each registered item is assigned a unique QR code, which staff can scan to retrieve details such as location, status, maintenance history, and assigned personnel. This feature streamlines record retrieval and improves accuracy in asset and linen management.

- Notification System

  The system which provided the feature of notification. It sent out system notifications for any critical condition regarding asset and linen. The alerts

will be sent when an asset has been transferred, asset maintenance schedule and asset or linen has a remark. It can enhanced the management and operation efficiency and effectively of UTAR Hospital.

Data Processing and Analysis:

- Real-Time Data Monitoring

  The system incorporated real-time data collection and processing to ensure the accuracy and timeliness of asset and linen detail information. The system processesed incoming data from multiple sources, such as RFID scan, gantry and user input for updating the information to track and monitor. It also applies data validation rules for data integrity and reduction of errors in keeping record.

- Customizable Reporting

  Users can generate personalized reports from the analysed data to clearly indicate data regarding asset and linen. The report generation facilities may be put to any such specific needs, like asset and linen summaries or trend analysis with respect to time, to provide flexibility and effectively for retrieving exactly the critical information in this regard.

User Interfaces

- ERPNext Dashboard

  It provides a comprehensive web-based dashboard for easily monitoring and managing asset and linen for UTAR Hospital. The users can directly know the information of the assets and the linens on this central system in real-time, thereby making them easily navigate. Users are allowing to track and monitoring real-time information about the inventory record, location, and maintenance schedules of assets and linens within the well-structured dashboard.

The system flow of proposed project "Asset and Linen Monitoring Information System framework for UTAR Hospital" is designed for the enhancement of the hospital in managing and monitoring assets and linens. Through real-time data, timely alerting, and user-friendly interfaces for hospital management, it helps to enhance operational hospital efficiency.

4.3 Use Case Diagram

The use case diagram illustrates the key functionalities and interactions within the asset and linen monitoring information system for UTAR Hospital. It is a visual representation of the interactions between users or actors and the system. It defines the functionality of system and how different user roles interact with its features. In this project, three primary actors such as administrator, department manager, and normal staff are identified. Each user role has specific responsibilities and privileges within the Asset and Linen Monitoring Information System. This outlines the core functionalities of the system and describes the interactions between users and system components.

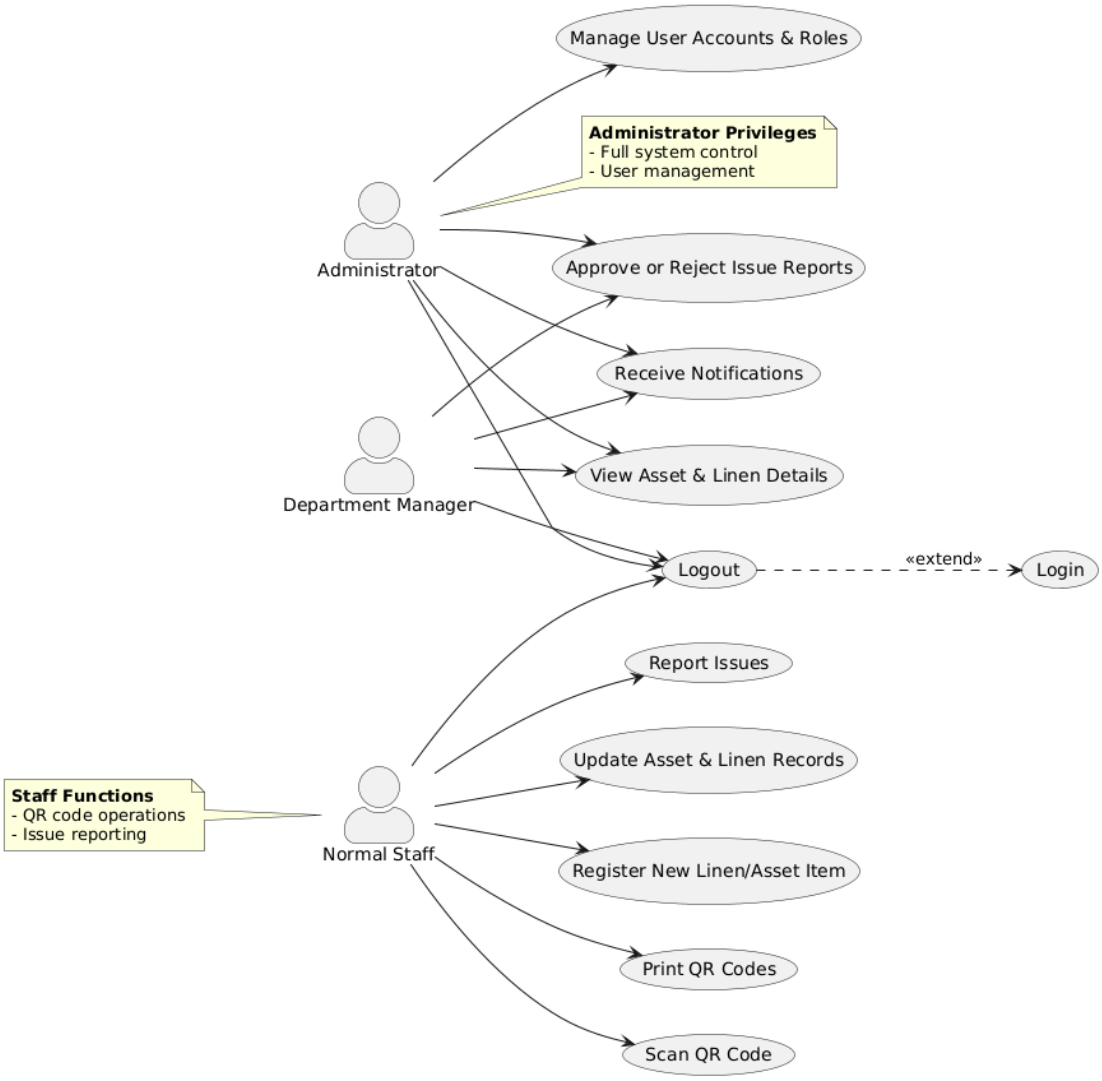


Figure 4.3.1 Use case diagram

User Roles	Responsibilities
Administrator	- Manages overall system operations - Handles user account management, including registration and role assignments - Monitors linen and asset records via the dashboard - Receives system notifications
Department Manager	- Monitors asset and linen status within their department - Approves or rejects reported issues submitted by staff - Receives system notifications - Generates departmental reports on asset and linen usage

Normal Staff	- Updates asset and linen records - Registers new linen and asset items - Views asset and linen details - Prints QR codes for linen and asset items - Reports issues related to missing or damaged assets

Table 4.3.1 User roles and responsibilities

The following are key system functionalities available to different users:

1. Login:

Actors: All users (Administrator, Department Manager, Normal Staff)

When users enter their credentials, system will verify login information. If authentication fails, users are prompted to retry or reset their password.

2. Scan QR Code:

Actors: All users

Users scan QR codes attached to assets and linens. System fetches and displays item details, including location, status, and last update.

3. View Asset & Linen Details:

Actors: All users

Users check the real-time status of tracked assets and linens. System provides details such as location, condition, and assigned personnel.

4. Report Issues:

Actors: Normal Staff

Normal staff report missing or damaged assets and linens. System logs the issue and sends notifications to the Department Manager and Administrator.

5. Receive Notifications:

Actors: Administrator, Department Manager

Administrators and department manager receive system notifications related to reported issues, asset movements and maintenance updates.

6. Approve or Reject Issue Reports:

Actors: Administrator, Department Manager

Department Managers and Administrators review reported issues. They either approve reports for further action or reject invalid reports.

7. Manage User Accounts & Roles:

Actors: Administrator

Administrators oversee user registrations and manage access roles. They ensure proper authentication mechanisms and role-based access.

8. Update Asset & Linen Records:

Actors: Normal Staff

Staff maintain and update information on tracked items. Users modify records when changes in status, ownership, or maintenance occur.

9. Print QR Codes:

Actors: Normal Staff

System generates QR codes for newly registered linen and asset items. Normal Staff can print QR codes for easy tracking.

10. Logout:

Actors: All users

Users securely log out to prevent unauthorized access.

The Use Case Diagram serves as a structured representation of user interactions within the Asset and Linen Monitoring Information System. By defining roles and corresponding functionalities, the system ensures efficiency in asset and linen tracking. The detailed description of use cases helps in designing and implementing a user-friendly system that meets operational needs effectively.

4.4 Activity Diagram

Activity diagrams visually represent the sequence of actions and decisions in a system, illustrating the flow of control between different activities. These diagrams provide an overview of system operations, making them useful for understanding user interactions and process automation.

4.4.1 Login Activity Diagram

The login activity diagram outlines how users gain access to the system. The process starts when a user enters their credentials. The system validates the input:

- If the credentials are valid, the user is redirected to the appropriate dashboard based on their role.
- If the credentials are invalid, the user is prompted to re-enter them. After multiple failed attempts, the user can choose to reset their password.
- The process ends once the user successfully logs in or exits the system.

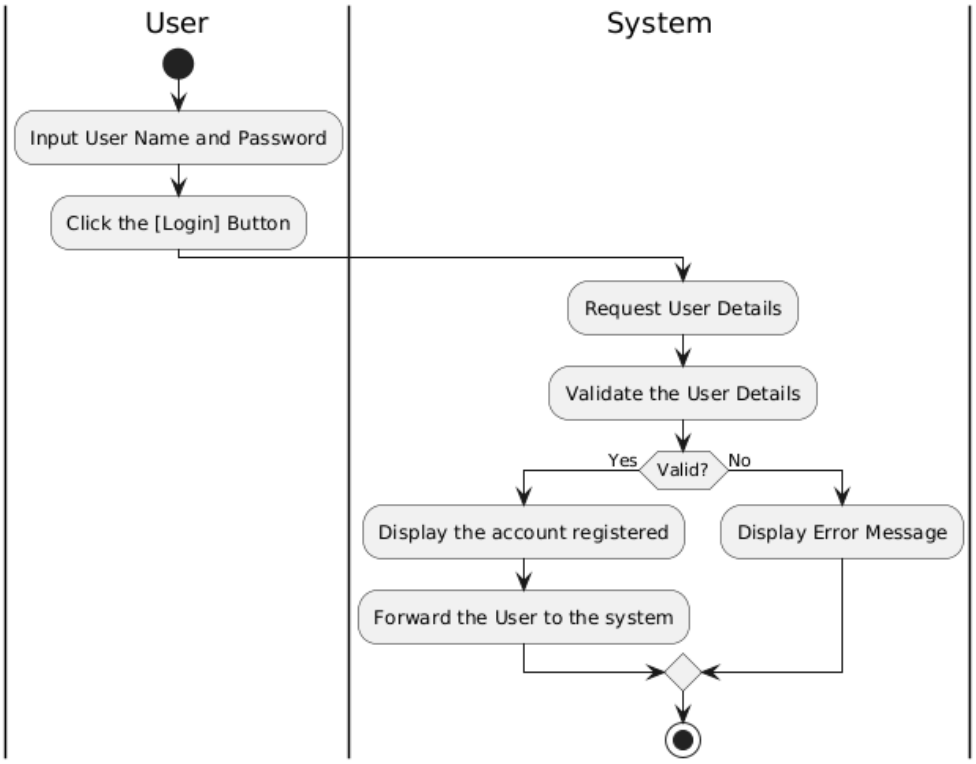


Figure 4.4.1.1 Login Activity Diagram

4.4.2 QR Code Scanning Activity Diagram

Users can scan QR codes on assets and linens to retrieve their details. The process follows these steps:

1. The user initiates the scanning process.
2. The system reads the QR code and verifies whether it matches a registered item.
    - If valid, asset or linen details such as location, status are displayed.
    - If invalid, an error message is shown.
3. The process ends once the user views the information or exits the scanning feature.

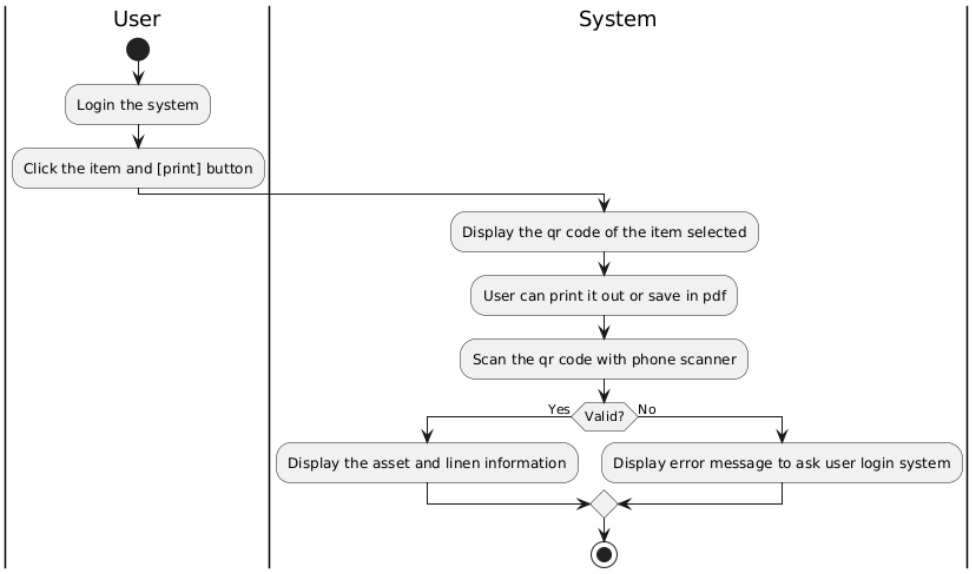


Figure 4.4.2.1 QR Code Scanning Activity Diagram

4.4.3 View Asset & Linen Details Activity Diagram

Users can check real-time information about assets and linens. The process follows these steps:

1. The user navigates to the dashboard.
2. The system retrieves the latest data from the database.
3. The details are displayed, including the status, location, and timestamp of item.
4. The user can close the view or return to the dashboard.

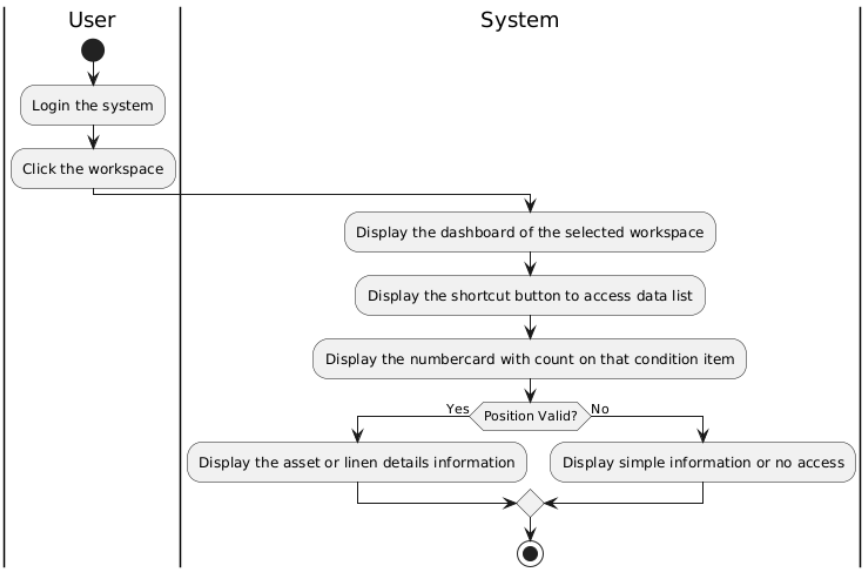


Figure 4.4.3.1 View Asset & Linen Details Activity Diagram

4.4.4 Report Issues Activity Diagram

Normal staff can report missing or damaged assets and linens. The process follows these steps:

1. The user selects "Remark Asset" or “Remark Linen” and enters the necessary details.
2. The system records the issue and notifies the responsible department manager and administrator.
3. The process ends when the report is successfully submitted, or the user cancels the action.

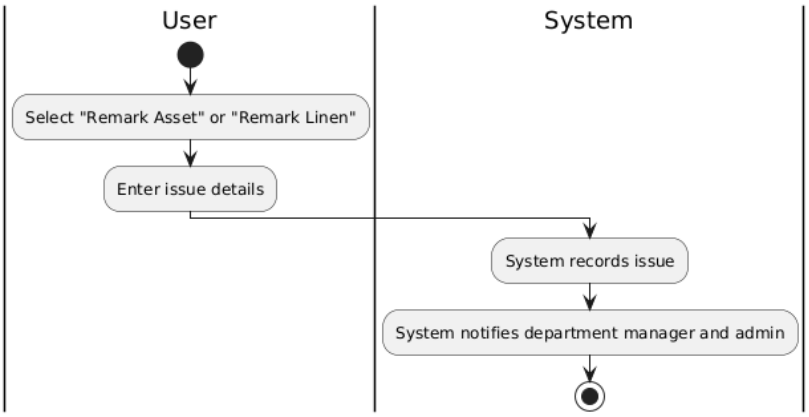


Figure 4.4.4.1 Report Issues Activity Diagram

4.4.5 Approve or Reject Issue Reports Activity Diagram

Department managers and administrators review reported issues. The process follows these steps:

1. The user (manager/admin) accesses the "Issue Reports" section.
2. The system retrieves and displays all reported issues.
3. The user selects an issue and chooses to either approve (for further action) or reject (if invalid).
4. If approved, maintenance or replacement is scheduled, and a notification is sent to staff.
5. The process ends once the action is completed.

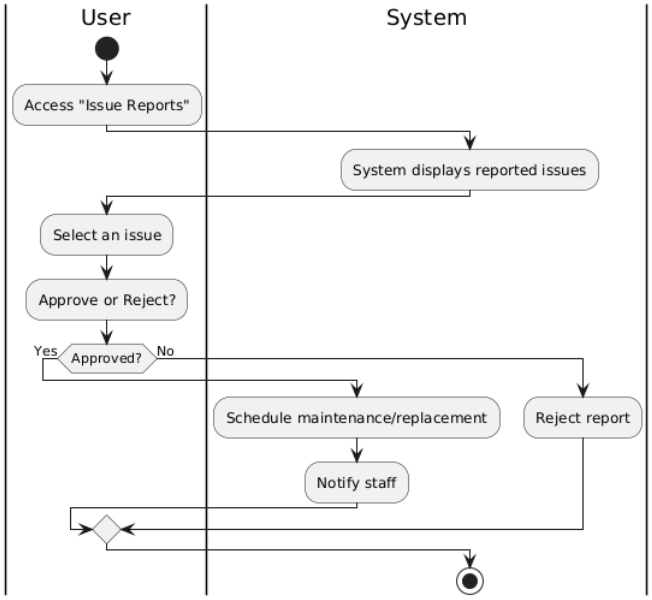


Figure 4.4.5.1 Approve or Reject Issue Reports Activity Diagram

4.4.6 Update Asset & Linen Records Activity Diagram

Staff can update asset and linen records to reflect changes in status or location. The process follows these steps:

1. The user selects an asset or linen item to update.
2. The system retrieves the existing details of item.
3. The user edits the necessary fields (e.g., status change, department transfer).
4. The system validates and saves the changes.
5. The process ends once the record is successfully updated.

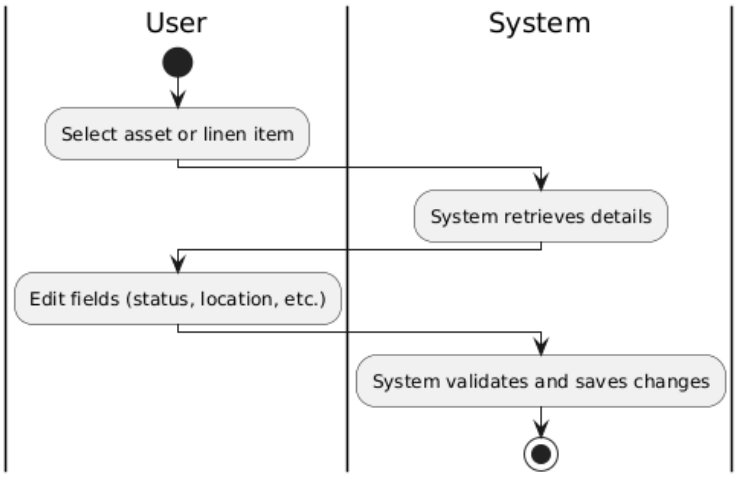


Figure 4.4.6.1 Update Asset & Linen Records Activity Diagram

4.4.7 Print QR Codes Activity Diagram

Staff can generate and print QR codes for new assets and linens. The process follows these steps:

1. The user selects "Generate QR Code" for a specific item.
2. The system creates the QR code.
3. The user previews and prints the QR code.
4. The process ends once the QR code is successfully printed.

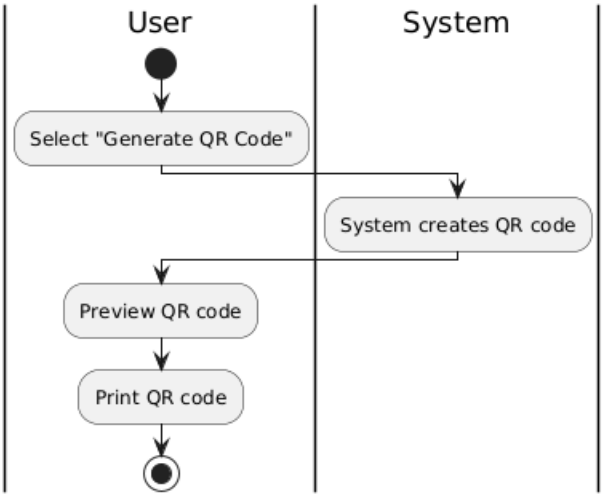


Figure 4.4.7.1 Print QR Codes Activity Diagram

4.4.8 Receive Notifications Activity Diagram

Administrators and department managers receive notifications to take necessarily action on item of asset or linen. The process follows these steps:

1. The system generates notifications based on predefined triggers (e.g., new issue reported, asset movement).
2. The user views the notification and takes action if needed.
3. The process ends once the notification is reviewed.

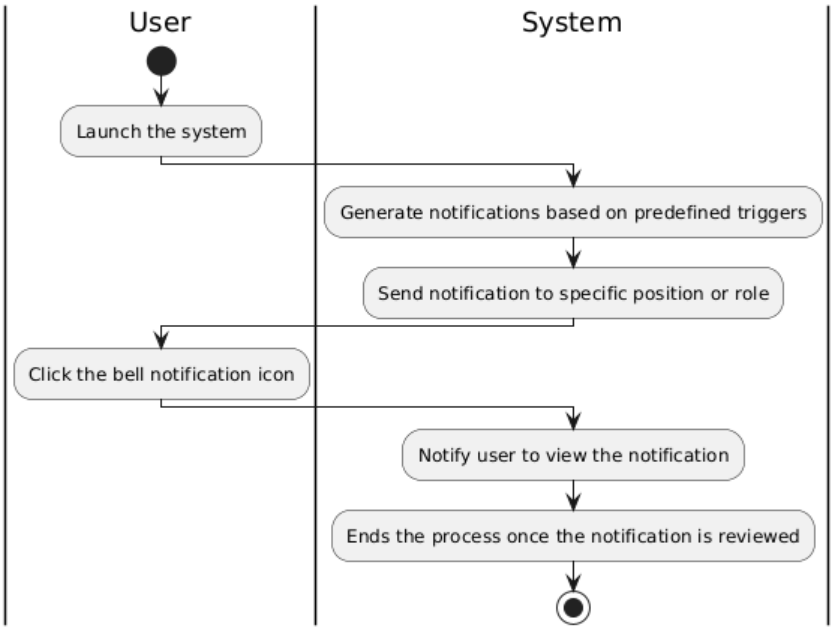


Figure 4.4.8.1 Receive Notifications Activity Diagram

4.4.9 Logout Activity Diagram

Users can log out to secure their accounts. The process follows these steps:

1. The user clicks the "Logout" button.
2. The system ends the session and redirects the user to the login page.
3. The process ends once the user is logged out.

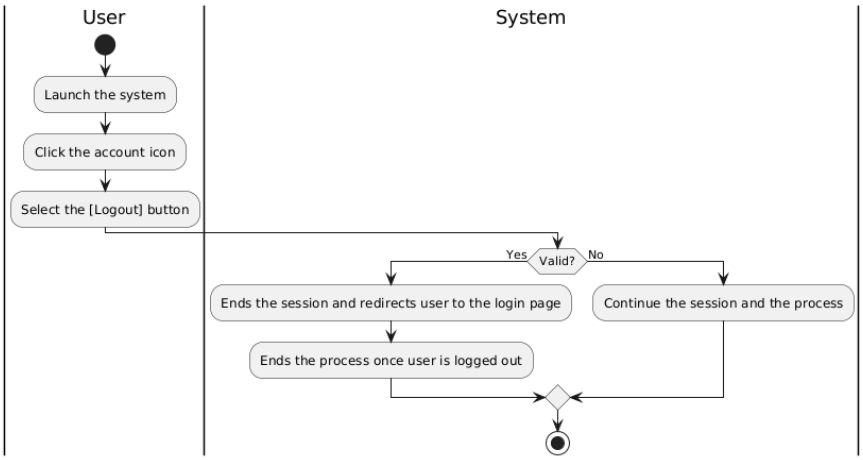


Figure 4.4.9.1 Logout Activity Diagram

The activity diagrams provide a structured representation of how users interact with the system. By visualizing processes like login, issue reporting, and asset tracking, these diagrams ensure clear understanding and efficient system operation.

4.5 Database Design

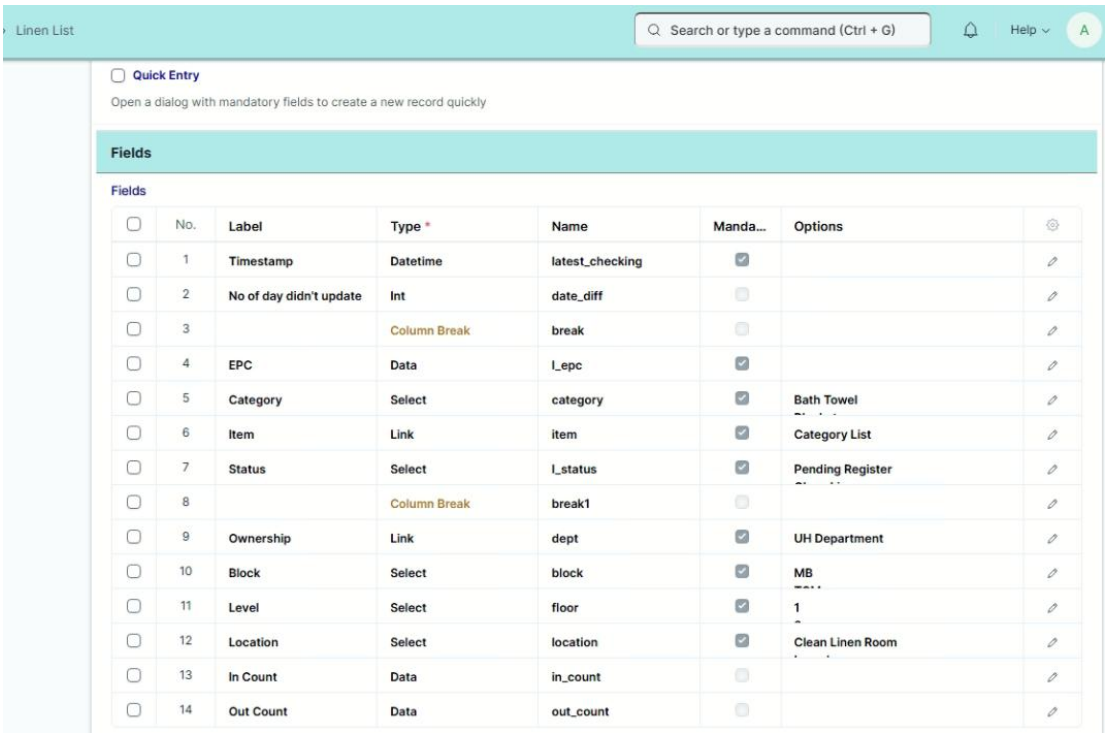
Database design is a crucial component of the Asset and Linen Monitoring Information System Framework for UTAR Hospital, as it defines the structure and organization of the data required to manage hospital assets and linen records effectively. A well-structured database ensures that information such as item registration, item status tracking, transaction record, and disposal record can be retrieved efficiently, maintained accurately, and protected securely. The database is implemented using MariaDB, a robust and open-source relational database system, integrated into the ERPNext platform to support real-time data operations. Each table, DocType in the system stores specific fields that reflect real-world hospital operations.

Below is a detailed of the key database tables designed for this system:

Linen List

The Linen List Table maintains records of all linen items, with fields such as epc, item, ownership, location, status, linen in count, linen out count, timestamp and so on.

These fields allow hospital staff to easily track the status, usage, and inventory movement of linens over time to ensure proper inventory control and operation.



No.	Label	Type *	Name	Manda...	Options
1	Timestamp	Datetime	latest_checking	☑	
2	No of day didn't update	Int	date_diff	☐	
3		Column Break	break	☐	
4	EPC	Data	l_epc	☑	
5	Category	Select	category	☑	Bath Towel
6	Item	Link	item	☑	Category List
7	Status	Select	l_status	☑	Pending Register
8		Column Break	break1	☐	
9	Ownership	Link	dept	☑	UH Department
10	Block	Select	block	☑	MB
11	Level	Select	floor	☑	1
12	Location	Select	location	☑	Clean Linen Room
13	In Count	Data	in_count	☐	
14	Out Count	Data	out_count	☐	

Figure 4.5.1 Linen list table

Asset List

The Asset List Table stores records of all hospital assets, including fields such as epc, item, category, department, location, status, ownership, block and floor. Additional fields like maintenance date and timestamp capture the maintenance date of asset and its most recent modification timestamp, ensuring traceability of asset records across the hospital. It acts as the central reference for managing all physical assets registered within UTAR Hospital.

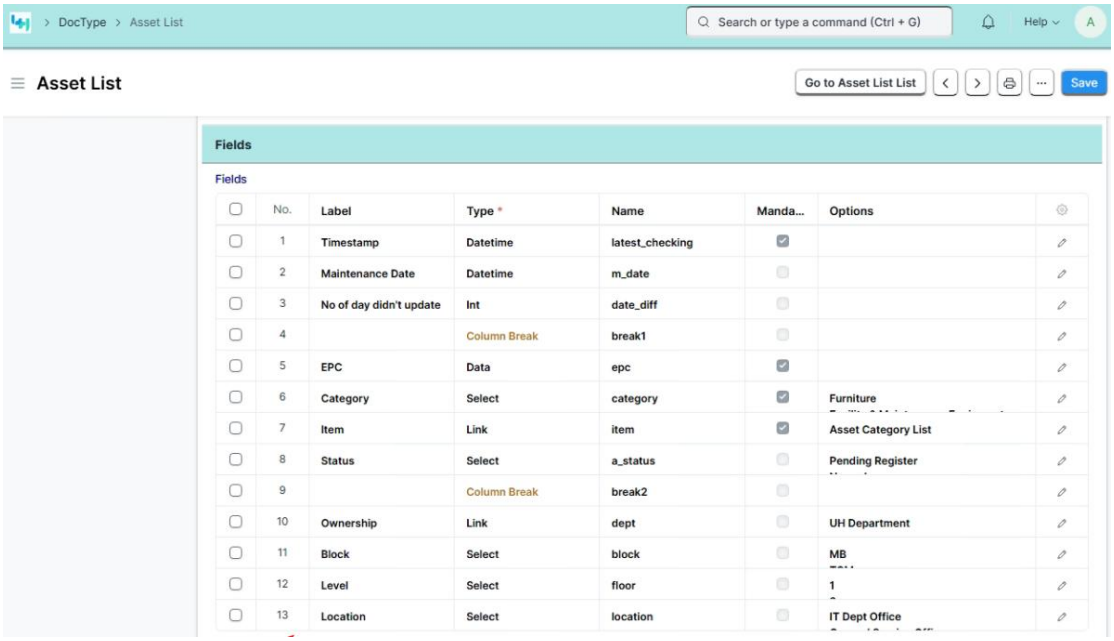


Figure 4.5.2 Asset list table

Dispose Item List

Disposed items are stored separately in the Dispose Item Table, which includes fields such as epc, item, category, ownership, and location, block and floor. This enables the hospital to keep an audit trail of all disposed assets and linens, along with the detail information for their removal from active use. This is ensuring traceability and compliance with hospital procedures.

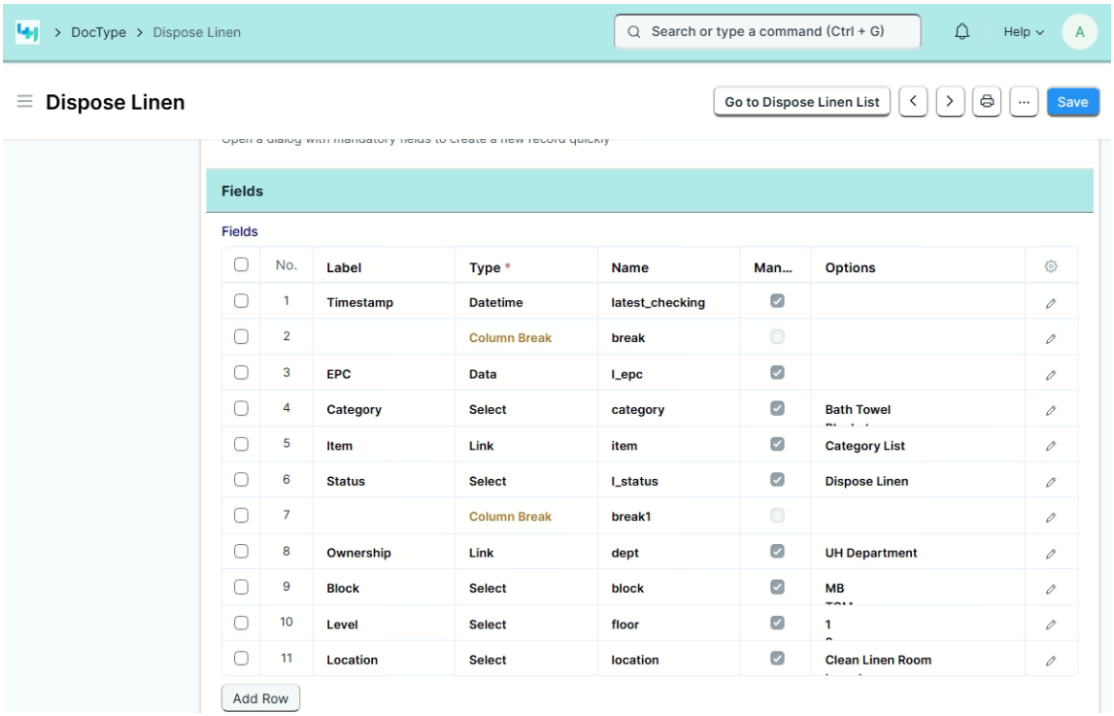


Figure 4.5.3 Dispose item list table

Transaction Linen List

The Linen Transaction Table logs every movement of linen items. Key fields such as timestamp, transaction day, quantity, weight, status, description and each item epc and item name are included to ensure full tracking of linen usage cycles across different departments. It is providing a complete audit trail of linen usage.

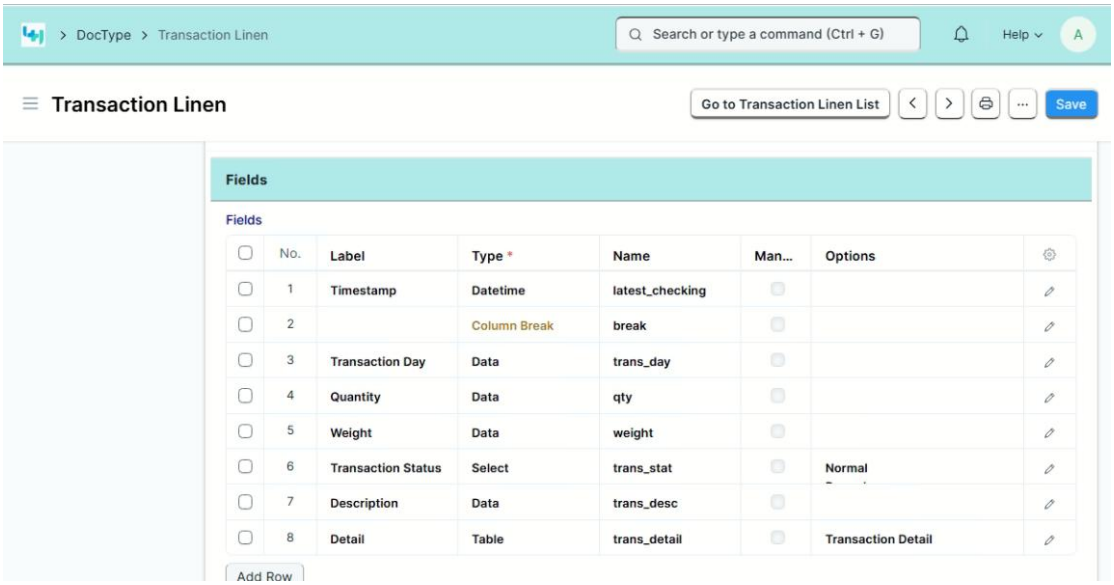


Figure 4.5.4 Transaction linen list table

Asset Department Transaction List

The Asset Department Transaction Table captures records of asset movements between departments, including fields like moving datetime, epc, category, item, the ownership, block, level and location of original and new ownership, block, level and location wanted to move, remark and status. This guarantees that the location of asset is always up-to-date and that all movement activities are properly documented. It is helping maintain accurate asset location records across the hospital.

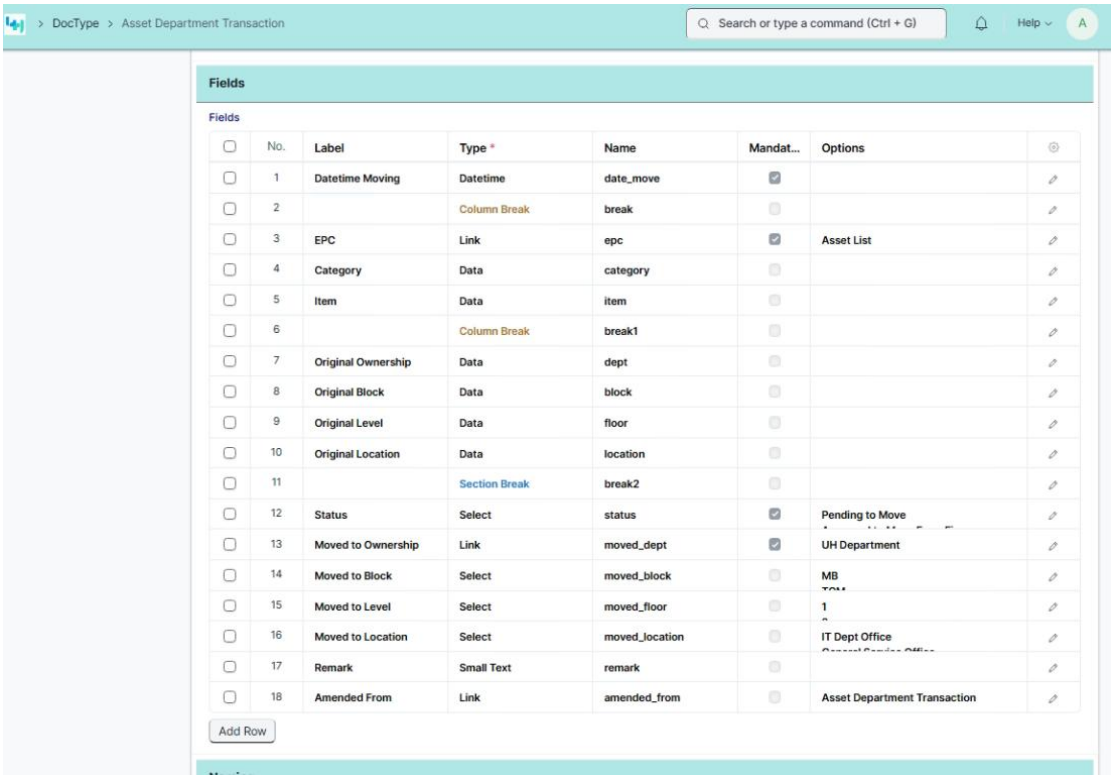


Figure 4.5.5 Asset department transaction list table

4.6 Concluding Remark

Chapter 4 covered the system design and workflow of the Asset and Linen Monitoring Information System Framework for UTAR Hospital. It detailed the system architecture, including key components such as user authentication, asset and linen management, and notification features. The system flow is outlined to illustrate how different processes interact, ensuring smooth operations. Additionally, the use case and activity diagrams provided a visual representation of user interactions,

system processes, and functional requirements. These diagrams helped define the roles and actions of different users within the system. The structured design ensures an efficient and organized approach to asset and linen tracking. Moreover, the database design defines the structure and organization of the data required to manage hospital assets and linen records effectively.

CHAPTER 5

System Implementation

5.1 Software Setup and Configuration

The implementation for the proposed project, "Asset and Linen Monitoring Information System Framework for UTAR Hospital" is a multistep process. This covers a series of steps starting from setting up software components to the full system development and configuration of the ERPNext system. At this phase, the system implementation will be done from software component setup and system infrastructure configuration to application deployment. The deployment is based on the ERPNext platform hosted on an Ubuntu Server, accessed via a web browser on a Windows environment. Some key tasks in the implementation process are shown below:

Software setup for this proposed project involves several of tools which are needed for the development and operation of the system. As the Ubuntu server will be utilized to operate Frappe framework ERPNext, user must start by installing the Ubuntu Server on Linux. This is important to ensure that the server environment is optimized for the operation before the start of the project. Firstly, the user needs to download and install an Ubuntu Server image file having pre-installed Frappe framework ERPNext on Windows. User who is required to download and install it from the official source, **https://ufile.io/iu8jhadr**, ensuring the reliability.

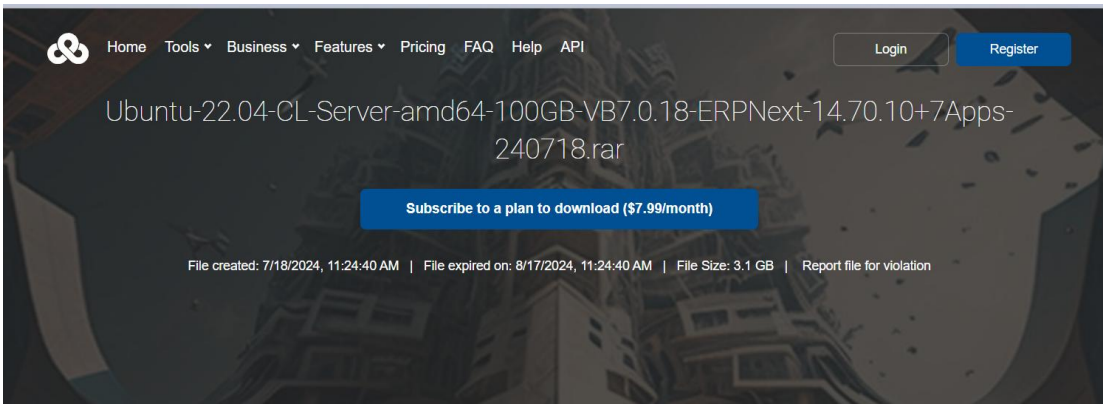


Figure 5.1.1 Ubuntu server image source

Once the image file of Ubuntu server is successfully downloaded and installed, user needs to add the image file of Ubuntu server in Oracle VM VirtualBox. The downloaded Ubuntu server image file will be created and added as the new virtual machine or OS in Oracle VM. Next, the user can launch it on Oracle VM VirtualBox.

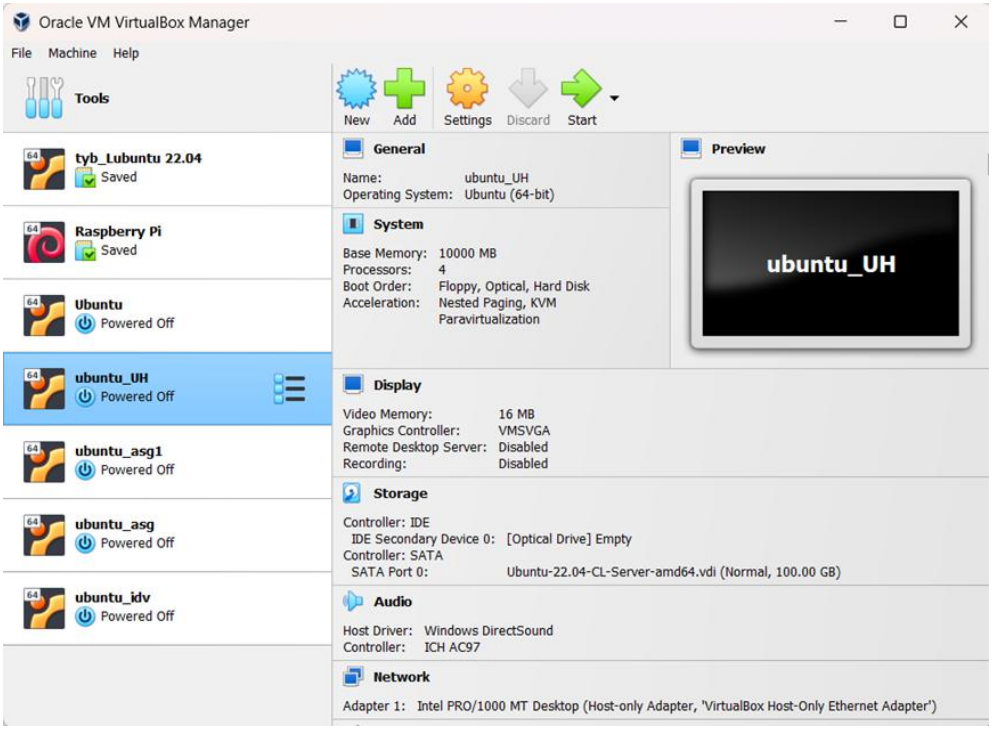


Figure 5.1.2 Ubuntu server has been added in Oracle VM VirtualBox

During the creation of a new Ubuntu Server virtual machine, user should typically adjust the RAM, disk space and the number of processor cores for optimizing performance and running the Ubuntu Server VM smoothly. For instance, a minimum of 4GB RAM, 25GB disk space and 2 processor cores is recommended for better performance. After the creation of a new Ubuntu Server virtual machine, a user can launch the Ubuntu server just by pressing "start". The network of the server is required to change to the “Host-only Adapter” which allowing the IP address of server is fixed.

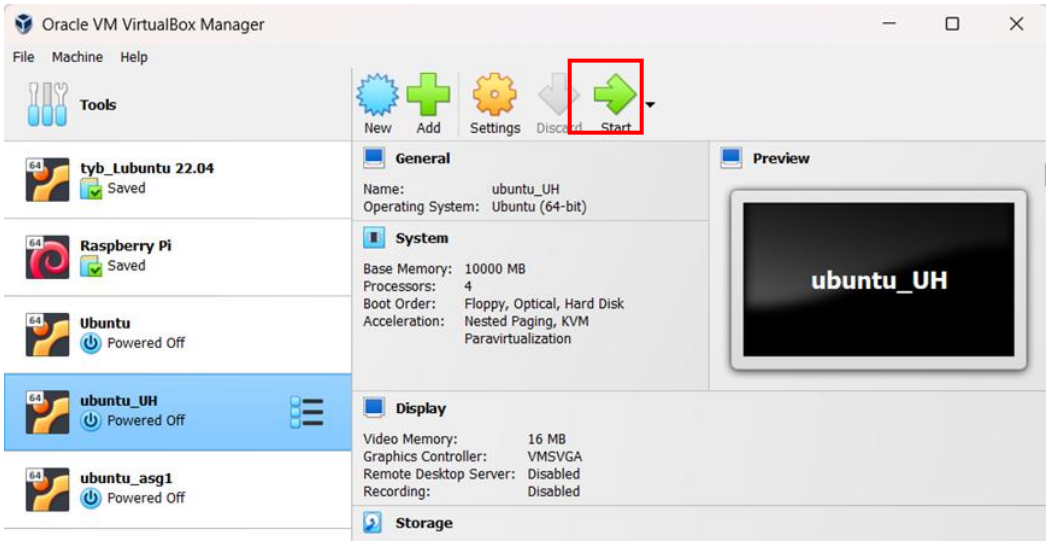


Figure 5.1.3 Click the “Start” button to run the Ubuntu server

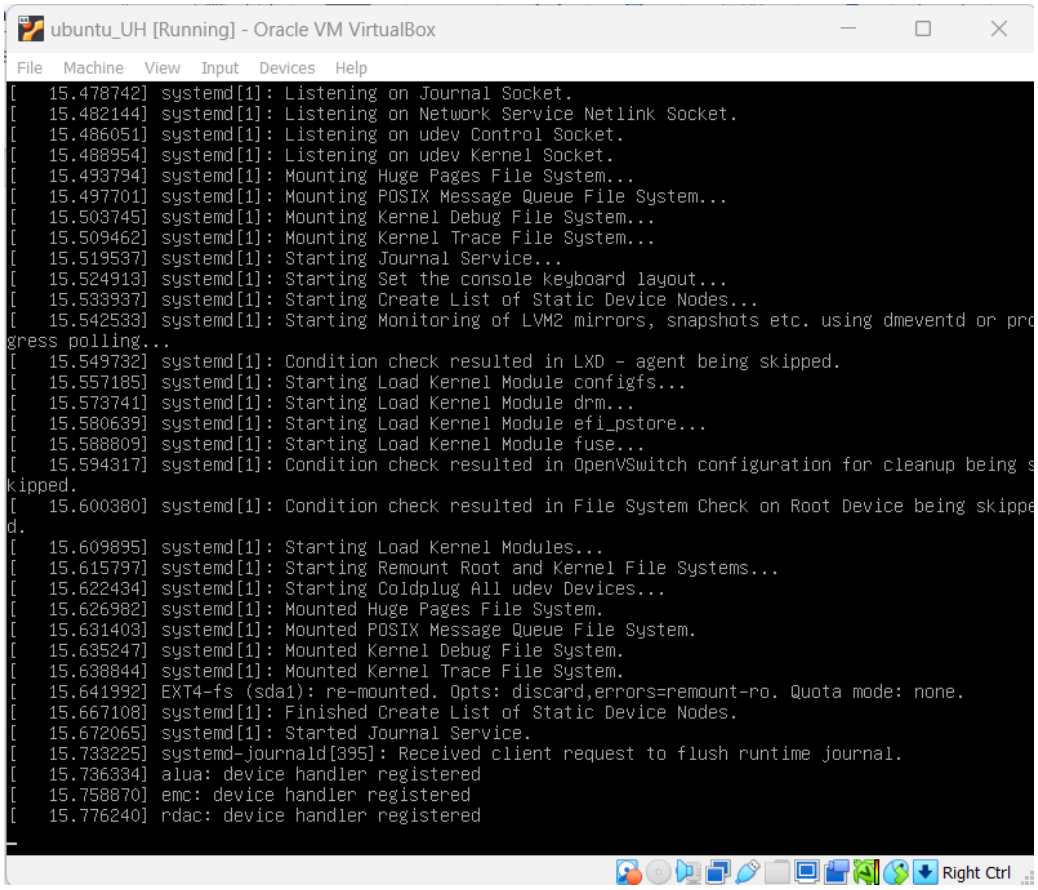


Figure 5.1.4 Run the Ubuntu server

User can log in to the ubuntu server with the username of server “ubuntu” and password “ubuntu”. Once authenticated, users can access the ERPNext interface by opening a web browser and navigating to the fixed IP address assigned to the server.

One issue encountered is that the IP address of server would occasionally change, making it difficult to reconnect to the system. To resolve this, the IP address of server is configured as a static IP address. This is achieved by modifying the network configuration file within the Ubuntu Server. By assigning a static IP address such as 192.168.56.101, the server now consistently uses the same address, preventing connectivity issues and ensuring stable access to ERPNext.

The steps to set a static IP address in Ubuntu Server are as follows:

1. Access the terminal in Ubuntu Server.
2. Edit the Netplan configuration file using a command like ‘sudo nano /etc/netplan/00-installer-config.yaml’
3. Replace the DHCP configuration with a static configuration:

```
network:
  ethernets:
    enp0s3:
      dhcp4: no
      addresses: [192.168.56.101/24]
      gateway4: 192.168.1.1
      nameservers:
        addresses: [8.8.8.8, 8.8.4.4]
  version: 2
```

4. Save the file and apply the changes using ‘sudo netplan apply’.
5. Confirm the IP address using ‘ip a’ to ensure the static IP is active.

By setting a fixed IP address, users can reliably access the ERPNext system by entering the static IP of server into any browser within the same network.

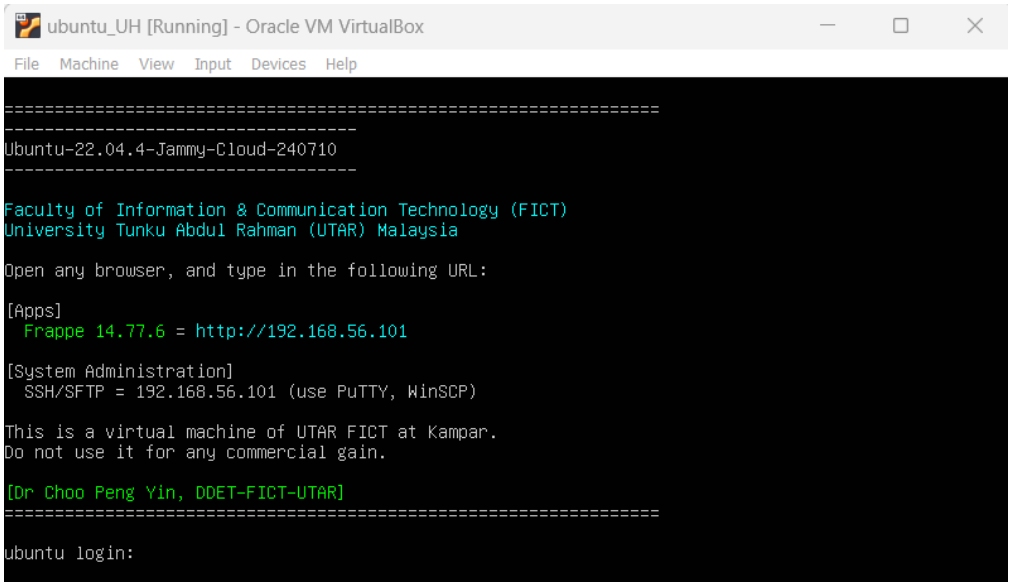


Figure 5.1.5 Ubuntu server console

Following the successful server and software setup, Frappe framework ERPNext is browsed in web browser on Windows environment to provide flexibility and user-friendly interface for the management of asset and linen for UTAR Hospital. Setting this up requires user to launch the Ubuntu Server, which ERPNext is hosted on Ubuntu server and navigate to the IP address of server using a web browser on Windows OS. Moreover, user can login to the system with username and password.

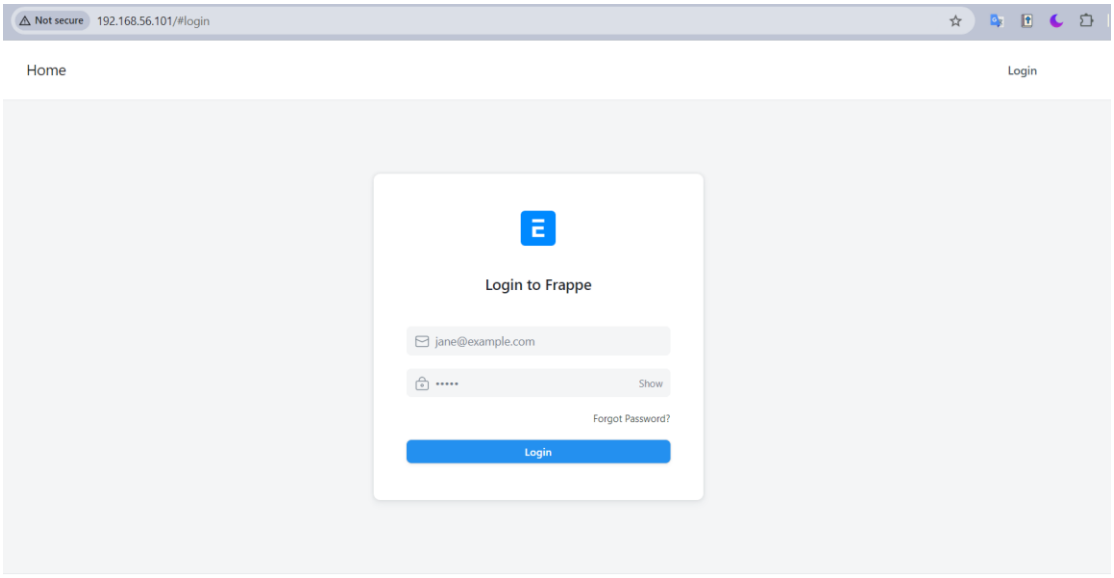


Figure 5.1.6 Login page of ERPNext website

5.2 Implementation Details

The implementation of the Asset and Linen Monitoring Information System for UTAR Hospital is carried out using the ERPNext platform, which offers a robust and flexible framework for building an application. The system development involved a combination of built-in ERPNext configurations and customized enhancements to meet the specific needs of tracking linen and asset movement within the hospital environment. The implementation process can be categorized into several key stages such as doctype creation, custom scripting, workflow configuration, QR code integration, permission setup, dashboard customization, and server deployment.

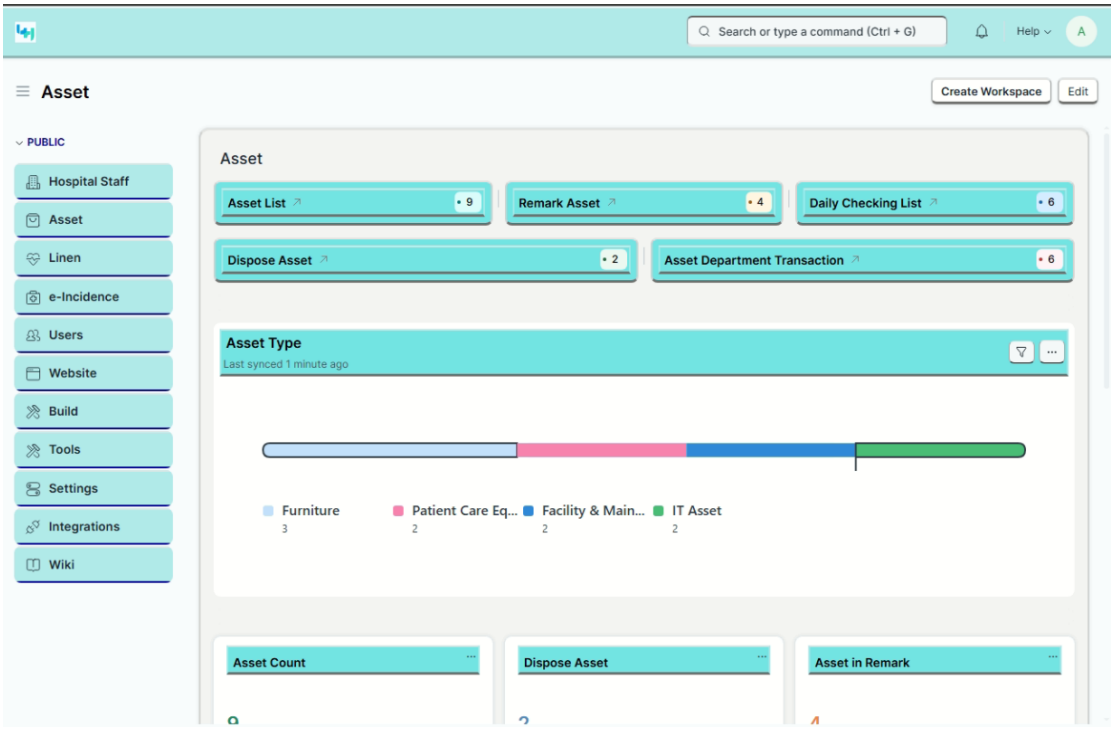


Figure 5.2.1 ERPNext on Windows

The ERPNext system is customized to include two main modules which are Linen Monitoring and Asset Management. These are implemented using custom doctypes created via the system. For the Linen module, fields such as epc, linen status, current location, linen item name, updated datetime, ownership, category, floor and block are configured. These fields ensured tracking the current usage and lifecycle of each linen item. Similarly, the asset module included epc, asset item name, asset status, current location, maintenance datetime, ownership, updated

datetime, and category. Field properties such as data types, default values, and mandatory constraints are carefully set to ensure proper data validation and user input behaviour.

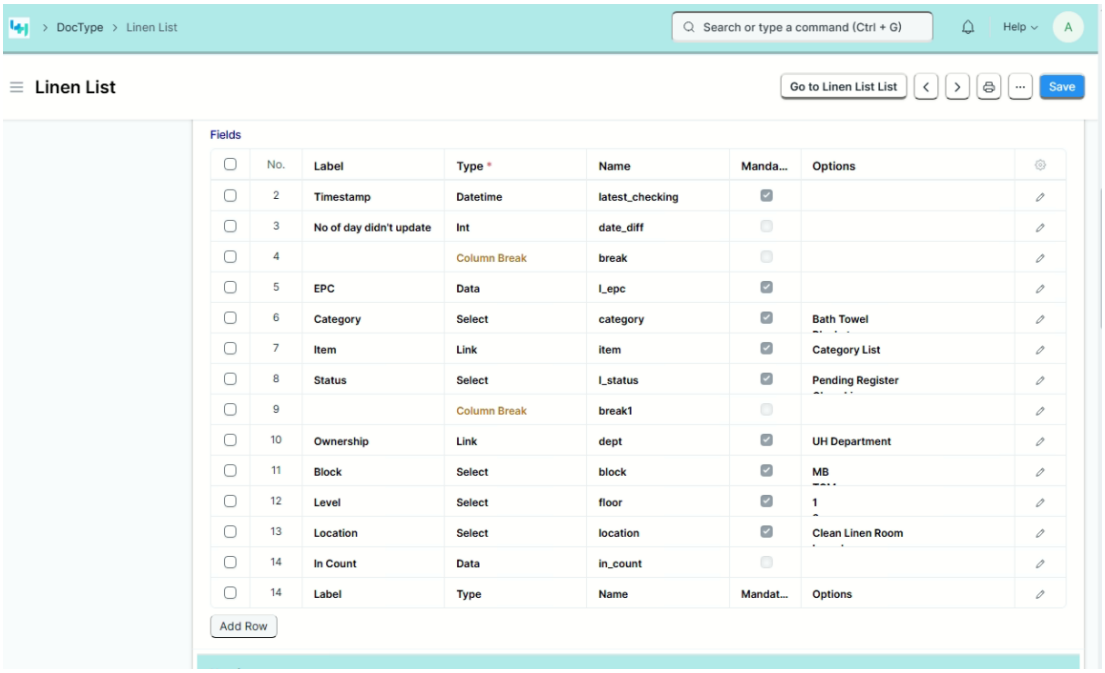


Figure 5.2.2 Doctype setup for Linen List

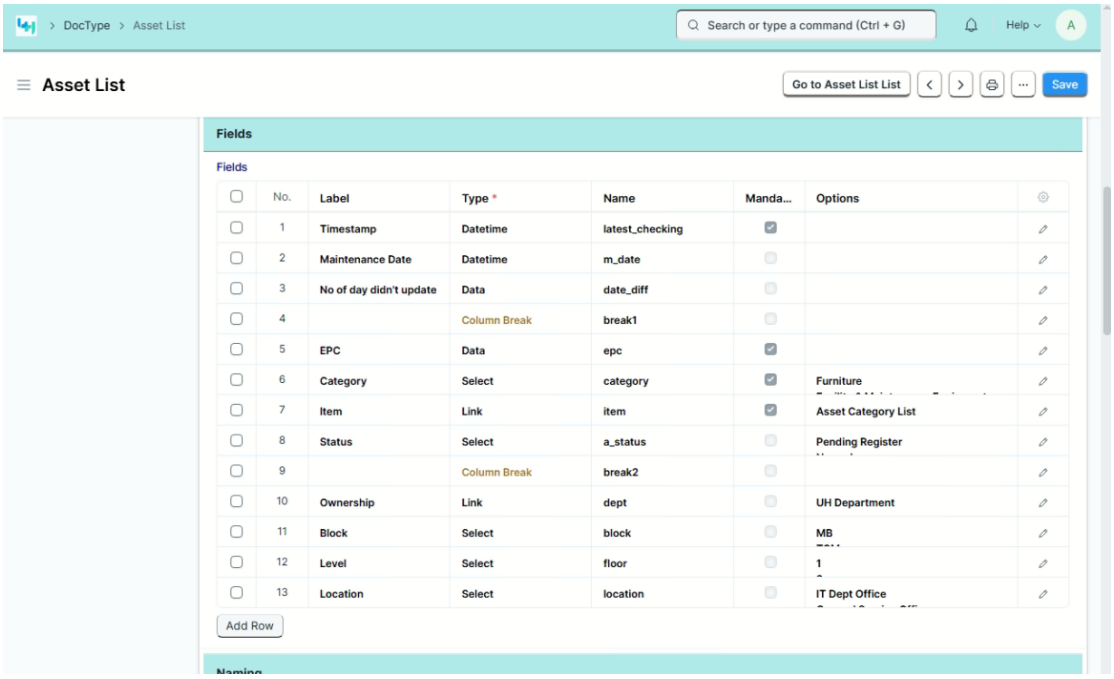


Figure 5.2.3 Doctype setup for Asset List

The ERPNext system for Asset and Linen Monitoring is enhanced through the development of multiple custom scripts to fulfil the functional requirements of UTAR Hospital. Client scripts are developed using JavaScript within Client Script feature of ERPNext. These scripts mainly handled front-end validation, improve user interaction, and user experience. For example, dynamically filtering item names based on the selected item category. It is simplifying the selection process for staff and minimizing data entry error, allowing users to quickly select the correct items without scrolling through unrelated options.

Below is the client script of filtering item names based on item category:

```
// Trigger client script when interacting with the "Asset List" form
frappe.ui.form.on("Asset List", {
    category: function(frm) {
    // Clear the existing value in the "item" field when a new category is
selected
        frm.set_value("item", "");

// Set a dynamic filter for the "item" field based on the selected category
        frm.set_query("item", function() {
            return {
                filters: {
                   // Only show items under selected category
                   category: frm.doc.category
                }
            };
        });
    }
});
```

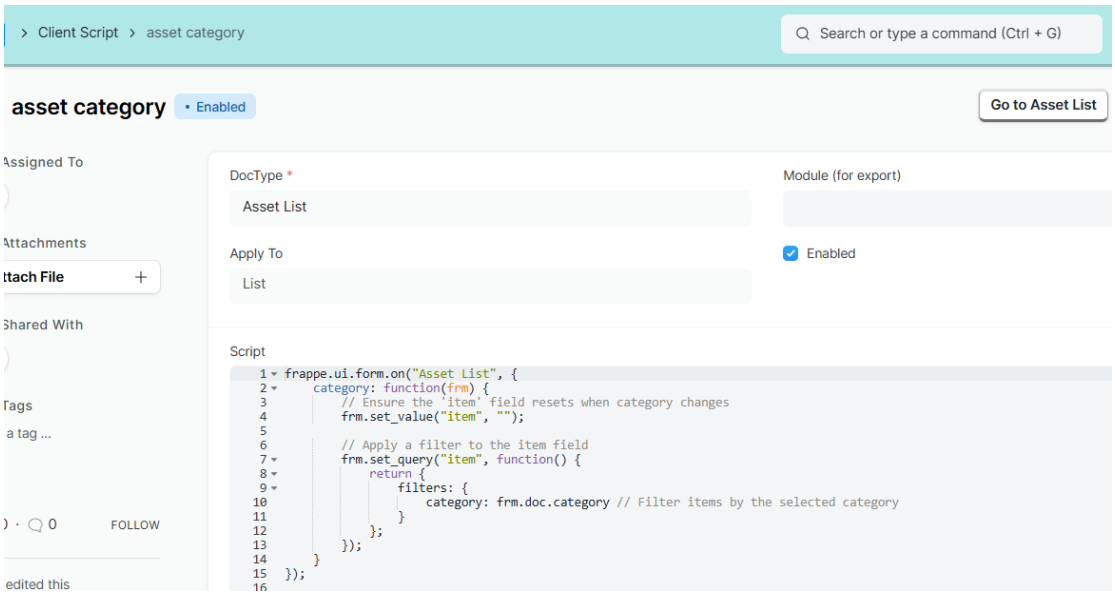


Figure 5.2.4 Client script of filtering item names based on item category

Furthermore, server scripts are implemented to automate backend processes and maintain clean, real-time records within the ERPNext system. These scripts are developed directly inside Server Script feature of EPRNext, using Python programming language, which is natively supported by the Frappe framework. For example, when an item is confirmed for disposal, a server-side script automatically removes it from the main linen or asset list and moves it to a separate disposal list. In another case, if a newly registered item is rejected by an admin or manager due to incorrect information, a script ensures the rejected item is automatically deleted from the database. Additional logic is applied to asset records, allowing real-time updates of asset information such as location and ownership when movement requests are approved through the workflow. These scripts collectively streamline operations by enforcing automation, reducing manual intervention, and ensuring data consistency across the system.

Always use ‘frappe.utils.get_url()’ in script to generate the base server address dynamically. This ensures the redirect URL will always match the current deployment server without requiring manual changes.

Below is the server script to remove item from linen or asset list and move to dispose linen or asset list:

```
# Get base server URL dynamically to avoid hardcoded IP and construct safe redirect link
base_url = frappe.utils.get_url()
redirect_url = f"{base_url}/app/linen-list"

# Check if the linen status is set to "Dispose Linen" and in "Registered" workflow state
if doc.l_status == "Dispose Linen" and doc.workflow_state == "Registered":
    # Set the action field for record keeping
    doc.action = "Dispose"
    # Move to the next stage of the workflow
    doc.workflow_state = "Pending dispose Linen"
    # Save the changes to the document
    doc.save()
    # Notify user that the item is now marked for disposal
    frappe.msgprint("The item will be marked for dispose.")

# If the item has been approved for disposal
elif doc.workflow_state == "Approved for dispose":
    # Prepare data to be carried forward into Dispose Linen doctype
```

```
    item_data = {
        'l_epc': doc.l_epc,
        'latest_checking': doc.latest_checking,
        'category': doc.category,
        'item': doc.item,
        'dept': doc.dept,
        'block': doc.block,
        'floor': doc.floor,
        'location': doc.location
    }

    # Show detailed info to user for verification/debugging
    frappe.msgprint(f"Item data for disposal: EPC: {item_data['l_epc']}, Latest Checking: {item_data['latest_checking']}, Category: {item_data['category']}, Item: {item_data['item']}, Ownership: {item_data['dept']}")

    # Check if a record with the same EPC already exists in Dispose Linen to avoid duplicates
    existing_dispose_record = frappe.db.exists("Dispose Linen", {"l_epc": item_data['l_epc']})

    # If no existing record found, proceed to create new Dispose Linen document
    if not existing_dispose_record:
        new_doc = frappe.get_doc({
            'doctype': 'Dispose Linen',
            'l_epc': item_data['l_epc'],
            'latest_checking': item_data['latest_checking'],
            'category': item_data['category'],
            'item': item_data['item'],
            'dept': item_data['dept'],
            'block': item_data['block'],
            'floor': item_data['floor'],
            'location': item_data['location']
        })

        # Insert the new Dispose Linen record, ignoring permission issues
        new_doc.insert(ignore_permissions=True)
        frappe.msgprint(f"New Dispose Linen record created for {item_data['item']}")

        # Check again if the same item still exists in the Linen List
        linen_exists = frappe.db.exists("Linen List", {"l_epc": item_data['l_epc']})

        if linen_exists:
            # Delete the linen item from the original Linen List
            frappe.delete_doc('Linen List', doc.name)
            frappe.msgprint(f"Deleted Linen List item: {doc.name}")

            # Use JavaScript inside msgprint to redirect user back to the Linen List page after 2 seconds using redirect_url
            frappe.msgprint("""
                <script>
                setTimeout(function() {
                    window.location.href = '%s';
```

```
                }, 2000);
                </script>
            """ % redirect_url)
        else:
            frappe.msgprint(f"Linen List item with EPC {item_data['l_epc']}
is successfully disposed.")
    else:
        # Inform user if Dispose Linen record already exists to prevent
duplication
        frappe.msgprint(f"Dispose Linen record with EPC
{item_data['l_epc']} already exists.")
else:
    # Notify the current linen status if it doesn't match any disposal
condition
    frappe.msgprint(f"Item status is '{doc.l_status}'.")
```

Below is the server script to remove rejected registration item:

```
# Get base server URL dynamically to avoid hardcoded IP and construct safe
redirect link
base_url = frappe.utils.get_url()
redirect_url = f"{base_url}/app/asset-list"

# Check if the workflow state is set to Rejected
if doc.workflow_state == "Rejected":
    # Get the name of the current document from the Asset List
    asset_name = frappe.db.get_value("Asset List", {"name": doc.name},
"name")

    # Show a user-friendly message about rejection and removal
    frappe.msgprint(
        msg="The item has been rejected and removed from the list.
Redirecting...",
        title="Rejected Successfully",
        indicator="red"
    )

    # Proceed to delete the record from the Asset List if found
    if asset_name:
        frappe.delete_doc("Asset List", asset_name,
ignore_permissions=True)

    # Inject JavaScript to auto-redirect the user to the list view after 2
seconds
    frappe.msgprint("""
        <script>
            setTimeout(function() {
                window.location.href = '%s';
            }, 2000);
        </script>
    """ % redirect_url)
```

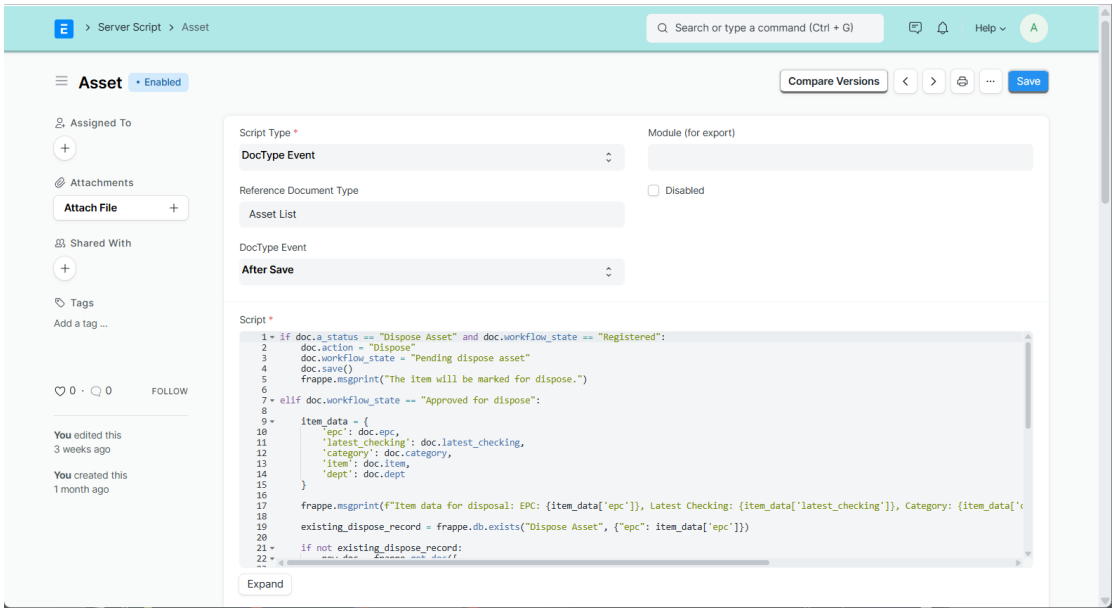


Figure 5.2.5 Server script of disposal item

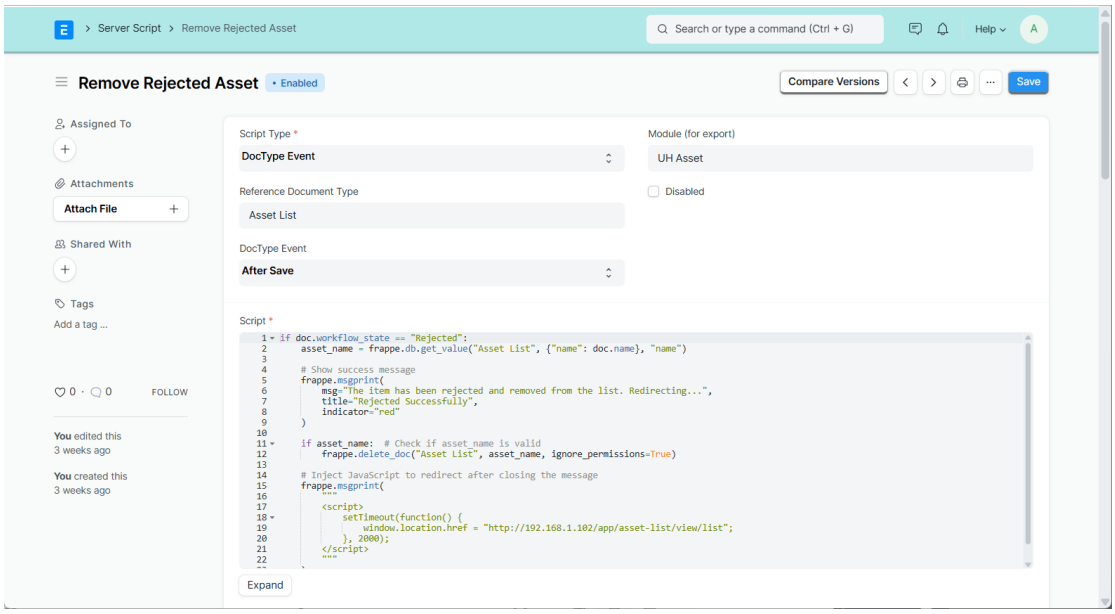


Figure 5.2.6 Server script of removing rejected registration item

By combining server scripts used Python for backend operations and client scripts used JavaScript for frontend behaviour, the system is able to automate key workflows, improve usability, and maintain high data quality with minimal manual intervention from users.

Moreover, QR code generation is integrated into each asset and linen record through the use of Print Format feature and Jinja templating of ERPNext. A custom Print Format is designed to include the QR code field for each record, which encodes the document name or tracking ID. This format allows for the printing of QR labels that can be attached to physical items. The QR code can be scanned using any mobile device to quickly retrieve the associated record within the system, enabling fast identification, tracking, and verification during audits or movement operations. This integration improves operational speed and reduces the risk of manual tracking errors.

Always use 'frappe.utils.get_url()' in script to generate the base server address dynamically. This ensures the redirect URL will always match the current deployment server without requiring manual changes.

Below is the script to generate the QR Code for each item based on their EPC and server IP:

```
<div style="width: 6cm; height: 3cm; border: 1px solid #000; display: flex;
align-items: center; padding: 0.2cm; box-sizing: border-box;">
    <!-- QR Code Container -->
    <div id="qrcode" style="width: 2cm; height: 2cm;"></div>

    <!-- EPC Display -->
    <div style="margin-left: 0.5cm; font-size: 12px; word-break: break-
word; max-width: 3.2cm;">
        <b>EPC:</b><br>
        {{ doc.epc }}
    </div>
</div>

<script
src="https://cdnjs.cloudflare.com/ajax/libs/qrcodejs/1.0.0/qrcode.min.js"><
/script>
<script>
    let epc = "{{ doc.epc }}";
    let scanUrl = "{{ frappe.utils.get_url() }}/asset.html?epc=" + epc;

    new QRCode(document.getElementById("qrcode"), {
        text: scanUrl,
        width: 75,
        height: 75
    });
</script>
```

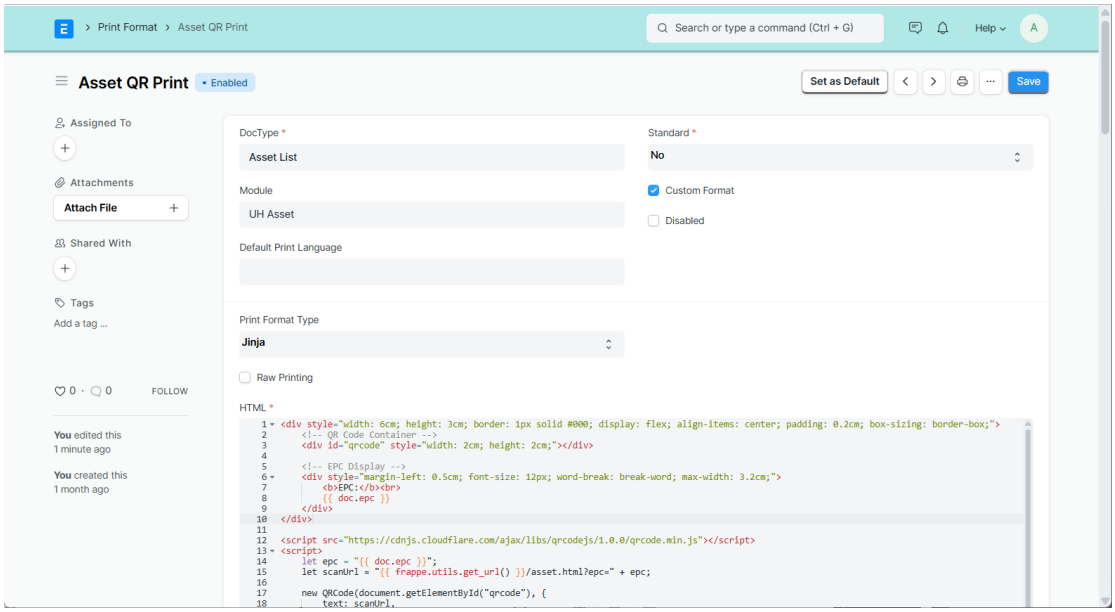


Figure 5.2.7 QR code generation through print format feature

Next, the workflow module in ERPNext is used to control record transitions and approvals. For linens, a workflow is set to ensure that when an item status is updated to “Pending Disposal,” it requires managerial approval before being marked as “Disposed.” The workflow is designed using states and actions, with assigned roles such as general services manager and admin to enforce access restrictions. The same logic is applied to the asset module, particularly for repair and decommission processes. For example, a workflow is set for asset item to move to other location or ownership. The states and actions are required to make by finance department and IT department to approve such as after finance department is approved the workflow states will pass to IT department after IT department is approved only the new asset item moved location information will be updated.

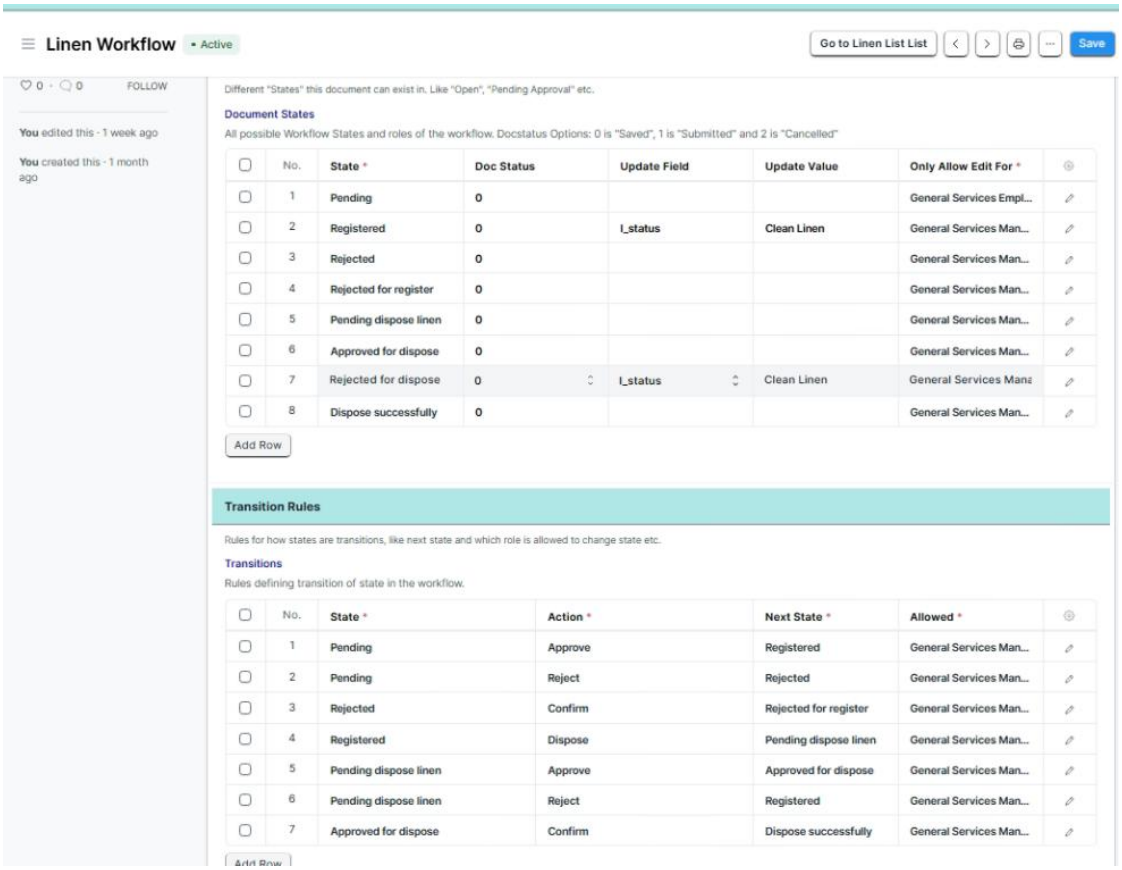


Figure 5.2.8 Workflow Setup for Linen Status Transition and Approval

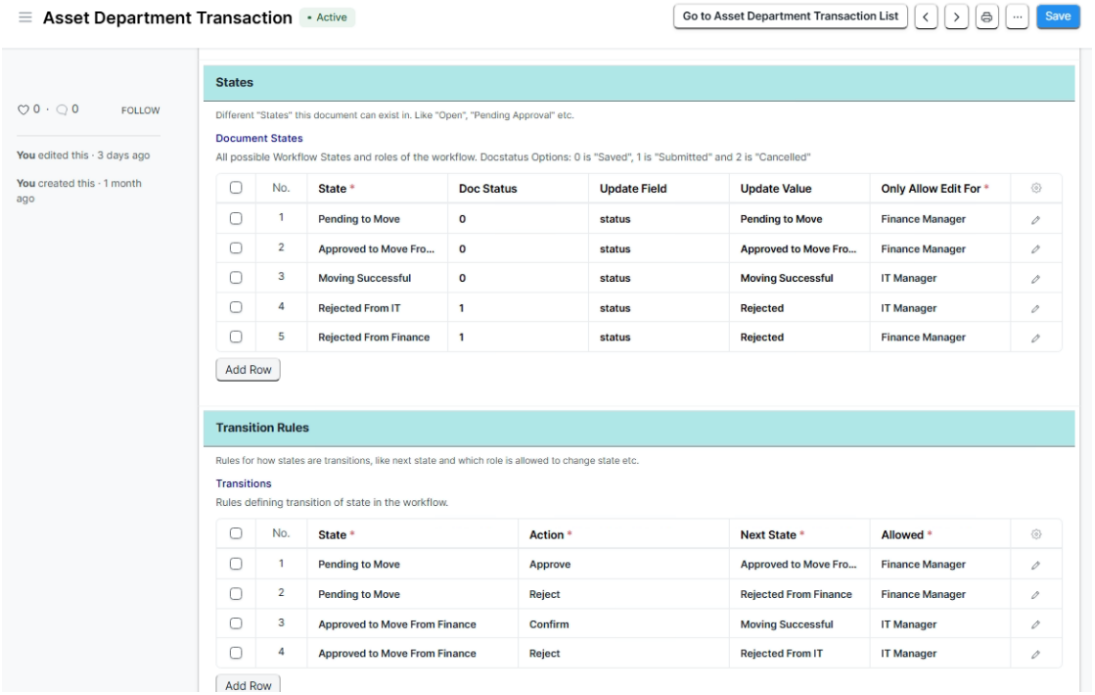


Figure 5.2.9 Workflow Setup for Transaction of Asset Item Moved Transition and Approval

In terms of role-based access control, the Role Permission Manager in ERPNext is used to assign permissions based on staff duties. For instance, general services staff only can read and edit linen records but cannot delete or approve them. IT Manager is given rights to update asset information, while administrators have full control overall whole system. This setup ensured that only authorized personnel could perform critical actions like asset disposal, linen dispose or transaction of asset item moved.

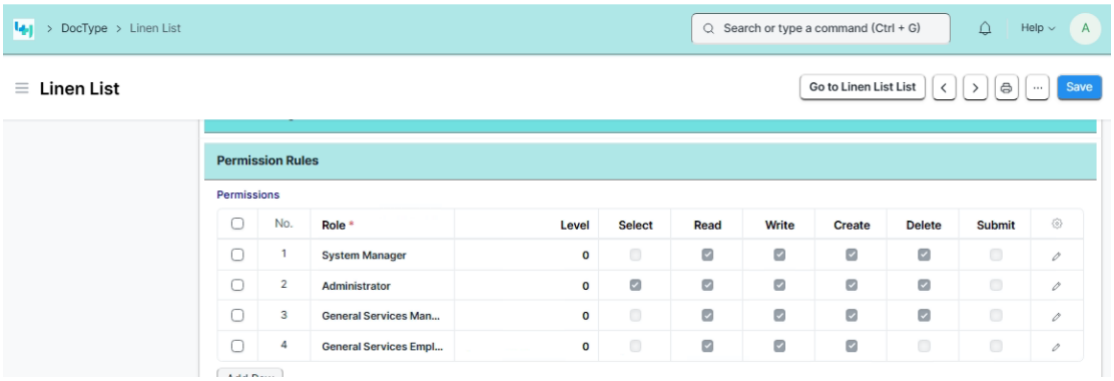


Figure 5.2.10 Permission Setup for Linen Modules

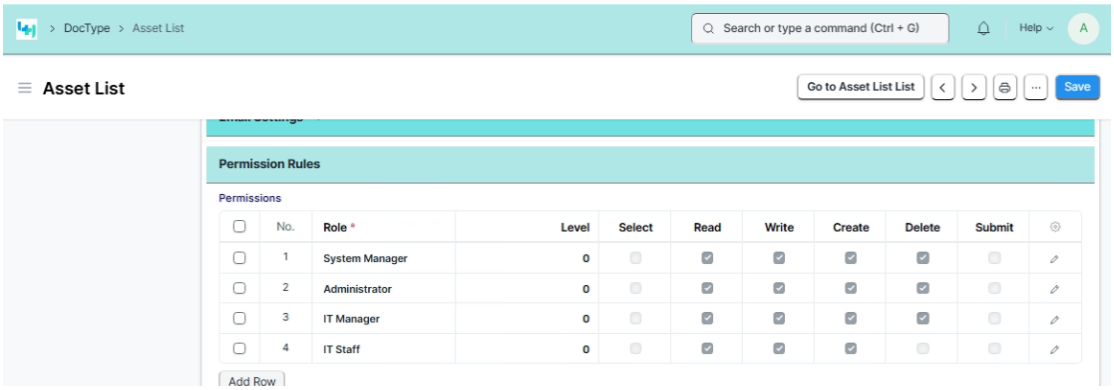


Figure 5.2.11 Permission Setup for Asset Modules

To improve system visibility, a custom dashboard is created using dashboard tools of EPRNext. The ERP system dashboard serves an important function for managing hospital resources by aggregating difficult information to one, easy-to-view, and accessible perspective. The dashboard offers up-to-date summaries that enable more accurate and quicker decisions. It integrates shortcut buttons for major activities,

numeric measures to represent overall quantities, and a collection of well-crafted charts to emphasize trends and up-to-date status.

Furthermore, the dashboard is designed with a strong user-oriented design approach to ensure it provided an intuitive and clear for users to monitor and control the linen and asset of UTAR Hospital. The thoughtful layout has various key display elements, including shortcuts features to access item list record, several charts and number cards display the analysis data of item to monitor and access the data effectively and efficiency. Color-coded elements on the charts bring clarity to the data interpretation and interaction, making sure the dashboard is compatible and beautiful.

Moreover, different types of visual elements are thoughtfully integrated to make complex data easy to understand and act on. Pie charts offer a quick overview of the linen and asset system-wide condition, such as the overall linen and asset status. For example, clean linen, dirty linen, normal asset, remark, pending register, or pending dispose. This helps identify the immediate availability of hospital for treating patients. On the other hand, bar chart is used. It uses to show comparisons such as Linen Location Chart where compare the number of linens that locate in hospital for use or sent to laundry for cleaning. This chart makes it easy to spot areas that are consuming more resources and may need attention.

Additionally, to view trends over a period, line graphs are utilized in the dashboard. These are graphs of transaction records as well as number of disposal items, enabling hospital administrators to monitor linen and asset movement and utilization based on month-to-month basis. For instance, analyse the heavy periods where linen turnover is high, monitors item of disposal between months. These enable hospital managers to better understand the status of asset and linen items.

Number cards provide quick, high-level summaries such as the number of items available, the current pending approval register item and number of disposal

item. This is giving decision-makers instant insights without the need for detailed analysis. Apart from that, the dashboard also includes shortcut buttons that allow users to browse directly to important list, like linen or asset item list, remark list, transaction list or dispose list. This efficient navigation saves time and improves overall efficiency.

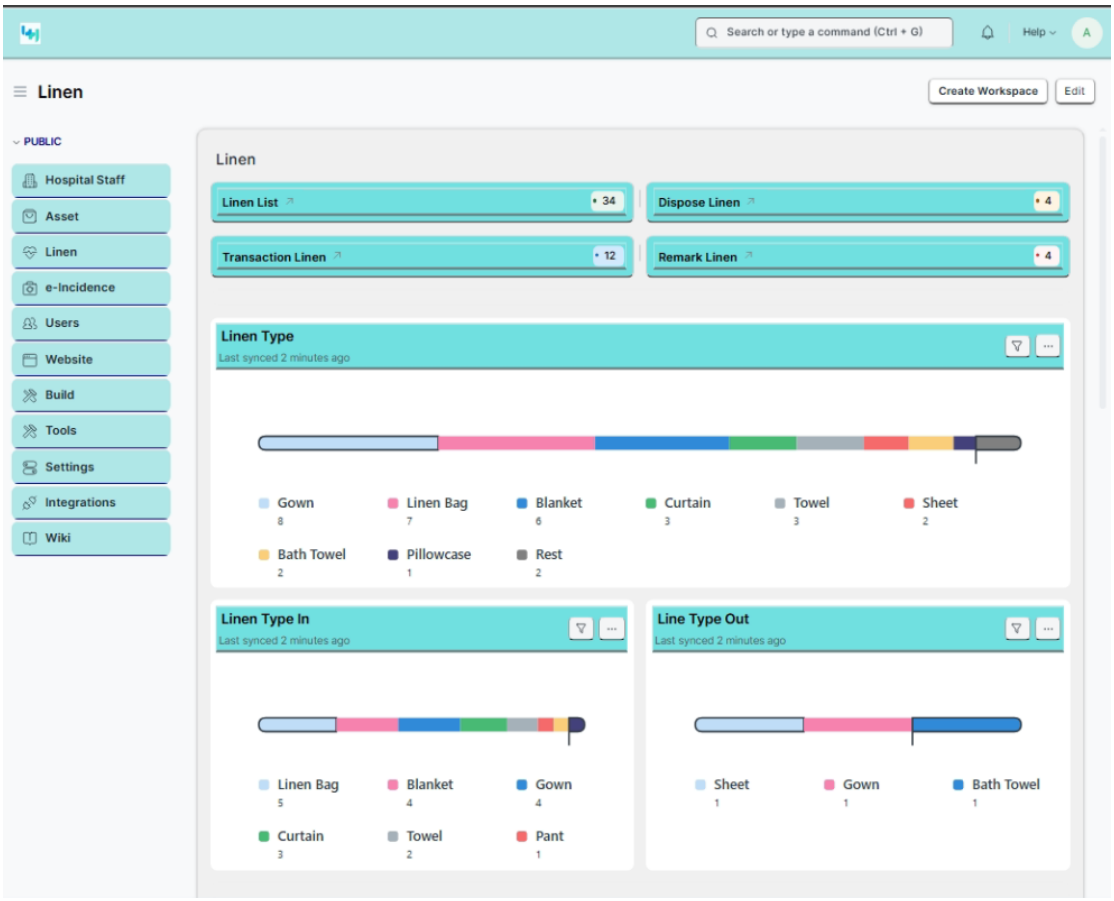


Figure 5.2.12 Overview of Linen Dashboard in ERPNext

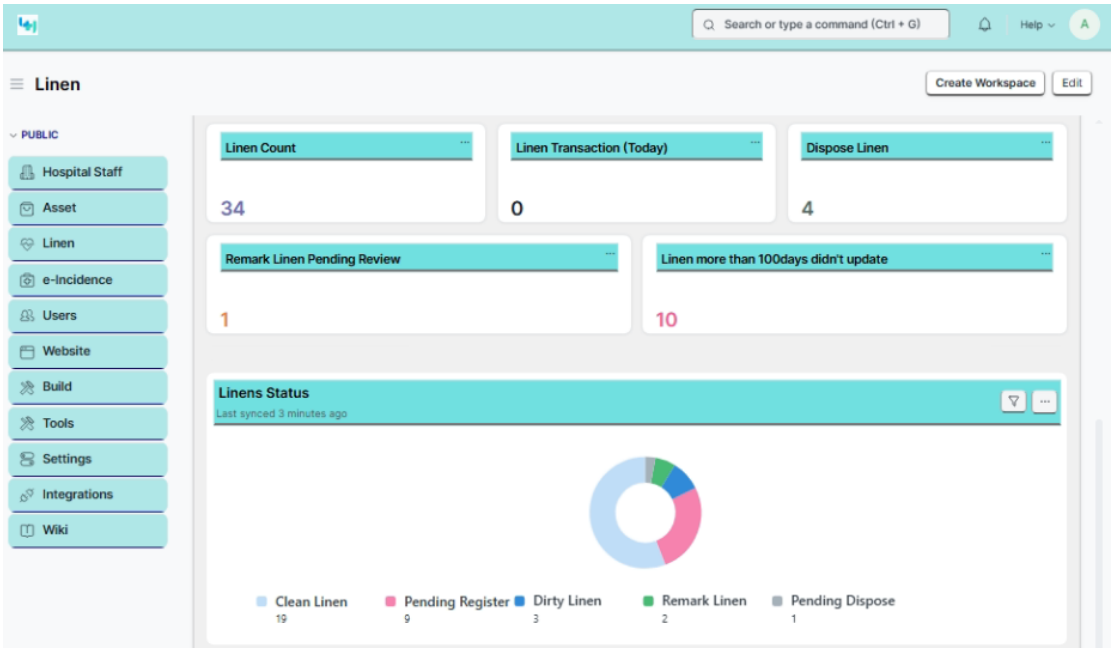


Figure 5.2.13 Overview of Linen Dashboard in ERPNext

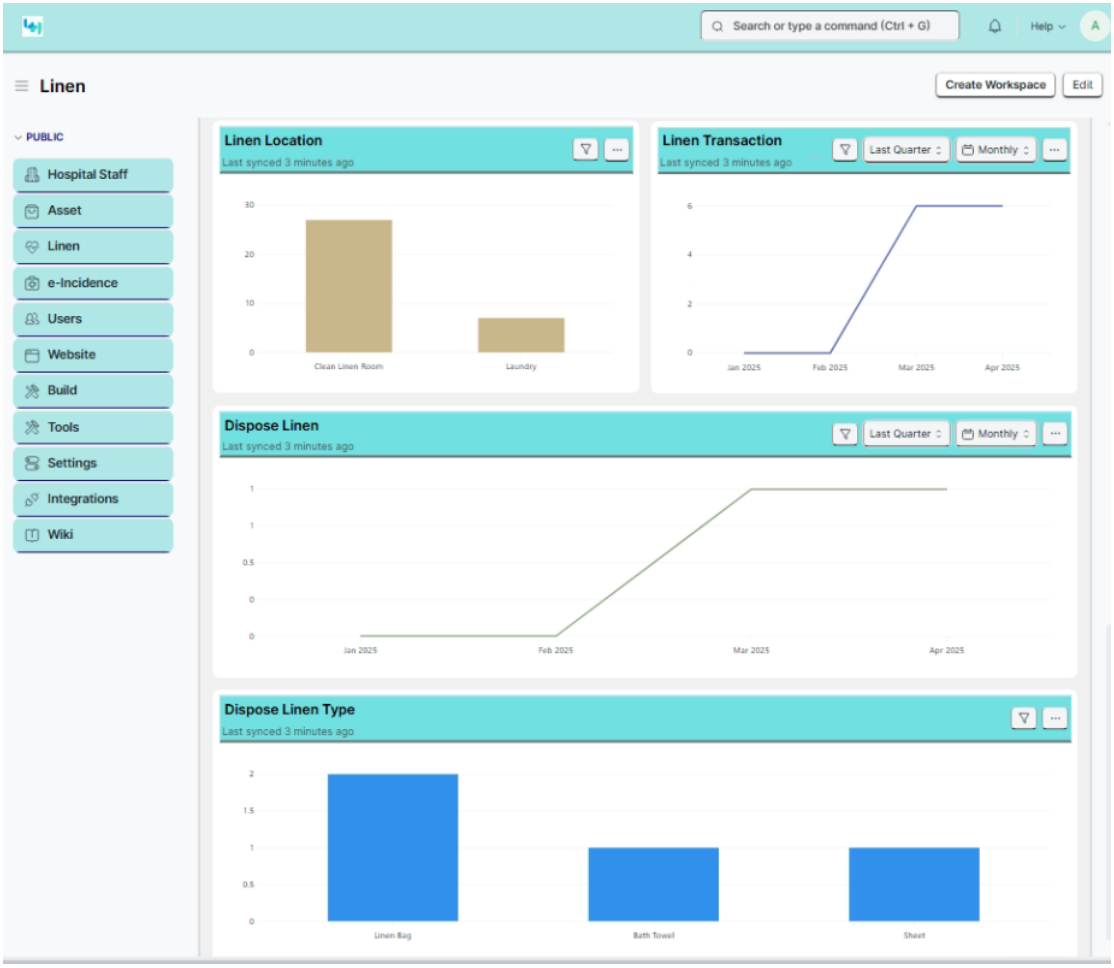


Figure 5.2.14 Overview of Linen Dashboard in ERPNext

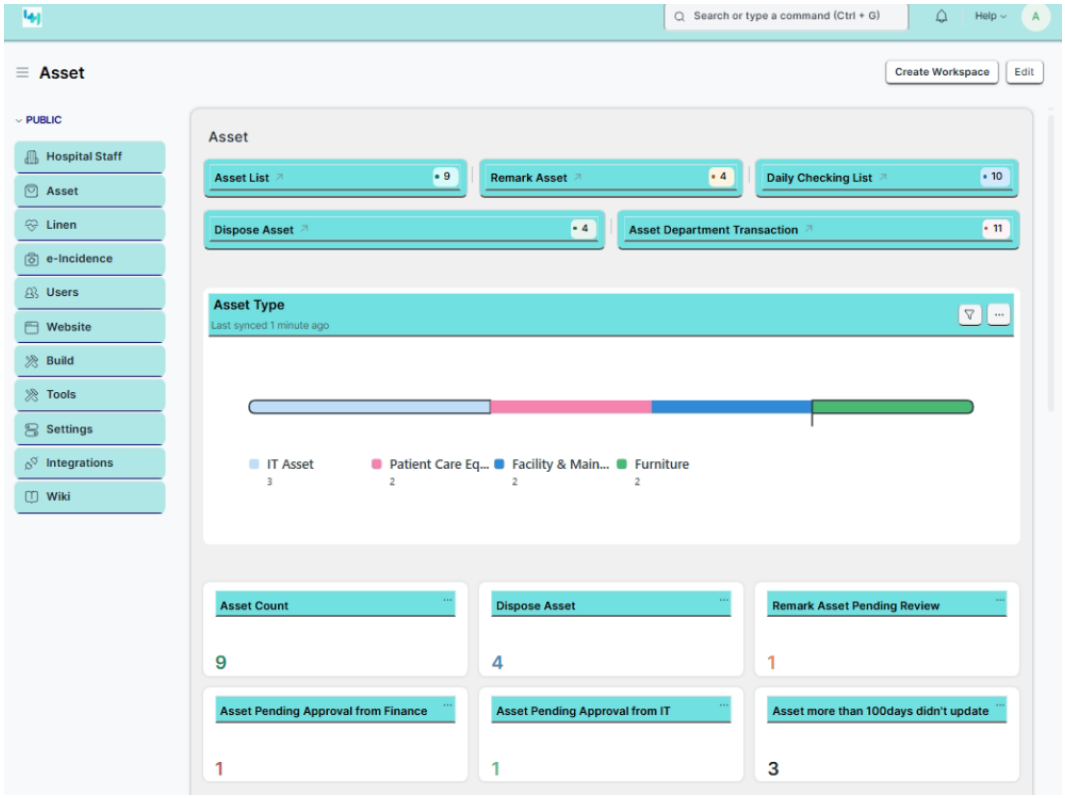


Figure 5.2.15 Overview of Asset Dashboard in ERPNext

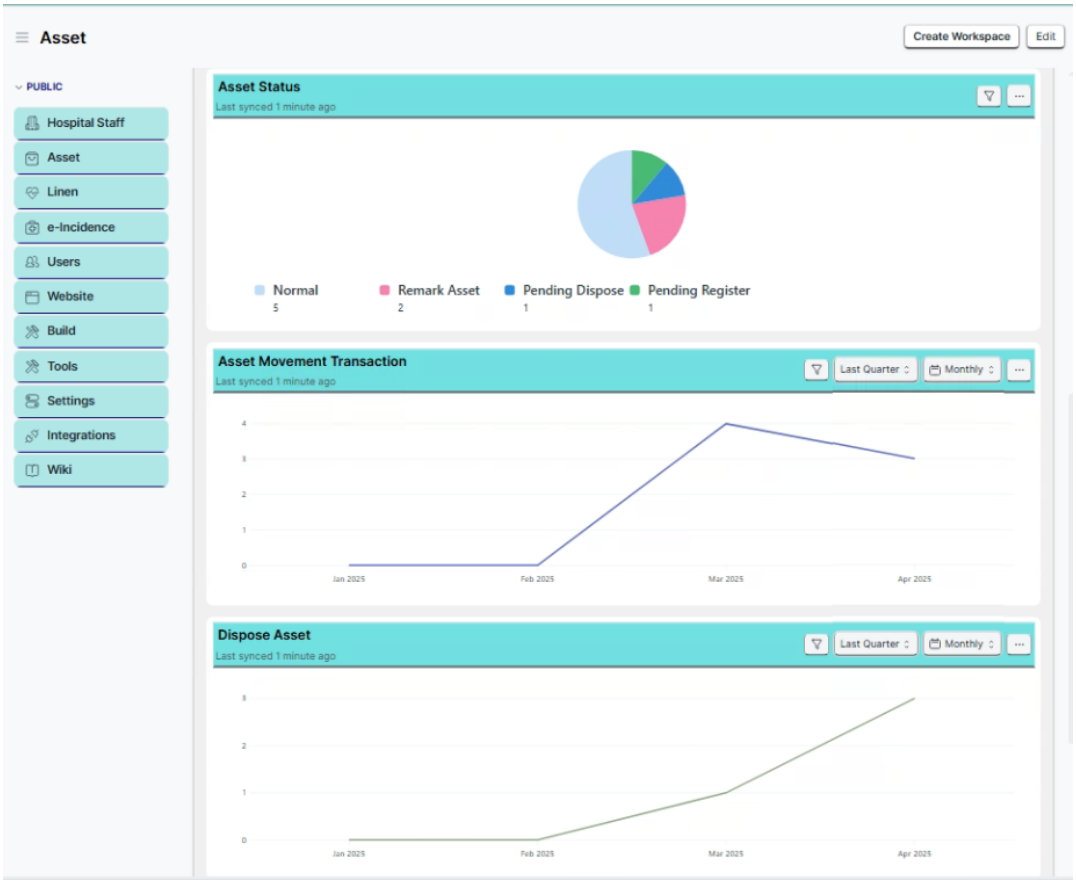


Figure 5.2.16 Overview of Asset Dashboard in ERPNext

Additionally, automated email and system notification alerts are configured using notification rules. For example, an alert is sent when status of linen or asset item is “pending dispose”, or when an asset item is forthcoming for maintenance. These features are achieved through the notification module of ERPNext and integrated using custom scripts.

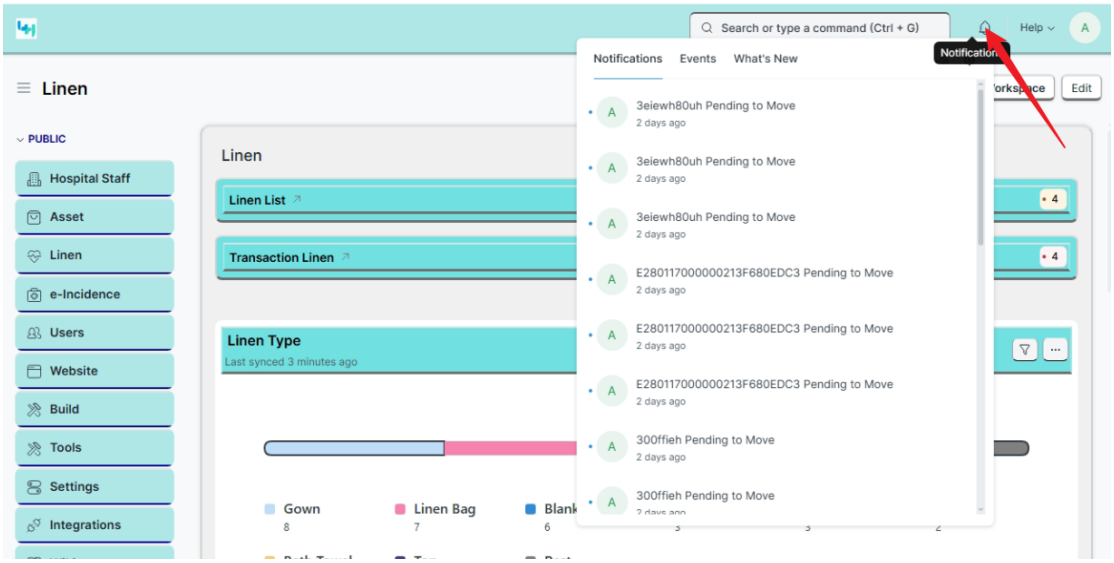


Figure 5.2.17 System notification feature on ERPNext

The configuration of transaction linen list is a log of all linen-related transactions at UTAR Hospital. It captures information with regards to linen ID, transaction date and time, linen type, and linen status. Such records are very important in tracking the movement of linens in and out at hospital. Since all the transactions of linen are recorded in the system which is allowing user to monitor and manage for effectiveness and efficiency.

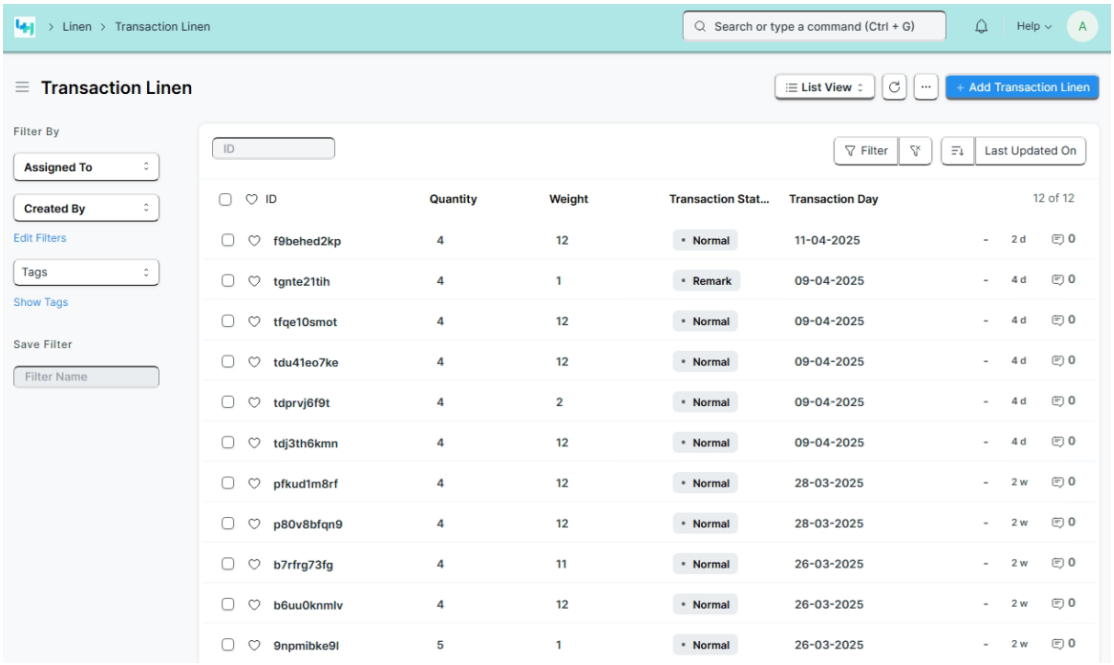


Figure 5.2.18 Overview of transaction linen list

5.3 System Operation

System operation refers to how the customized ERPNext system functions to monitor both linens and hospital assets. The system includes two main modules which are linen and asset, both of which are developed using custom doctypes and scripts. These modules enable users to input, track, and update data regarding linen and asset movement, status, condition, and lifecycle, complete with QR code integration for real-time viewing and scanning. Access control is applied based on user roles to ensure secure usage of the system.

5.3.1 Login Functional Operation

Firstly, users need to launch the Ubuntu server in the Oracle VM VirtualBox to operate the ERPNext. Users which can browse the IP address of server in Windows web browser to access the ERPNext. In the login page, users must enter own personal credential to authorize and log into the ERPNext system. The login page of ERPNext plays a crucial role in allowing users to access the system by their username or email address and password. This consists of a simple user interface that provides users to submit the entered credentials. After clicking on the login button, the system will

verify the entered credentials with the user database. The system will grant users who credentials are correct to access the system and display the homepage of ERPNext.

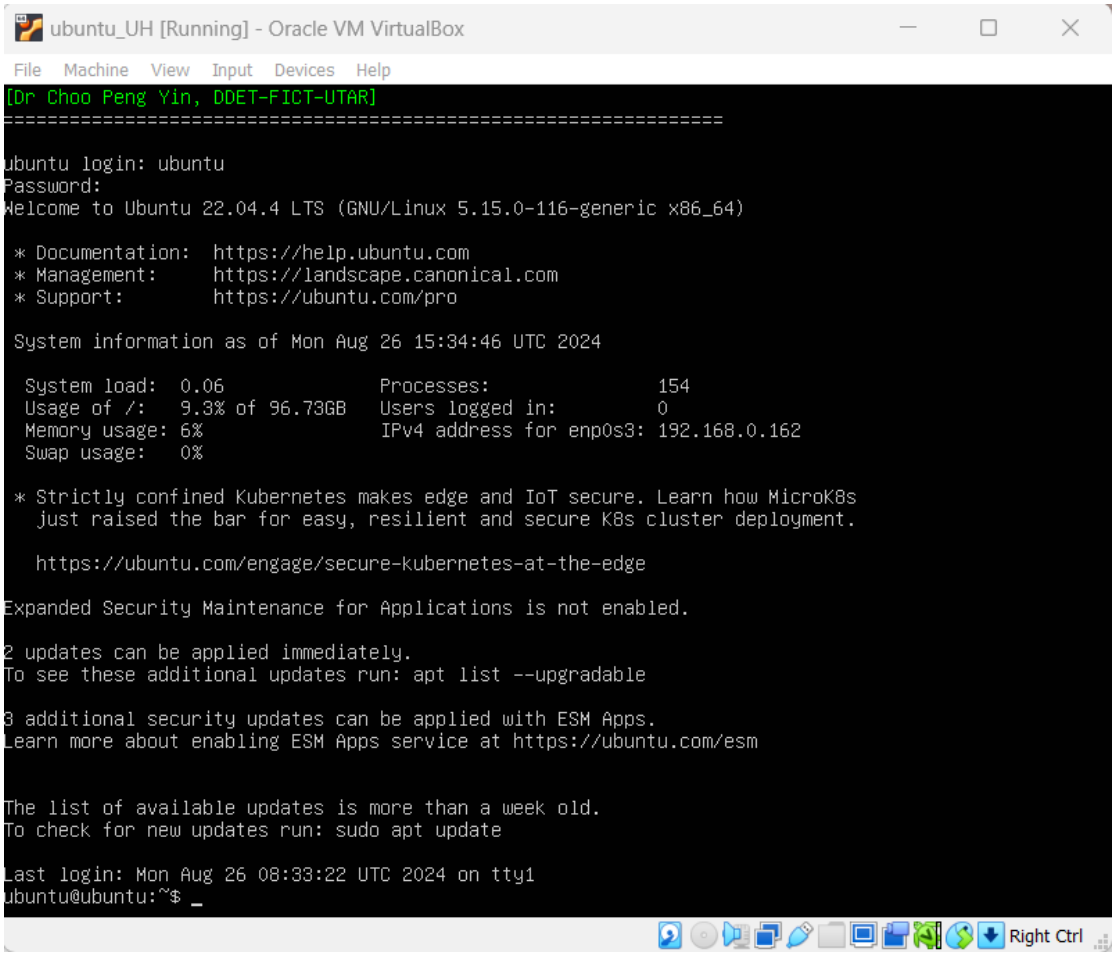


Figure 5.3.1.1 Launch the Ubuntu server

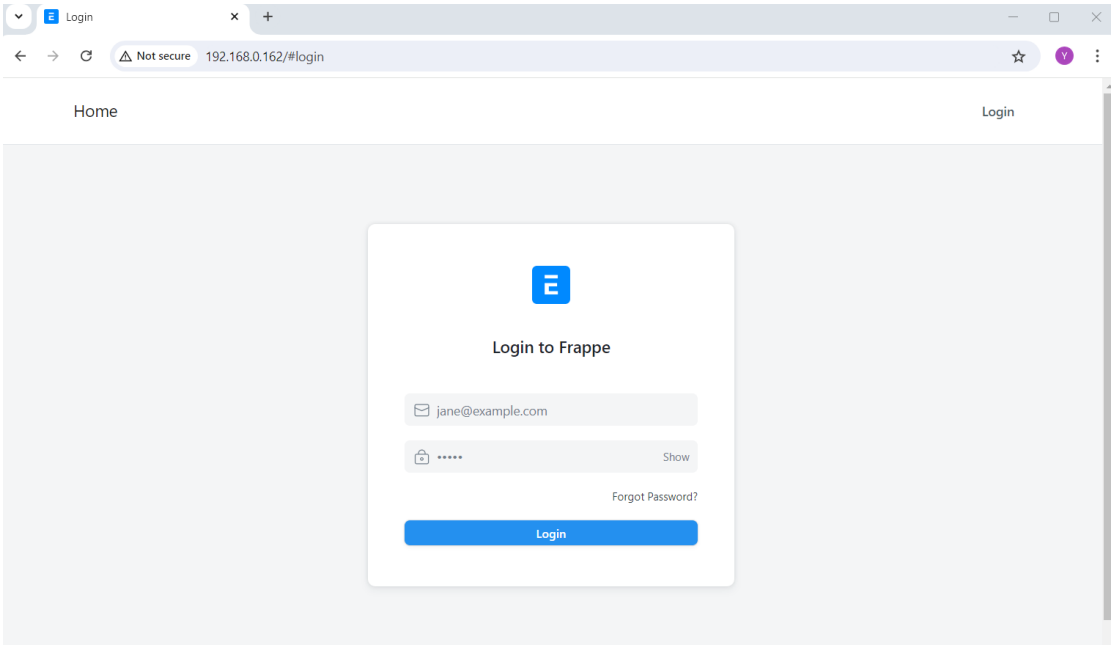


Figure 5.3.1.2 Browse the IP address of server in web browser

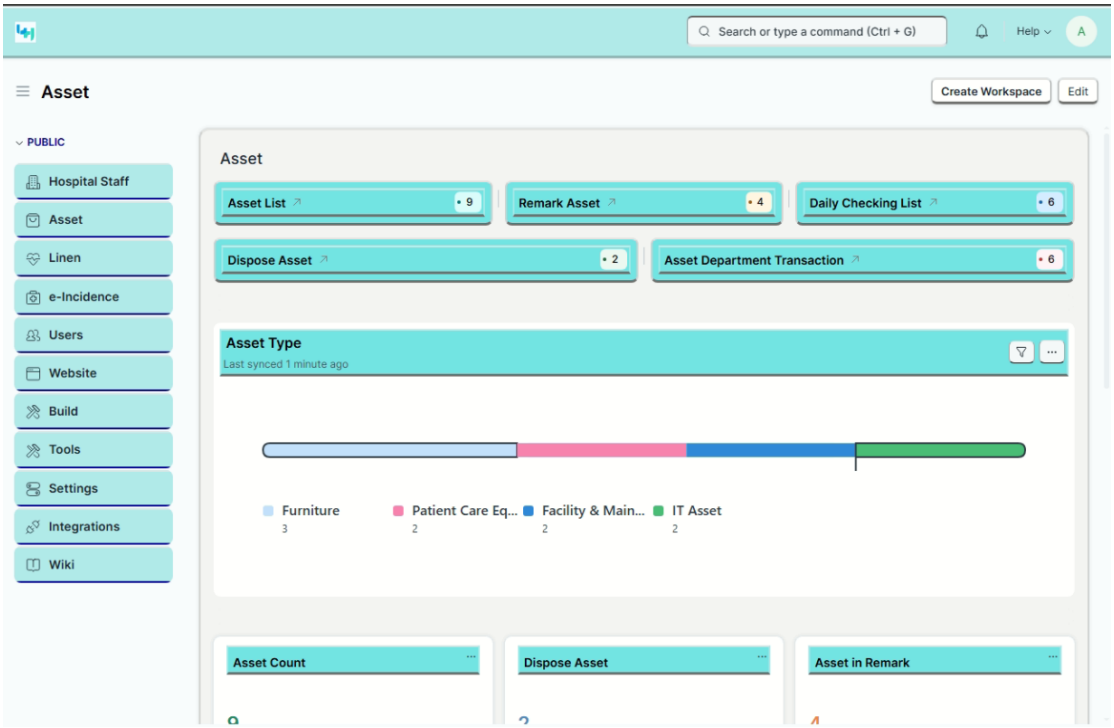


Figure 5.3.1.3 Homepage of ERPNext

Once logged in, users view the system that contain workspace options for Linen, Asset, User and other created workspace. The navigation sidebar allows quick access to different functions depending on user permissions.

5.3.2 User Role and Access Functional Operation

A user access control configuration of the system that grants the administrator the power to administer and limit access to the linen dashboard as well as its functionality. It ensures that user who without permission are disallow getting to view, edit, or manage the same linen records and transactions. Different levels of access could be setup based on user roles, and each user will have protection from sensitive information while performing actions based only on the set permissions.

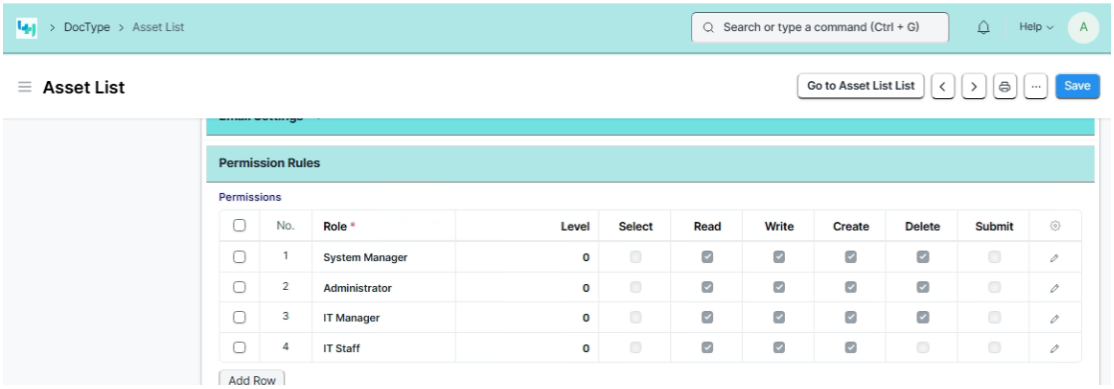


Figure 5.3.2.1 Permission Setting by Role

ERPNext system offers super administrator the power to create, read, modify and delete the user record. Super administrator can create a new user account for staff of UTAR Hospital to access the system. New user information will be added and stored in the user database.

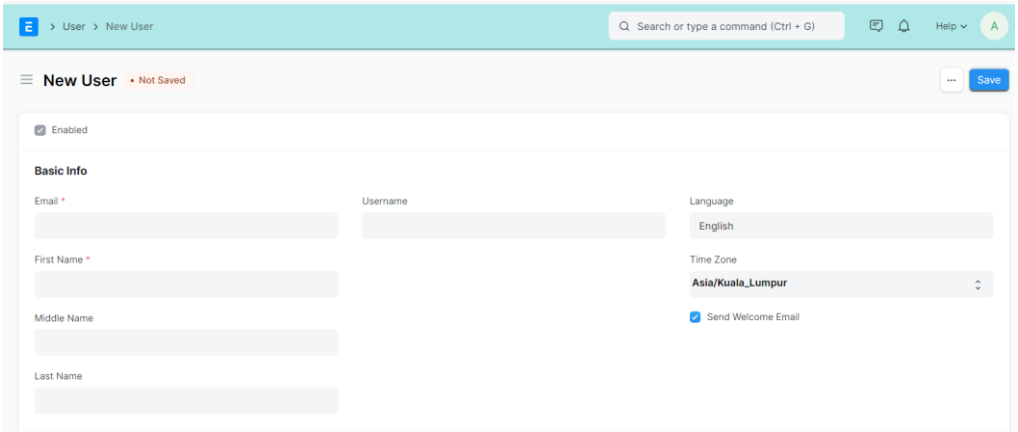


Figure 5.3.2.2 Create new user

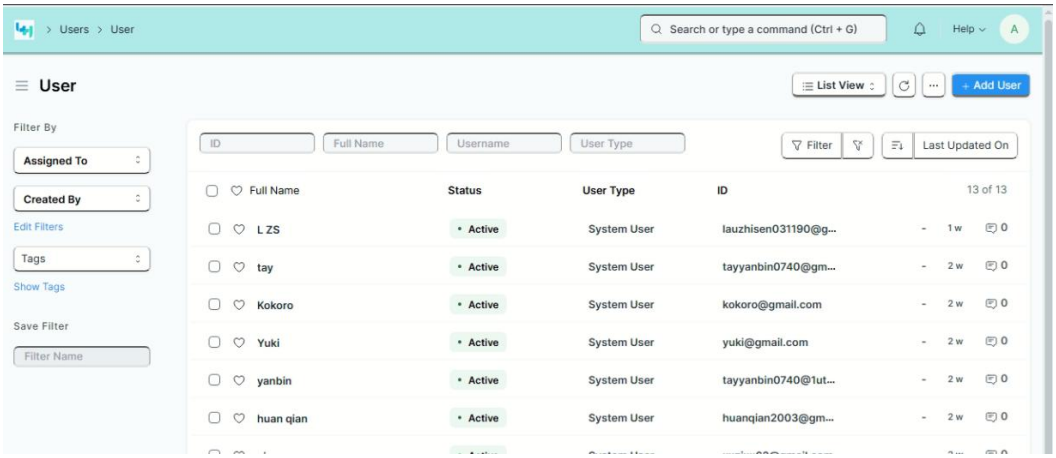


Figure 5.3.2.3 Overview of user list

The role-based access also controls by super administrator which manage different levels of access for different users. For instance, super administrators will have fully access to the system like detailed records for asset and linen inventory and several features. While the access of general department staff that without any special role will be limited only to relevant dashboards for their operations like the general service departments. This is to ensure that each user handles data relevant to their responsibilities only, further enhancing the security as well as user-friendly.

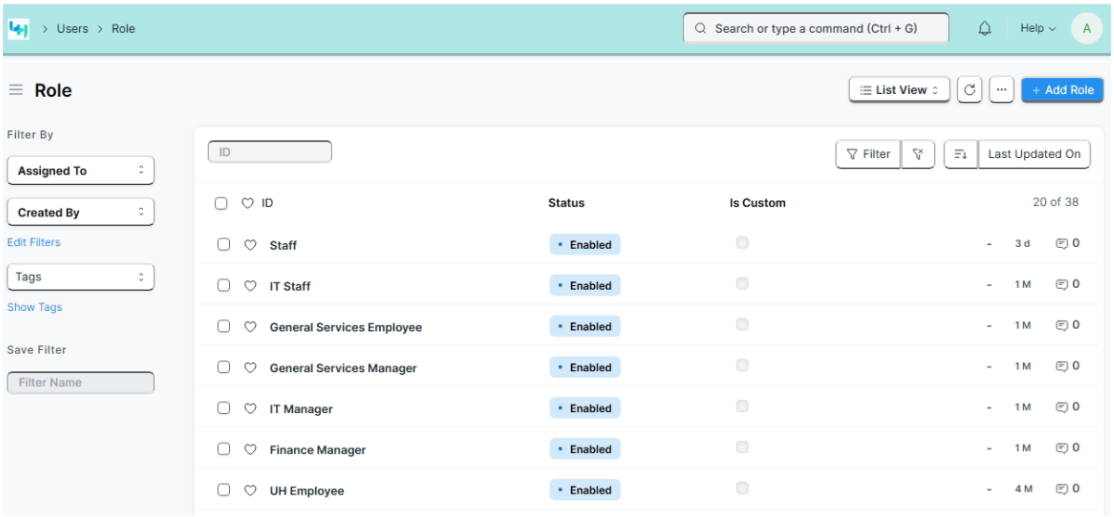


Figure 5.3.2.4 List of user role

5.3.3 Linen Functional Operation

Figure 5.3.3.1 shows the form used to register new linen items into the system. Staff are required to fill in key details such as linen item epc, linen item name,

category, current location, ownership, and datetime. A Client Script is implemented to filter available items based on the selected linen category, reducing human error.

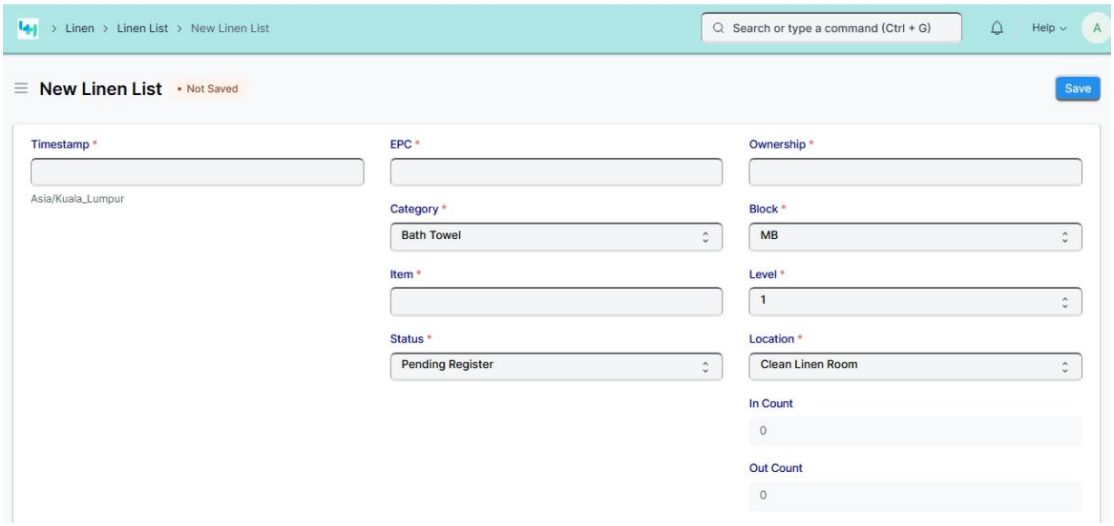


Figure 5.3.3.1 Linen Registration Form

Upon submission of the linen registration form, a QR code is automatically generated and displayed in the record. This QR code is linked to the unique ID of linen and is used for tracking, scanning, and verification purposes.

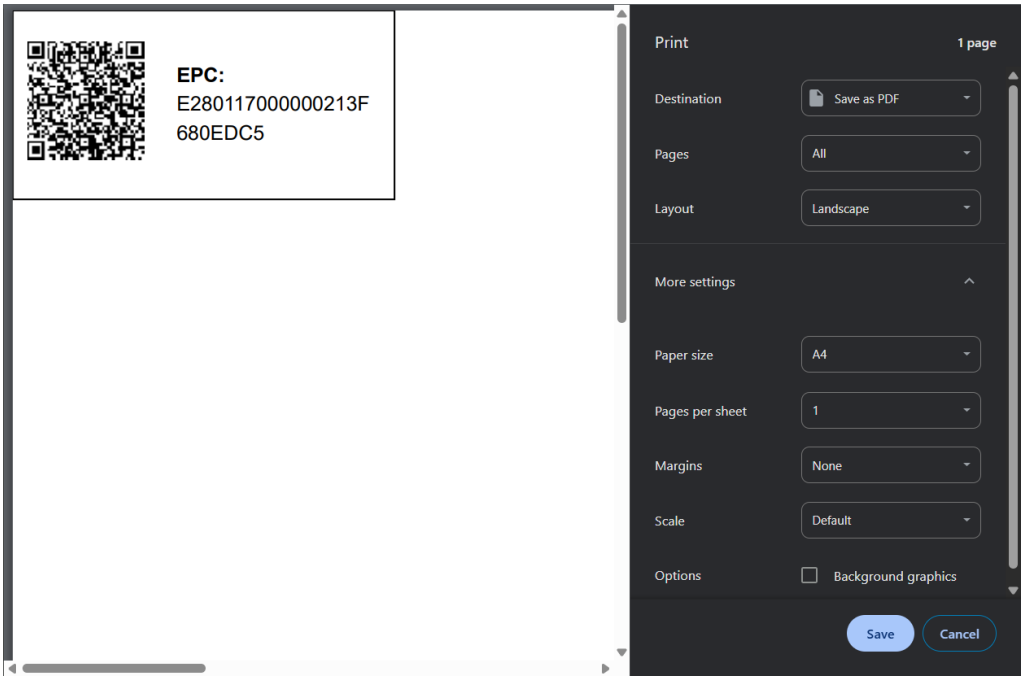


Figure 5.3.3.2 QR code generation on registration

Figure 5.3.3.3 View of after printing out QR code

5.3.4 Asset Functional Operation

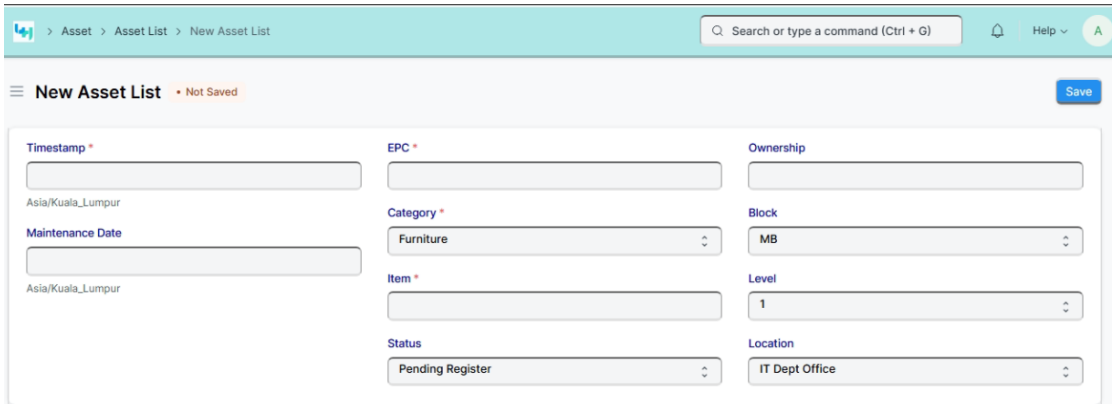


Figure 5.3.4.1 Asset Registration Form

Figure 5.3.3.1 displays the asset registration form where asset item name, item epc, category, ownership, datetime and location details are entered. A similar filter script used in linen registration is also applied here to limit the item selection based on category. Furthermore, assets can be requested for relocation or moving the item to another location and ownership. When finance manager and IT manager approve the request, a server script updates the current location and ownership of asset item automatically, ensuring real-time data accuracy.

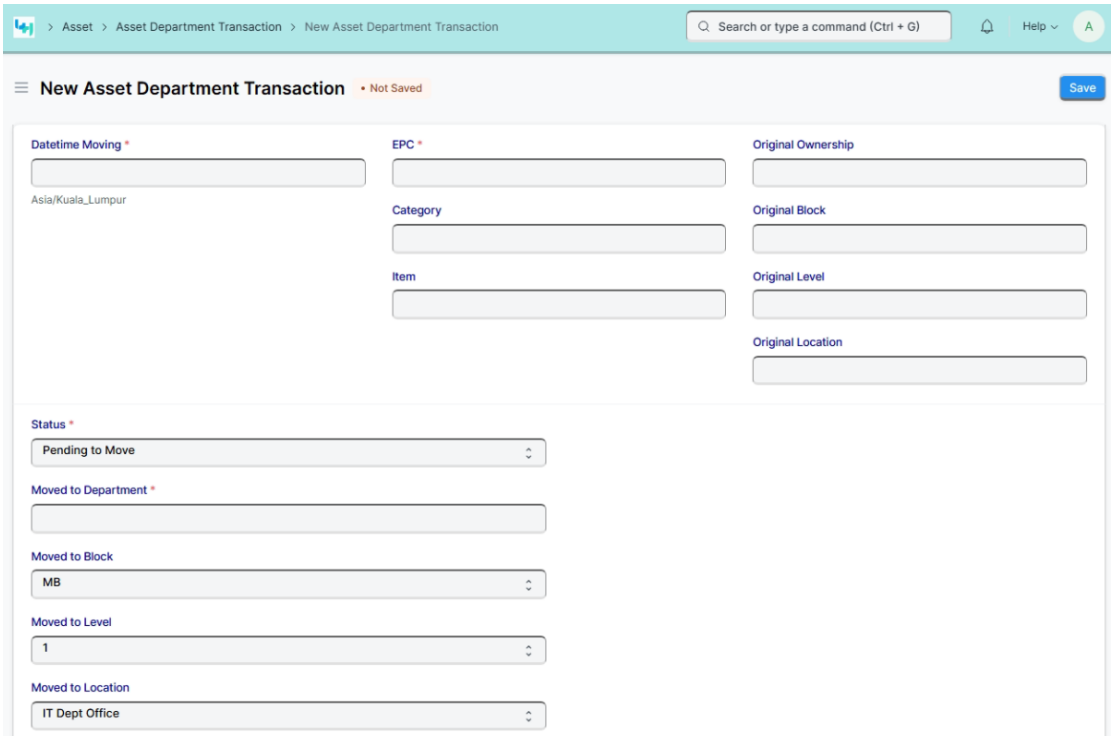


Figure 5.3.4.2 Asset Movement Registration Form

5.3.5 Item Approval and Rejection Functional Operation

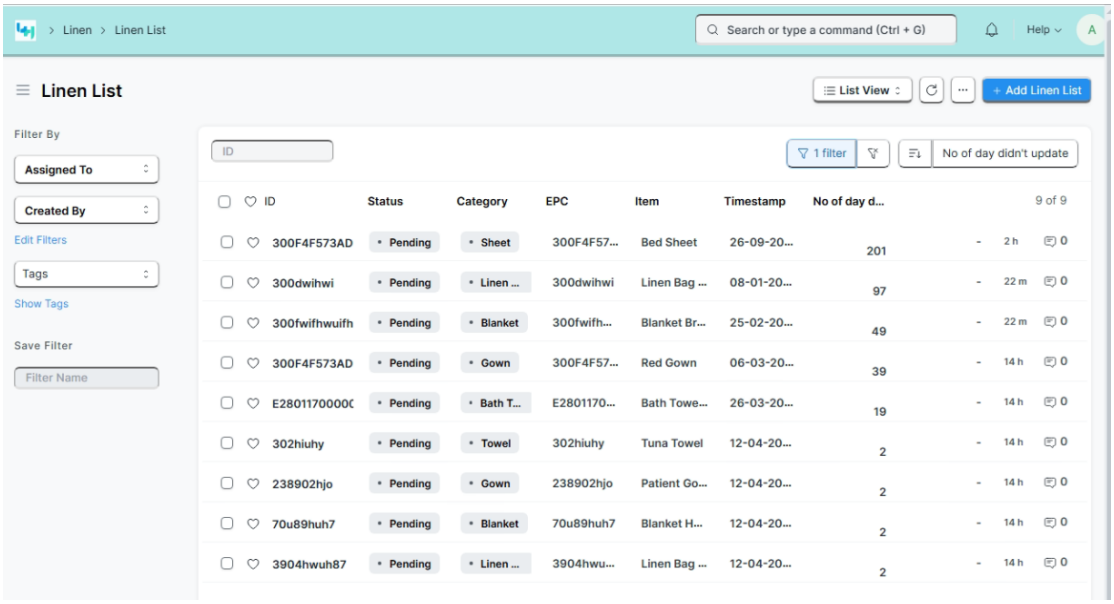


Figure 5.3.5.1 List of Linen Item Pending Register

The item list displays all newly registered items such as assets or linens that are awaiting review and confirmation by a managerial-level user. Each entry typically includes key details such as item name, category, location, registration date, and the

user who initiated the request. This interface is critical in ensuring data accuracy and control before any new item is officially recorded into the monitoring system.

Managers access this module to review each submission. Upon reviewing, they are given two primary actions such as “Approve” or “Reject”. If the item is approved, it is officially added to the respective monitoring list which is asset list or linen list and becomes fully traceable in the system, including being linked with its QR code and real-time location.

If the item is rejected, a backend server script is automatically triggered. The script will perform to remove the item record from the system to prevent unauthorized or incorrect data from remaining in the database. It ensures that any related temporary data is also cleared to maintain data integrity. It also reduces the risk of human error during the approval workflow and keeps the approval interface focused only on active pending items.

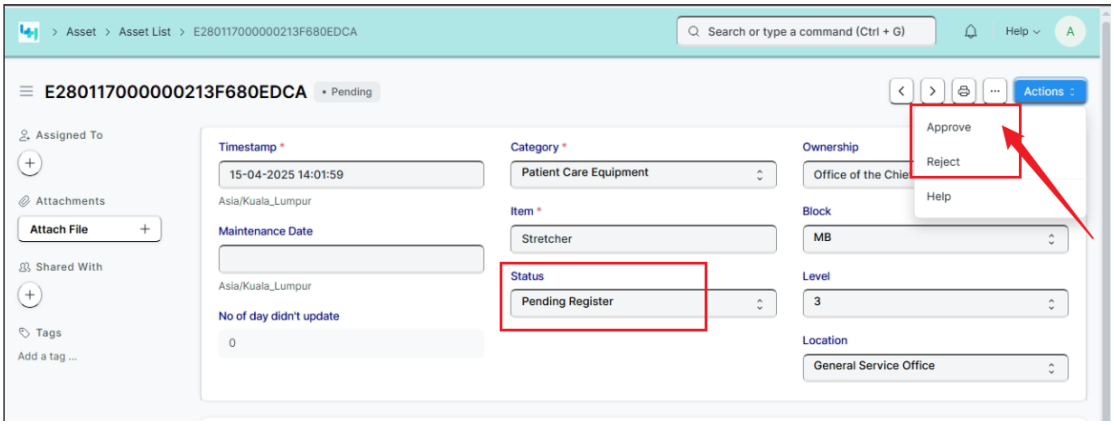


Figure 5.3.5.2 Pending Item Approval List

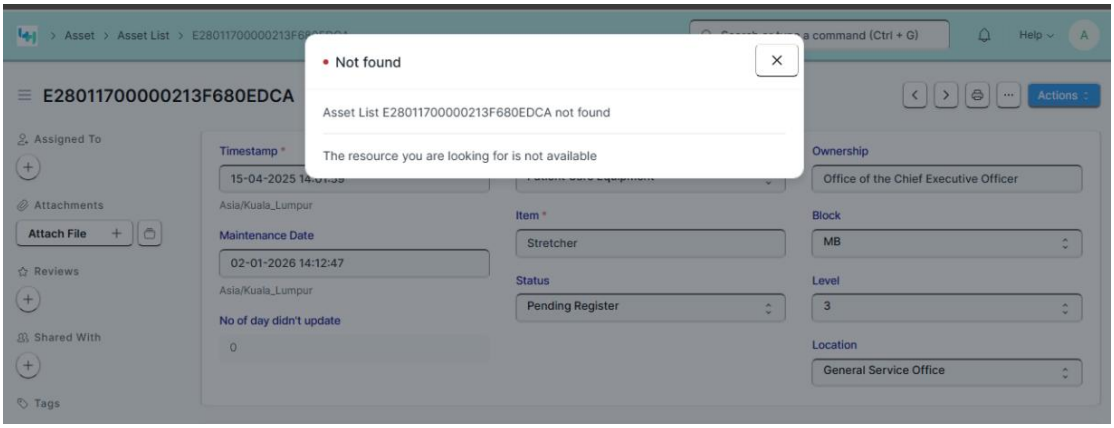


Figure 5.3.5.3 Action: Rejected Items Removed Automatically

5.3.6 Item Disposal Functional Operation

Staff can initiate a disposal request by selecting the linen or asset item, optional adding a reason for disposal, and submitting the request for approval.

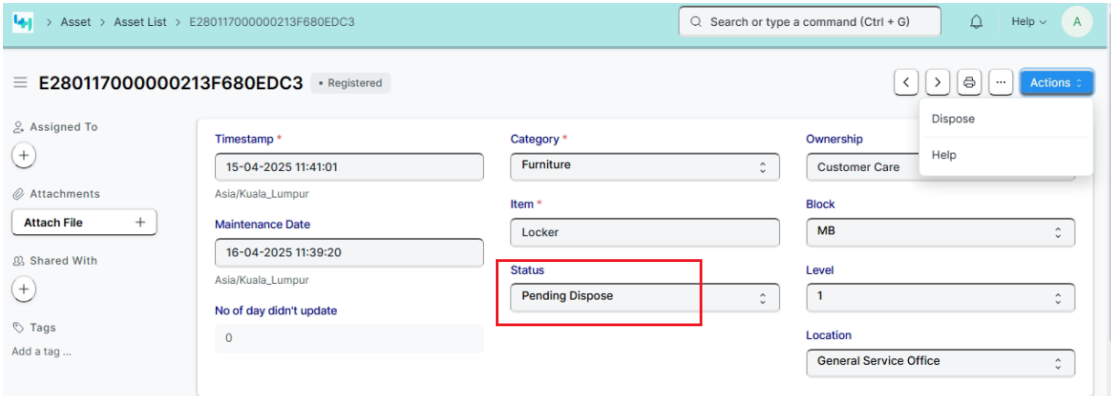


Figure 5.3.6.1 Asset Item Disposal Request Form

Once the disposal is approved, the item is automatically removed from the main list and recorded under the disposal list. This process is handled through a server script to ensure consistent tracking of disposed items.

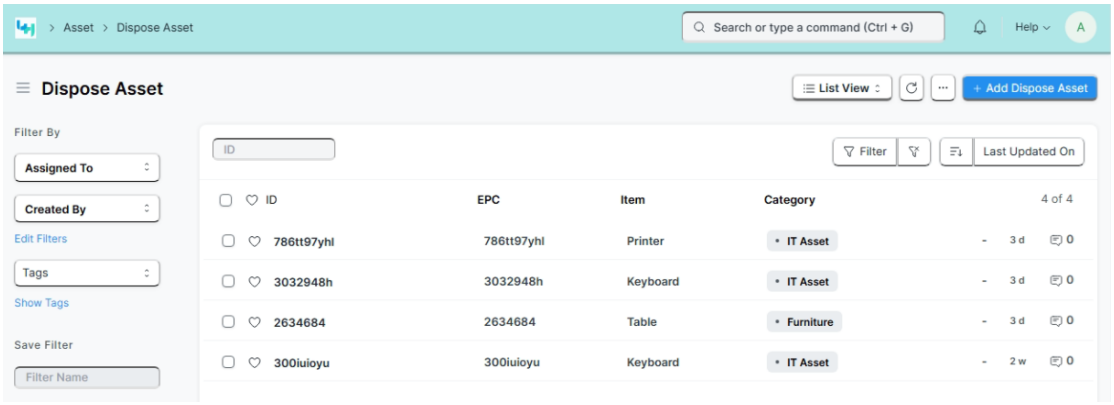


Figure 5.3.6.2 Asset Item Disposal List

5.3.7 QR Code Print Format Functional Operation

Print Format feature of ERPNext is used to create a custom label that includes the QR code. This QR code encodes the document name, EPC or other information for fast scanning. The print format can be exported and attached to physical items for verification via mobile device scanning.

Below is listed the steps how to generate the QR Code for each item:

1. Write the script to generate QR code of each item via EPC of item in the Print Format feature. It is used for generating QR codes linked to linen items, with a static image generated.

```
<div style="width: 6cm; height: 3cm; border: 1px solid #000; display: flex;
align-items: center; padding: 0.2cm; box-sizing: border-box;">
    <!-- QR Code Container -->
    <div id="qrcode" style="width: 2cm; height: 2cm;"></div>

    <!-- EPC Display -->
    <div style="margin-left: 0.5cm; font-size: 12px; word-break: break-
word; max-width: 3.2cm;">
        <b>EPC:</b><br>
        {{ doc.epc }}
    </div>
</div>

<script
src="https://cdnjs.cloudflare.com/ajax/libs/qrcodejs/1.0.0/qrcode.min.js"><
/script>
<script>
    let epc = "{{ doc.epc }}";
    let scanUrl = "{{ frappe.utils.get_url() }}/asset.html?epc=" + epc;

    new QRCode(document.getElementById("qrcode"), {
```

```
        text: scanUrl,
        width: 75,
        height: 75
    });
</script>
```

2. Open the “Linen List” or “Asset List” and click the item want to print its QR code.

3. Click the “printer” icon button.

4. Select the Print Format to Asset QR Print or Linen QR Print.

5. Click the “Print” and print out the QR code.

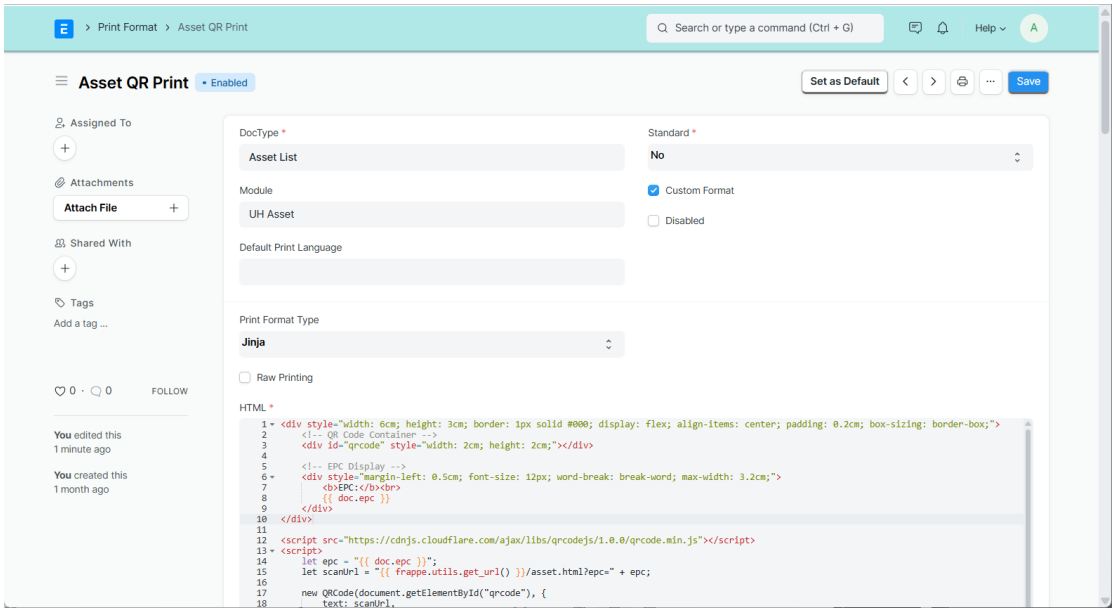


Figure 5.3.7.1 QR code generation through print format feature

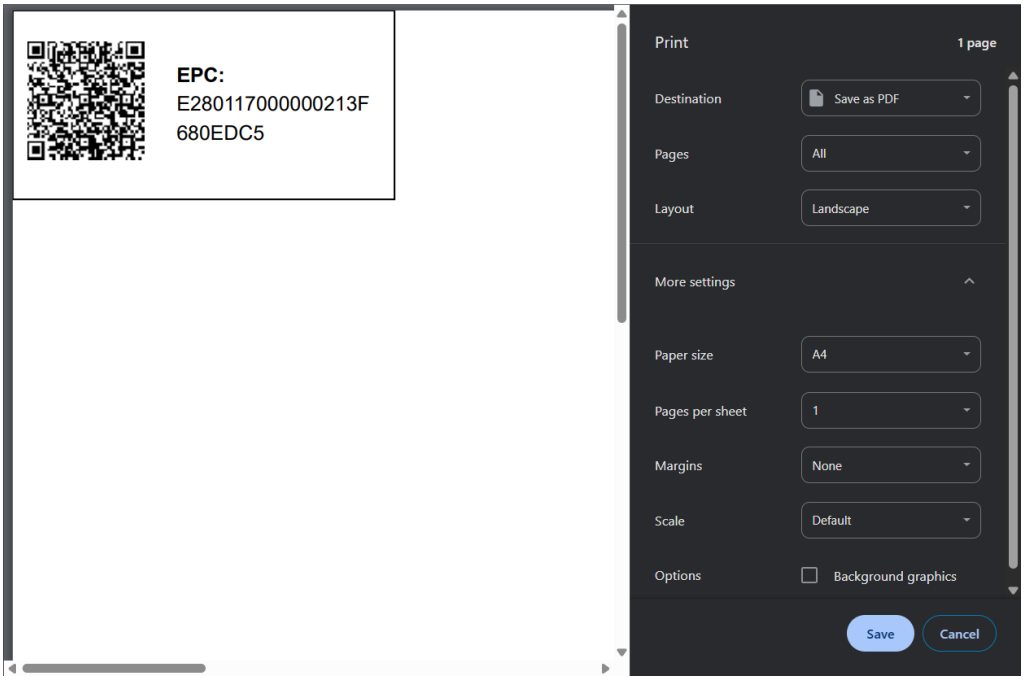


Figure 5.3.7.2 Print out the QR Code

Figure 5.3.7.3 View of after printing out the QR Code

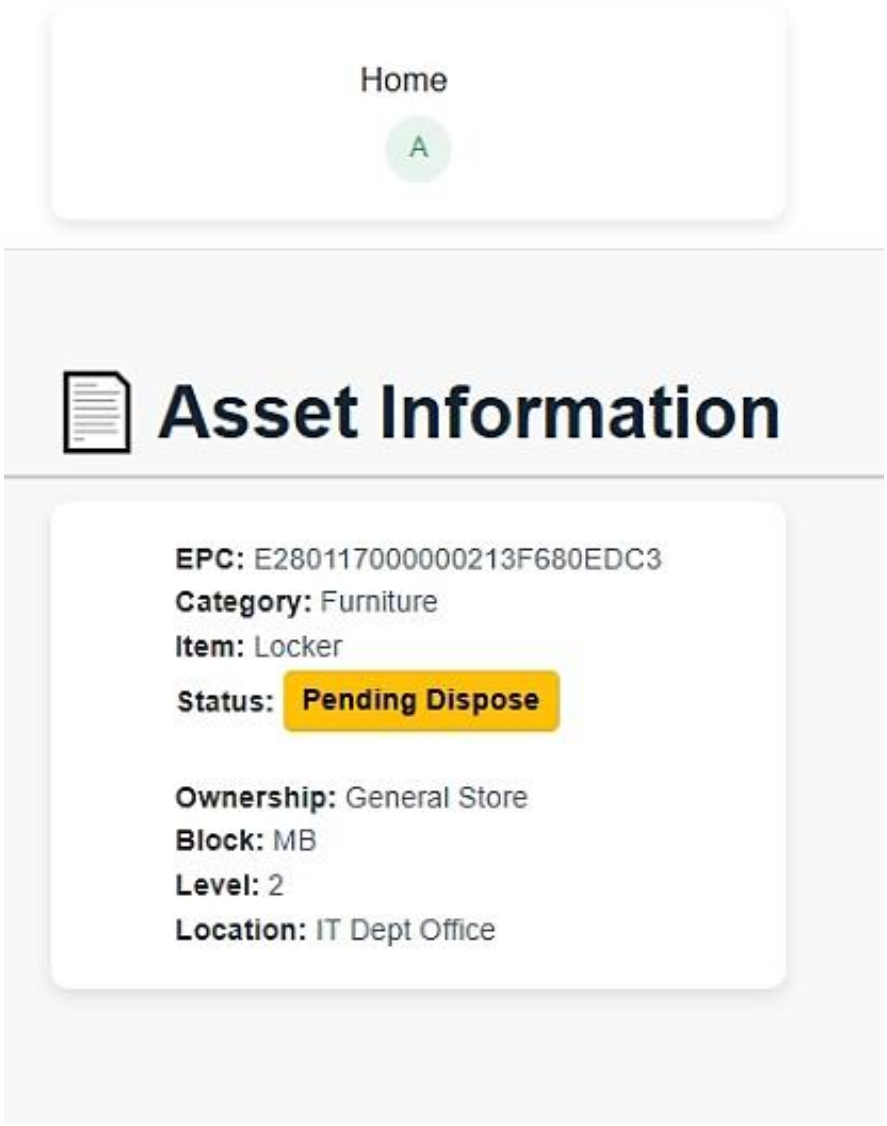


Figure 5.3.7.2 View of after scanning QR Code by using mobile scanner

5.3.8 Item Filter Functional Operation

The feature of filter in the system is a function that allows user to select specific condition of data for filtering. Once user has selected the filter condition, the system will filter and show the relevant data information for user. This feature provides user with an easily and quickly way to monitor and track the asset and linen of UTAR Hospital.

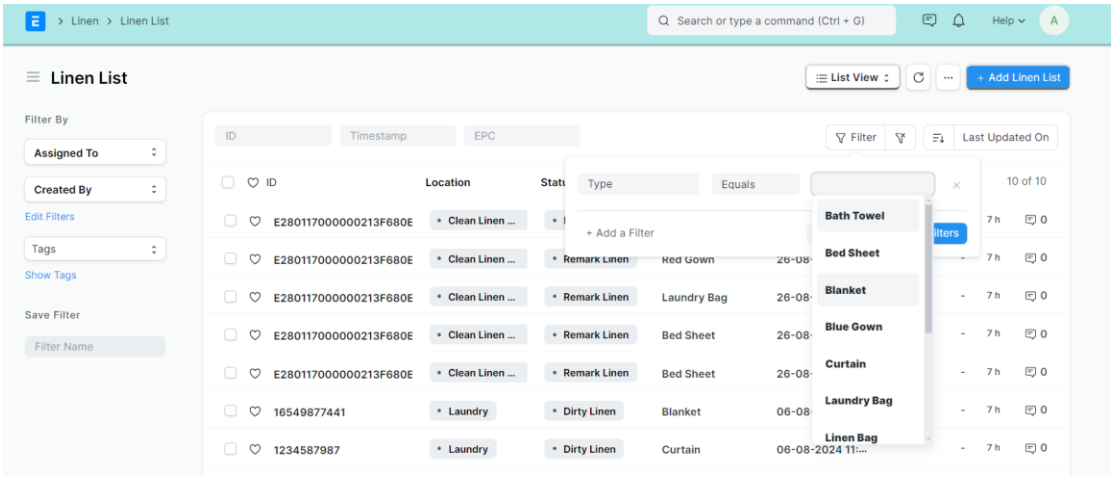


Figure 5.3.8.1 Filtering feature in the system

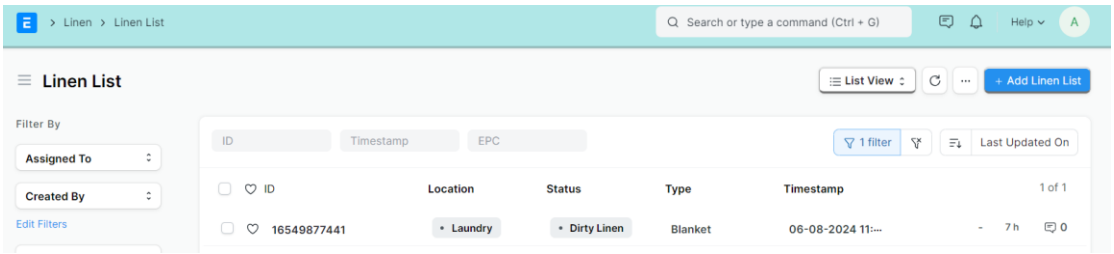


Figure 5.3.8.2 Filtering result

5.3.9 Notification Functional Operation

Alert system notification feature of system which offers user timely responses to specific condition that relates to asset and linen. The alerts are automatically generated and sent to relevant personnel when specific condition is triggered. For example, asset maintenance schedule or remarked asset and linen. This is minimizing the risk of oversight on maintenance schedule and maintaining operational efficiency.

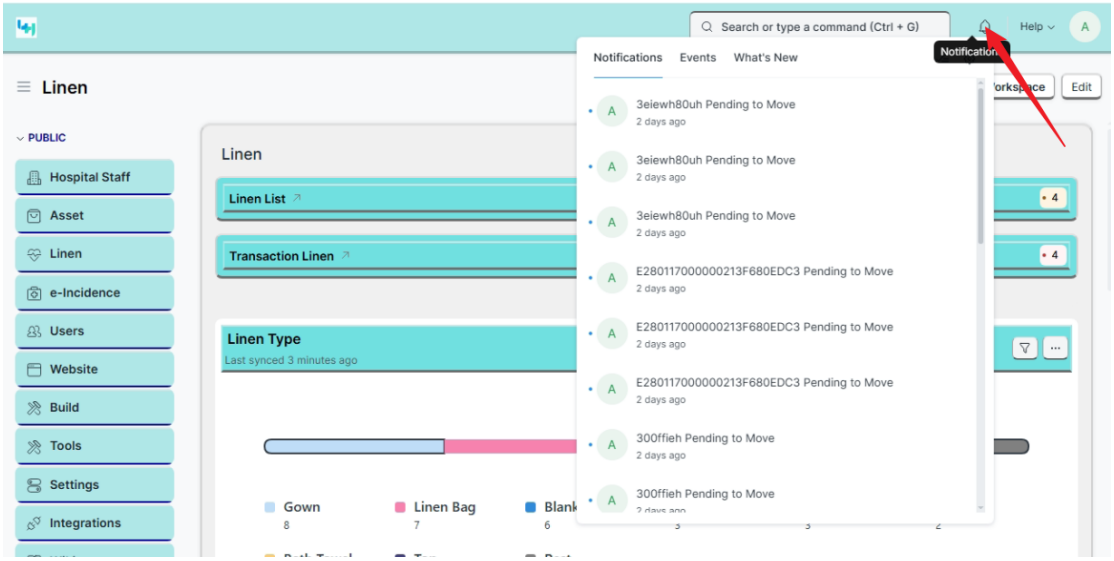


Figure 5.3.9.1 Feature of system notification

5.3.10 Dashboard Functional Operation

Linen dashboard which is a key component of the system. It is designed to monitor and track the linen at UTAR Hospital by viewing analysis charts, which provide overview of linen status, location and other information. The dashboard allow includes a comprehensive list view record of linen data. For instance, linen list which is main record list that records every linen detail information and transaction linen list that tracks each transaction of linen. This is collecting the data in real-time, ensuring that the latest information is processed and displayed correctly.

The Asset Dashboard is another core component of the system, specifically designed to monitor and manage assets used within UTAR Hospital. It provides a visual overview and real-time data insights into the asset inventory of hospital through various analysis charts and interactive record lists. This dashboard enables administrative staff and department heads to view key statistics such as total number of assets, status, asset item type statistics, and so on. Additionally, the asset dashboard also contains some shortcut keys to navigate user to comprehensive list view that shows every detailed information of asset including item name, epc, asset category, location, status and ownership.

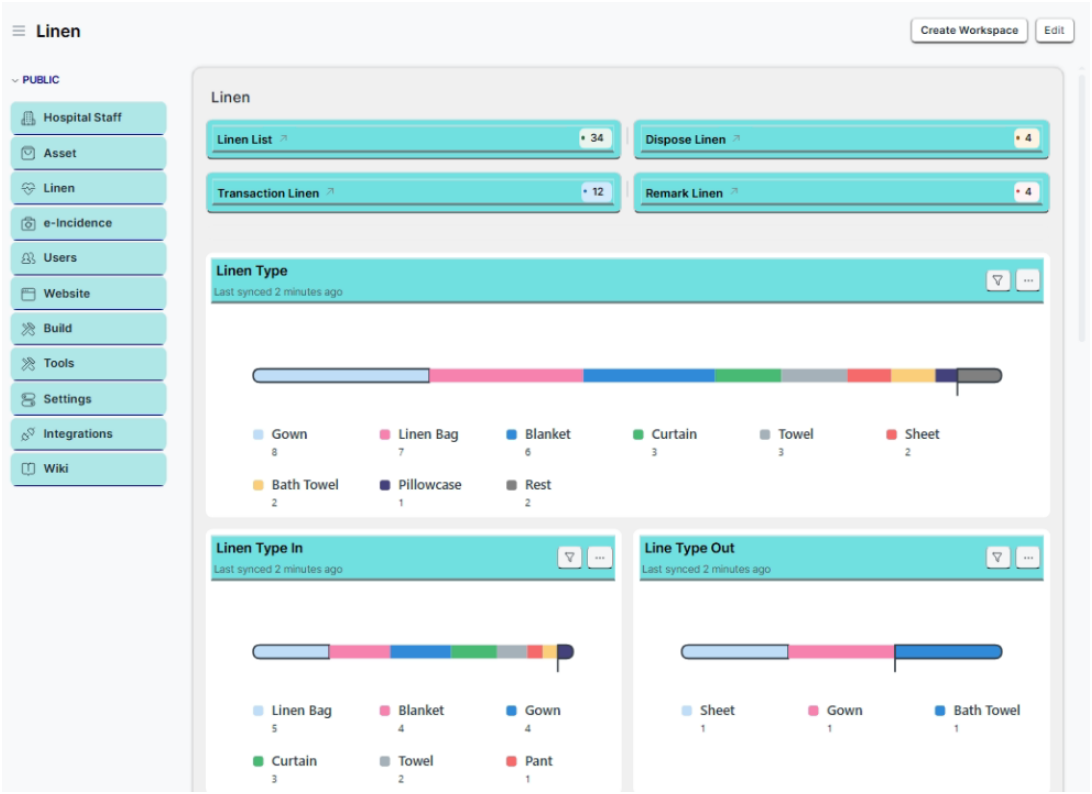


Figure 5.3.10.1 Overview of linen dashboard

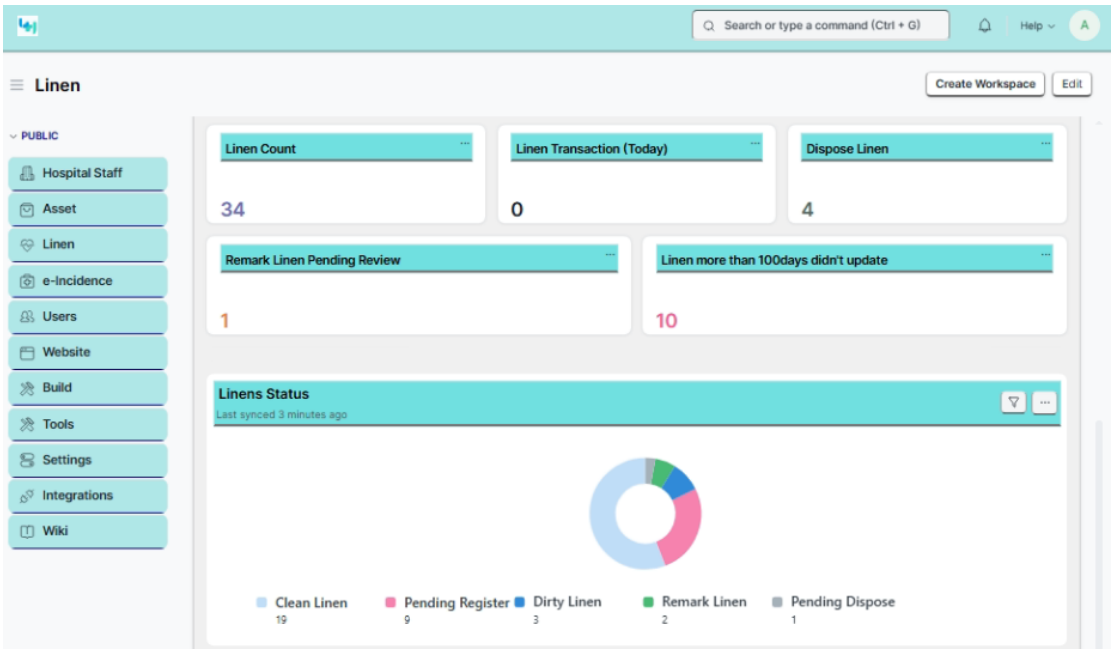


Figure 5.3.10.2 Overview of linen dashboard

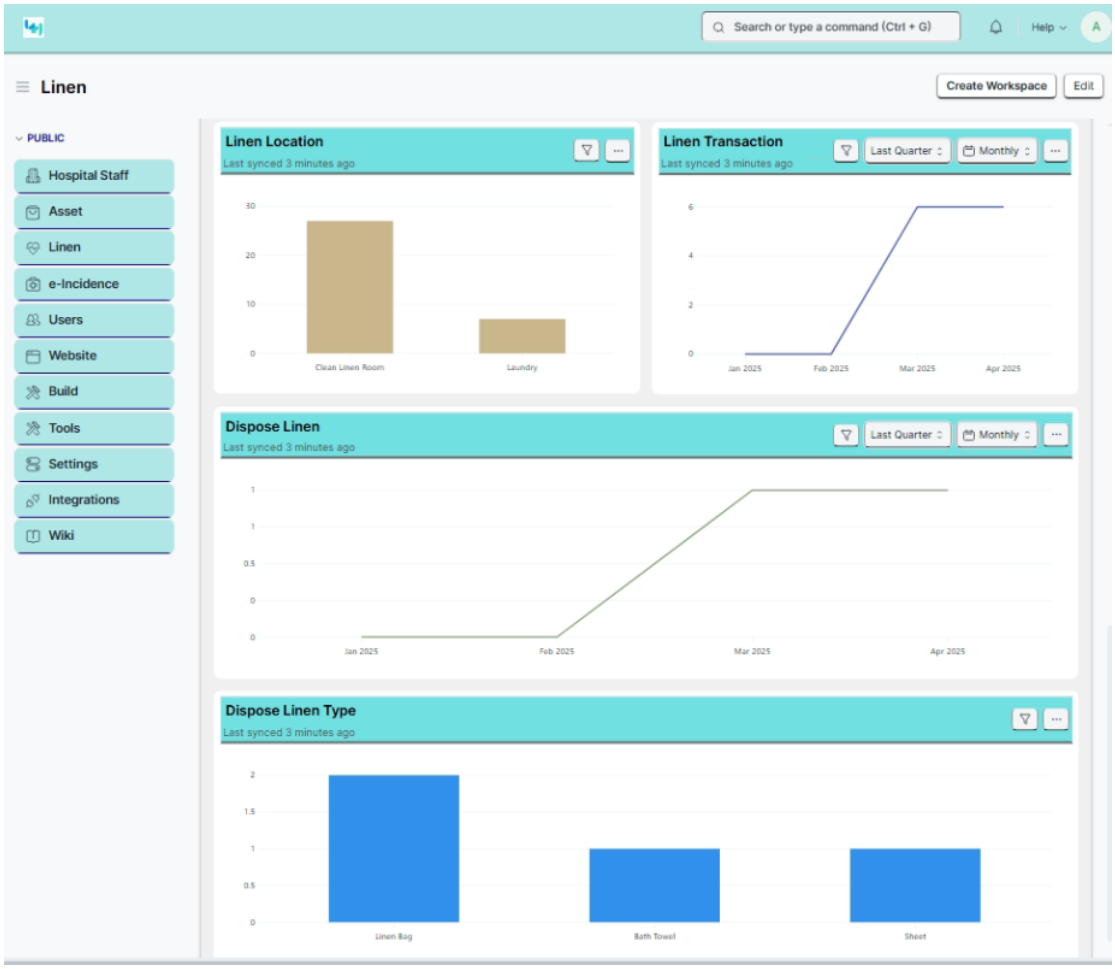


Figure 5.3.10.3 Overview of linen dashboard

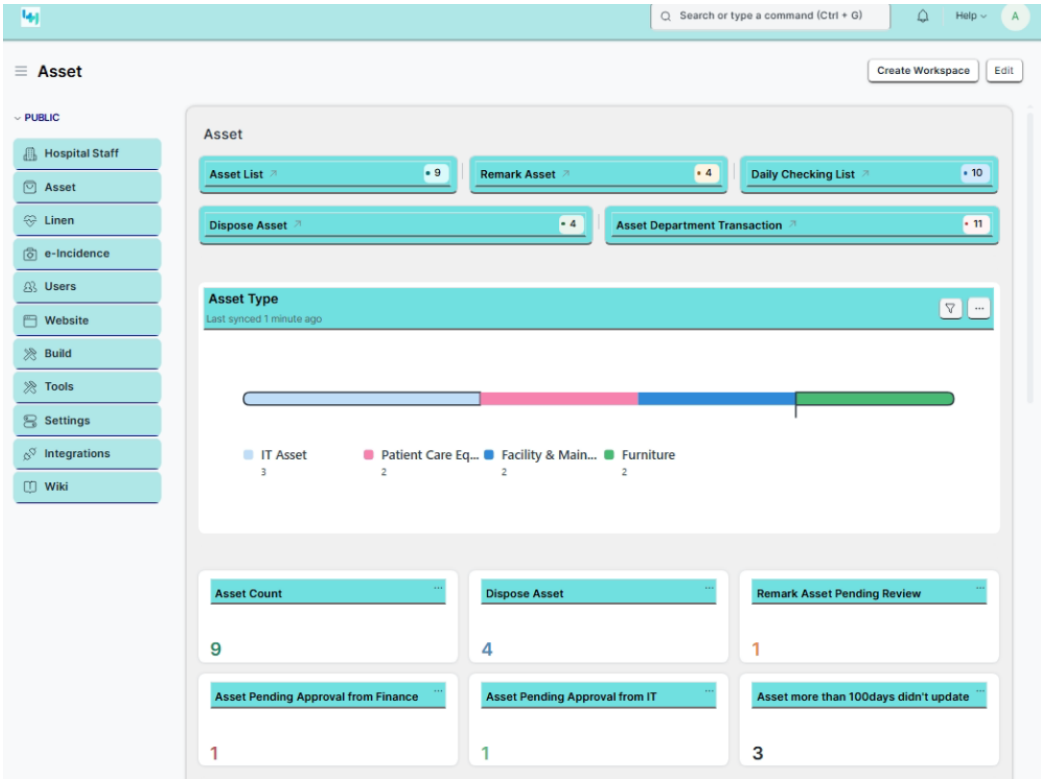


Figure 5.3.10.4 Overview of asset dashboard

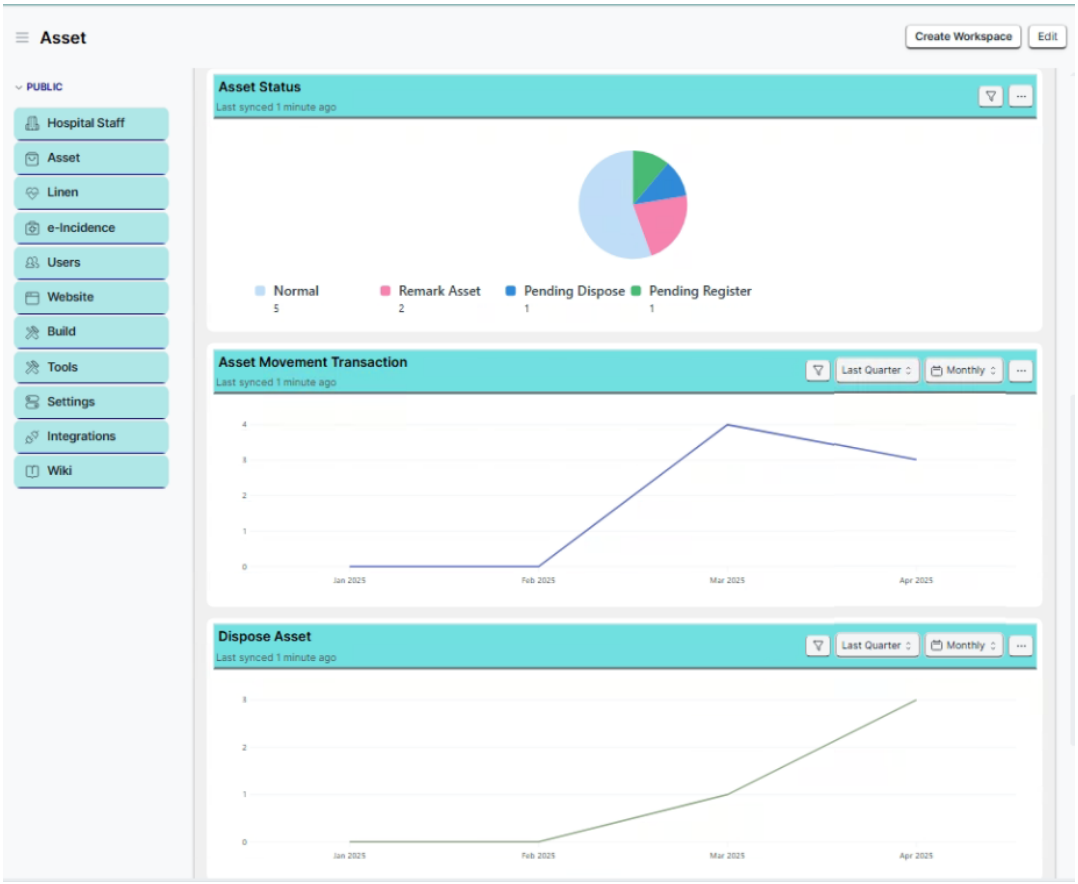


Figure 5.3.10.5 Overview of asset dashboard

5.4 Implementation Issues and Challenges

During system implementation, several issues are encountered. One of the main challenges involved QR code integration. In the beginning, the default print format of ERPNext which is unable to support QR image embedding for custom doctypes. This required manual script writing using HTML to generate dynamic links. Furthermore, implementing custom scripts to filter item selections based on category and control record movement such as disposal or rejection required a thorough understanding of the ERPNext scripting framework. At the start, unexpected actions are observed, such as filters unable to apply correctly or actions being triggered even before form validation. Careful debugging and testing are needed to ensure scripts ran only after proper validations and state changes.

Additionally, setting up multi-step approval workflows for linen and asset registration, transfer, and disposal posed challenges in defining clear user roles and permissions. In some cases, users with insufficient privileges could access sensitive operations. This required multiple iterations of role permission configuration to ensure only authorized personnel could approve, reject, or update records based on workflow status. Lastly, during testing, rejected or wrongly registered linen and asset items are still visible in the main list view. This required additional server-side logic to completely remove or archive such records. Maintaining clean and consistent data, especially when items changed location or ownership, is another challenge that required additional script enhancements.

These challenges, although time-consuming, contributed to deeper system understanding and resulted in a more refined and stable implementation. The experience also strengthened the robustness and usability of project for hospital operations.

5.5 Concluding Remark

In this chapter, there is detailed discussed the implementation of system which setup the software, system setting and configuration. Furthermore, system operation which outlines the functionality that have been done in this project. Each functional

module is designed and tested to ensure usability, efficiency, and real-time monitoring capabilities, especially tailored for the operational needs of UTAR Hospital. System implementation issues and challenges are highlighted the problems that is faced during the implementation process of project.

CHAPTER 6

System Evaluation and Discussion

6.1 System Performance Evaluation

The performance evaluation of the system aims to assess the stability, speed, and responsiveness of system during actual operations. These evaluations ensure that the system performs well under expected workloads and can handle common user interactions without delays or failures. The evaluation focuses on four aspects such as response time, load behaviour, and network efficiency. This method allows tracking of page load times, request durations, and system responses in real time, ensuring the system meets performance expectations for daily hospital use.

6.1.1 Response Time Analysis

Response time analysis focus on the time it takes for a user action to trigger a server response and for the webpage to reflect the change. This analysis tests key functionalities such as login the system, item registration, approval workflow and update information. For this evaluation, 5 trials are conducted per task. Each trial involved measuring the time between the initial user action and the full completion of the process, including backend validation, database update and frontend rendering.

As showed in Table 6.1.1.1, the average total response time for the login process is approximately 57.87 milliseconds (ms). This consists of average 47.17ms waiting for the server to respond and average 7.59ms for content download. The login operation demonstrates efficient backend communication and frontend rendering, contributing to a seamless authentication experience.

Times	Waiting for server response	Content download	Total response time
1	45.51ms	7.26ms	55.71ms
2	46.16ms	10.97ms	59.82ms
3	44.66ms	8.57ms	55.63ms
4	45.46ms	6.68ms	53.87ms

5	56.04ms	4.49ms	64.34ms

Table 6.1.1.1 Response Time for Loging Process

As showed in Table 6.1.1.2, the average total response time for item registration is approximately 30.57ms, with minimal variation between trials. This consists of average 27.41ms waiting for the server to respond and average 0.63ms for content download. Since the server responded quickly, and the content load times are nearly instantaneous, thus confirming that this process is lightweight and performs efficiently under typical conditions.

Times	**Waiting for server response**	**Content download**	**Total response time**
1	22.94ms	0.60ms	27.52ms
2	32.98ms	0.65ms	34.78ms
3	26.69.ms	0.70ms	31.63ms
4	26.53ms	0.60ms	28.11ms
5	27.89ms	0.60ms	30.80ms

Table 6.1.1.2 Response Time for Item Registration Process

Among all tested processes, the workflow and update operations showed the longest average response time, approximately 82.64 ms. This consists of average 78.67ms waiting for the server to respond and average 1.15ms for content download. This is expected, as these operations often involve both record validation and database updates. However, the system still performs well in acceptable levels, maintaining smooth interactions even under tasks that require more processing.

Times	**Waiting for server response**	**Content download**	**Total response time**
1	99.80ms	0.56ms	102.10ms
2	72.35ms	1.25ms	78.26ms
3	76.66.ms	0.90ms	81.67ms
4	70.36ms	2.31ms	75.48ms
5	74.20ms	0.71ms	75.69ms

Table 6.1.1.3 Response Time for Update Information and Workflow Process

These functions process is tested multiple times under stable network conditions and yielded consistent results, demonstrating the reliability of the backend performance of system. This performance meets hospital standards for web-based applications, ensuring responsive interactions during tasks. Timestamps are recorded after each interaction to measure system responsiveness.

6.1.2 Load Testing

Load testing is conducted to evaluate how the system behaves when multiple users access it simultaneously. This is to verify the ability of the system to maintain stability and accuracy under pressure. To simulate this, multiple browser sessions act as representing different users are launched using incognito windows and separate user login. Each session performed key tasks such as logging in to the system simultaneously. The server handled the load without any system crashes or data inconsistency.

In this testing, 5 concurrent users are simulated. Across most sessions, the system is maintained stability without triggering any crashes or data mismatches. However, during the second test iteration, all five sessions experienced a server-side failure resulting in a temporary unavailability of the system. This incident suggests that while the system is stable under normal concurrent access, it may face reliability challenges during intermittent network instability or unexpected server-side issues. This incident is also noted as an unexpected environmental limitation, rather than a flaw in the system logic or ERPNext configuration. Outside of this disruption, the system resumed normal operation in subsequent test rounds.

Table 6.1.2.1 presents the recorded server response times across five test cycles. The first test run recorded response times ranging from 383.05ms to 626.44ms, which is within an acceptable threshold. Following the server failure during the second iteration, recovery is observed in the subsequent tests, with significantly lower and more stable response times ranging between 53.08ms and 408.93ms. These observations suggest that while the system is capable of handling concurrent users

efficiently, its performance is sensitive to the underlying server and network conditions. This simulation aimed to replicate real-world usage patterns during peak operational periods.

Times	User 1	User 2	User 3	User 4	User 5
	Waiting for server response (ms)				
1	452.24	533.44	453.08	626.44	383.05
2	Fail	Fail	Fail	Fail	Fail
3	91.56	53.08	75.41	73.75	408.93
4	76.15	107.16	88.51	368.71	74.62
5	83.61	97.15	126.49	79.43	301.20

Table 6.1.2.1 Response Time for Multiuser Sametime Login Process

6.1.3 Network Performance

Since the system is deployed within a private network environment and ERPNext is hosted on Ubuntu Server, its performance is also affected by local area network conditions. A reliable and high-speed network connection is essential to ensure seamless communication between client devices such as staff computers and the ERPNext server, particularly when users are accessing real-time dashboards, registering new items, or performing workflow action.

To evaluate the quality of network communication, the command-line ping tool is used to measure packet delivery rate and latency. Using the CMD terminal, multiple ping tests are conducted targeting the IP address of server. These tests revealed consistent low-latency results, with average response times ranging between 0 to 3ms, indicating a fast and stable connection. Additionally, without any packet loss is detected during any of the ping cycles, further confirming the stability of the network environment.

These results demonstrate that the LAN infrastructure within the UTAR hospital environment supports reliable client-server communication. The low latency and absence of packet loss suggest that network bottlenecks are unlikely to hinder the

performance of the asset and linen monitoring system. This reliability is critical for maintaining system usability and ensuring that real-time updates without disruption.

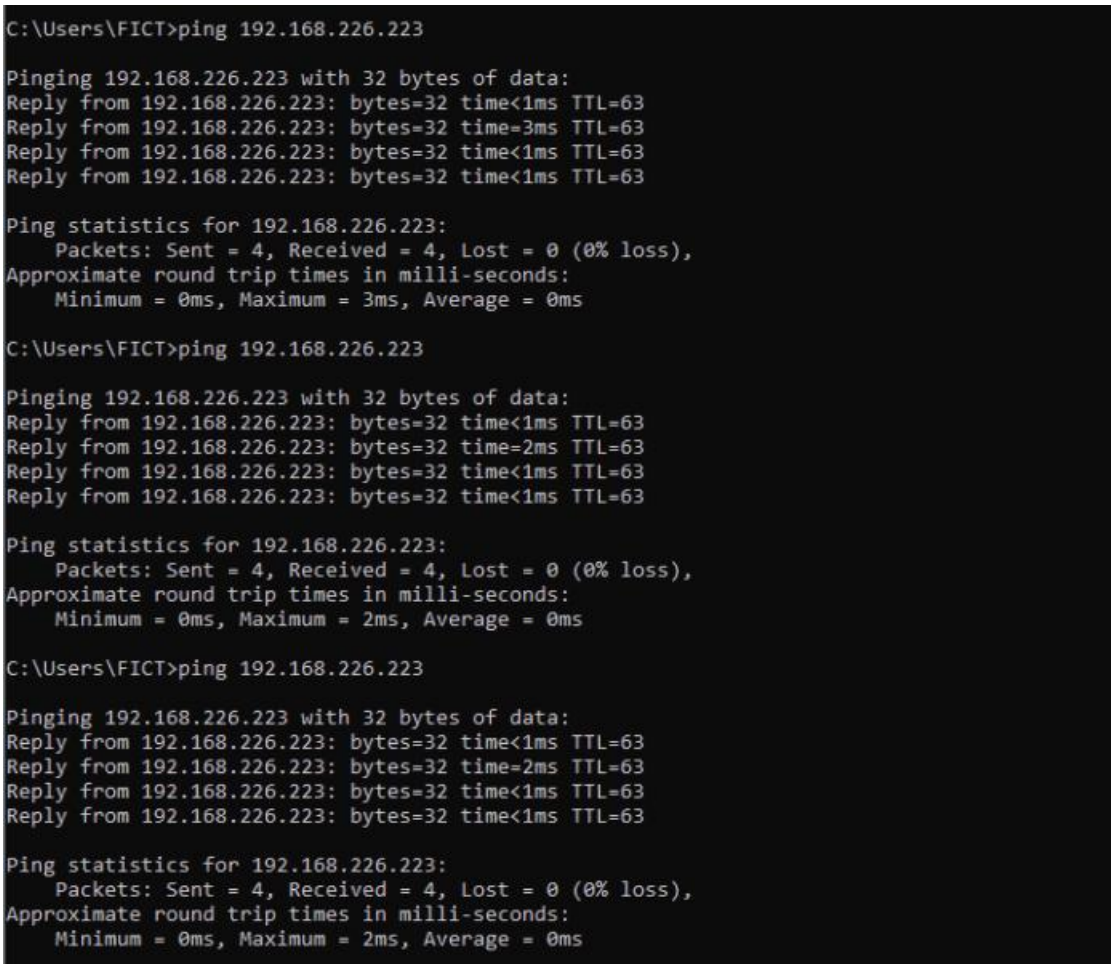


Figure 6.1.3.1 Network Latency and Packet Loss

Overall, the performance of system is within the acceptable range for web-based applications running on local infrastructure. By using browser inspection tools for real-time measurement, it is observed that the system provides responsive interactions, stable multi-user load handling, and low latency without any packet loss. The detailed evaluation confirms that the system is ready for real-world deployment within a hospital environment.

6.2 System Testing Setup and Result

System testing is conducted to evaluate the functional correctness of the developed system. This testing phase aimed to ensure that each module performs according to its functional requirements under typical user scenarios. The testing environment is prepared on the private UTAR network, where the ERPNext system is hosted on an Ubuntu Server. Users accessed the system via browsers on client machines to perform the test cases. The role assigned for the execution is typically either a general hospital staff member or system administrator, depending on the functionality being tested.

Test cases are created to cover both positive scenarios such as creating new asset records, updating linen status, or retrieving dashboard data and negative scenarios like submitting invalid inputs, unauthorized access attempts. The expected results are clearly defined based on the system requirements, and actual results are observed and recorded during testing.

Each test step includes the input values, expected results, actual results, and whether the test is marked as Pass or Fail. In all test cases conducted, the actual results consistently matched the expected outcomes, and the system responded accurately and stably under normal conditions. This system testing process confirmed that the system is ready for deployment in a controlled environment, with all core functions operating reliably and returning appropriate feedback to users based on their interactions.

Log In Test Case				
Use Case : Log In **Date Created** : 17/4/2025 **Role** : User				
No.	**Input Values**	**Expected Results**	**Actual Results**	**Pass/Fail**
1	Click the “Login” button on the Login page.	The system displays an error message show that requests the user login detail.	The system displays an error message show that requests the username or email and password of	Passed

			user.	
2	Click the "Login" button after entering the user login details.	The system navigate user to the homepage of system.	The system navigate user to the homepage of system.	Passed
3	Enter an invalid login detail such as username or password.	The system displays an error message show that login information is invalid.	The system displays an error message show that login information is invalid.	Passed

Table 6.2.1 Log In Test Case

New Item Registration Test Case				
Use Case : New Item Registration **Date Created** : 17/4/2025 **Role** : Staff				
No.	**Input Values**	**Expected Results**	**Actual Results**	**Pass/Fail**
1	Click "Add New Linen or Asset" button on the Linen or Asset list webpage.	The system displays the linen or asset registration form.	The system displays the linen or asset registration form.	Passed
2	Fill in valid asset details and click "Save."	The system saves the new item and shows confirmation message.	The system saves the new item and shows confirmation message.	Passed
3	Leave required fields empty and click "Save."	The system prompts user to complete the required fields.	The system prompts user to complete the required fields.	Passed
4	Enter unique epc of item in duplicate	The system displays an alert message show that item has already existed.	The system displays an alert message show that item has already existed.	Passed

Table 6.2.2 New Item Registration Test Case

Item Status Update Test Case				
Use Case : Item Status Update **Date Created** : 17/4/2025 **Role** : Staff				
No.	**Input Values**	**Expected Results**	**Actual Results**	**Pass/Fail**
1	Click on a listed linen or asset item record.	The system opens the linen or asset item details.	The system opens the linen or asset item details.	Passed
2	Click and update the status of item from "Pending Register" to "Normal" or "Clean Linen"	The system updates and saves the item status.	The system updates and saves the item status.	Passed
3	Leave status fields empty and click "Save."	The system prompts user to complete the status fields.	The system prompts user to complete the status fields.	Passed

Table 6.2.3 Item Status Update Test Case

Register Item Workflow Test Case				
Use Case : Register Item Workflow **Date Created** : 17/4/2025 **Role** : Admin / Manager				
No.	**Input Values**	**Expected Results**	**Actual Results**	**Pass/Fail**
1	Submit a new item register for approval.	The system changes the item status to "Pending Register" and sends notification to the manager and admin.	The system changes the item status to "Pending Register" and sends notification to the manager and admin.	Passed
2	Manager reviews and clicks "Approve".	The system updates the status to "Registered" and logs the name of approver and timestamp.	The system updates the status to "Registered" and logs the name of approver and timestamp.	Passed

3	Manager reviews and clicks “Reject”.	The system updates the list and remove the rejected item.	The system updates the list and remove the rejected item.	Passed
4	Attempt to approve without role permission and user access.	The system denies access and displays an alert message.	The system denies access and displays an alert message.	Passed

Table 6.2.4 Register Item Workflow Test Case

Item Disposal Workflow Test Case				
Use Case : Item Disposal Workflow **Date Created** : 17/4/2025 **Role** : Admin / Manager				
No.	**Input Values**	**Expected Results**	**Actual Results**	**Pass/Fail**
1	Click on a listed linen or asset item record.	The system opens the linen or asset item details.	The system opens the linen or asset item details.	Passed
2	Click and update the status of item to “Pending Dispose”	The system updates and saves the item status.	The system updates and saves the item status.	Passed
3	Submit an item for disposal.	The system changes the item workflow state to “Pending Approval to Dispose” and sends notification to the manager and admin.	The system changes the item workflow state to “Pending Approval to Dispose” and sends notification to the manager and admin.	Passed
4	Manager reviews and clicks “Confirm”.	The system updates the details item to Dispose List and remove the disposal item from linen or asset list.	The system updates the details item to Dispose List and remove the disposal item from linen or asset list.	Passed
5	Manager reviews and clicks “Reject”.	The system updates the item status from	The system updates the item status from	Passed

		"Pending Dispose" to "Clean Linen" or "Normal"	"Pending Dispose" to "Clean Linen" or "Normal"	
6	Attempt to approve without role permission and user access.	The system denies access and displays an alert message.	The system denies access and displays an alert message.	Passed

Table 6.2.5 Item Disposal Workflow Test Case

Delete Item Test Case				
Use Case : Delete Item **Date Created** : 17/4/2025 **Role** : Admin / Manager				
No.	**Input Values**	**Expected Results**	**Actual Results**	**Pass/Fail**
1	Click on a listed linen or asset item record.	The system opens the linen or asset item details.	The system opens the linen or asset item details.	Passed
2	Click the "Delete" button on the webpage of item.	The system prompts a confirmation message asking if the user is sure to delete the item.	The system prompts a confirmation message asking if the user is sure to delete the item.	Passed
3	Confirm the deletion by clicking "Yes" button	The system deletes the item from the database and removes it from the asset or linen list.	The system deletes the item from the database and removes it from the asset or linen list.	Passed
4	Attempt to access the deleted item link.	The system shows "Item not found" or redirects to the list view.	The system shows "Item not found" or redirects to the list view.	Passed

Table 6.2.6 Delete Item Test Case

QR Code Generation Test Case				
Use Case : QR Code Generation **Date Created** : 17/4/2025 **Role** : All				
No.	**Input Values**	**Expected Results**	**Actual Results**	**Pass/Fail**
1	Create a new asset or linen item and save the record.	The system will automatically generate a unique QR code for the item.	The system will automatically generate a unique QR code for the item.	Passed
2	View and print the QR code using the "Print Format" function.	The system generates a printable page with the correct QR code.	The system generates a printable page with the correct QR code.	Passed
3	Save the generated QR code in pdf file.	The QR code is saved and displayed correctly in the pdf.	The QR code is saved and displayed correctly in the pdf.	Passed

Table 6.2.7 QR Code Generation Test Case

QR Code Scanning Test Case				
Use Case : QR Code Scanning **Date Created** : 17/4/2025 **Role** : All				
No.	**Input Values**	**Expected Results**	**Actual Results**	**Pass/Fail**
1	Open a mobile QR scanner application.	The scanner is ready to scan QR codes.	The scanner is ready to scan QR codes.	Passed
2	Scan a valid QR code of an asset or linen item.	The system displays the correct item details linked to the QR code.	The system displays the correct item details linked to the QR code.	Passed
3	Outsiders scan a QR code of item.	The system shows an error message and unable to access view the details of item.	The system shows an error message and unable to access view the details of item.	Passed
	Staff connect to	The system shows an	The system shows an	Passed

	different network with server.	error message and unable to access view the details of item.	error message and unable to access view the details of item.	

Table 6.2.8 QR Code Scanning Test Case

6.3 Project Challenges

Throughout the development of the project, several challenges are encountered. One of the main difficulties is the network reliability and server performance, especially when conducting load testing and system simulations. During peak hours or unstable network conditions, the Ubuntu-based server hosting ERPNext occasionally became unresponsive, affecting the consistency of the testing environment.

Furthermore, there is limited documentation and resources on this newer version. As the fact that version is quite new, whereas other versions have a huge number of resources available, detailed guides and information are somewhat lacking on the internet for it. This has made most of the usage and creation usually done by trial and error. For example, the preparation and documentation of system workflows. Due to limited existing documentation, a significant amount of time had to be invested in manually identifying and mapping out the operational flow of asset and linen movements within the hospital environment. This task is essential to ensure that the system accurately reflected real-world processes but required close coordination with stakeholders and careful interpretation of procedural details.

Another major issue is the inclusion of additional features that are lacking to include initially, such as user-specific workflow approvals and real-time data updates on the dashboard. These enhancements required writing custom client scripts and server scripts using Frappe framework of ERPNext, which added complexity to the project.

6.4 Objectives Evaluation

The objectives of project had been outlined in Chapter 1 serve as the direction for guiding the development of system towards achieve its intended goals.

Objective 1: To design and implement a solution for tracking and monitoring assets and linen at UTAR Hospital using ERPNext

This objective had been successfully achieved. The system is designed and implemented using ERPNext to automate the tracking and monitoring processes of both assets and linens, which previously relied on manual data record. Through the integration of real-time update features and an intuitive user interface, hospital staff can now access current information on the availability, location, and status of items. This significantly reduces time spent on searching for resources and helps avoid data redundancy. For instance, instead of recording the same asset on multiple sheets or platforms, all updates are now centralized and synced in the ERPNext system. The implementation also includes filtering and visual dashboard features, which assist hospital management in quickly assessing operational conditions and making timely decisions.

To ensure smooth implementation of the system, training sessions are conducted for UTAR Hospital staff. The training sessions included familiarizing users with key system features, such as item registration, item status tracking, utilization of QR codes, and navigation through the dashboard. Through hands-on practice, staff are made proficient enough to operate and maintain the system independently, even with minimal technical expertise. In addition, a user manual had been drawn up and distributed as a step-by-step reference manual for future use. The user manual for the chosen extracts is attached in the Appendix of this report.

Due to privacy considerations and the confidential nature of hospital operational procedures, only selected excerpts of the user manual are included in the appendix of this report. The full user manual, containing detailed step-by-step instructions for the operation of the Asset and Linen Monitoring Information System

Framework. It had been provided directly to UTAR Hospital management for internal use. The excerpts shown aim to demonstrate the general structure, writing style, and key sections of the manual while respecting organizational confidentiality.

Objective 2: To develop a real-time data dashboard for enhanced data accuracy and availability

This objective had also been achieved. A real-time data dashboard is developed and integrated into the ERPNext system, enabling administrators and relevant departments to access up-to-date asset and linen information instantly. Information such as timestamp, item type, department, and last modified records are retrieved dynamically from the database to ensure accuracy and timeliness. The dashboard also supports monitoring charts, filter functions, and visual representations that help in assessing asset utilization and linen distribution. Furthermore, it provides alert notifications for timely actions, such as status of item is in pending or overdue maintenance. The result is a more informed decision-making process and enhanced operational responsiveness within UTAR Hospital.

To further improve tracking accuracy and item identification, a QR code generation feature is incorporated. Each asset and linen item are assigned a unique QR code, enabling quick scanning and retrieval of item details using mobile devices. The dashboard also features pie charts, bar charts, percentage graphs, line graphs, and number cards, presenting critical insights into resource distribution and usage trends. Alert notifications are implemented to notify users of items pending action or requiring urgent attention, such as overdue maintenance.

Objective 3: To implement role-based access control to ensure data security and confidentiality

This objective is fully implemented. Role-based access control is configured in the system to protect data integrity and restrict access to sensitive information based on user roles. Super administrators are granted full access to all system modules,

including asset and linen dashboards, staff management, and records editing or deletion. In contrast, departmental users are limited to dashboards relevant to their responsibilities, with access restricted to functions like creating, editing, or viewing relevant records only. This separation of access ensures that sensitive data is safeguarded and that users only interact with information applicable to their department. As a result, the system promotes accountability, data security, and minimizes the risk of unauthorized changes or data exposure.

6.5 Concluding Remark

This chapter provides a comprehensive assessment of the developed system's functionality and reliability. The system performance is evaluated using metrics to ensure the system remains stable and responsive under different usage conditions. Furthermore, the system testing procedures and results, which verify the correctness and expected behaviour of each function through a series of use case tests. This chapter also highlights the challenges encountered during the project. Moreover, reviews the extent to which the project objectives are met, confirming that the system fulfils its core goals.

CHAPTER 7

Conclusion and Recommendation

7.1 Conclusion

In a nutshell, this report outlines the successful completion of the final year project that focused on developing an Asset and Linen Monitoring Information System Framework for UTAR Hospital using ERPNext platform. The primary objective of the project is to modernize and enhance the asset and linen of hospital tracking process by replacing traditional, manual processes with a centralized and real-time system. The system offers an easy-to-use dashboard that enables the administration and staff of hospital to view, manage, and analyse the records of assets and linen in a very easy and accurate manner.

During the process of developing the system, ERPNext is tailored to accommodate important functionalities such as real-time data dashboards, integration of QR codes, workflow approval, remark tracking, and notifications. Several analytical tools such as number cards and charts are implemented on the dashboard to allow visual tracking of status, item movement, and data distribution across departments. The alert notification feature of system ensures timely response to critical events such as item remarks or scheduled asset maintenance. Additionally, role-based access control is configured to restrict sensitive data access and editing permissions, thus enhancing data security and integrity in the hospital environment.

The development adopted an Agile methodology, which supported flexible planning and continuous updates throughout the project lifecycle. This approach allowed frequent testing and iterative refinements to meet the specific requirements of hospital. The final system is successfully implemented and evaluated through system testing and performance analysis, proving its reliability, responsiveness, and ability to handle real-time data efficiently. Challenges faced during development, such as limited documentation, server instability during multi-user testing, and the need for

custom script implementations, are resolved through careful troubleshooting and iterative improvements.

Moreover, the performance of system is evaluated through response time analysis, load testing, and network reliability checks. The results confirmed that the system performs well under normal and multi-user conditions, with stable response times and minimal latency. Functional testing showed that all modules met their requirements, and system objectives are successfully achieved. Even though there are some problems, such as limited ERPNext documentation and the need to implement additional scripts for enhanced automation, the system proved to be robust, reliable, and adaptable to the needs of hospital.

In conclusion, this project provides a complete and practical solution to the challenges of managing assets and linens in a hospital setting. Through real-time monitoring, increased transparency, automated process, and secure user authorization, the system increases the efficiency of the operations, decreases manual efforts, and empowers UTAR Hospital to make more informed, data-driven decisions in the management of the available resources. The system also provides a scalable platform for add-on development or integration with other hospital IT systems.

7.2 Recommendation

Although the asset and linen monitoring information system framework designed and built in this project is met the primary objectives, there are still some improvements that can be made to further extend its utility and adaptability within hospital operation.

- **Enhance System Security and Audit Logs**
  Although role-based access control is already in place, future improvements could include comprehensive audit logs that capture every user action within the system. This would boost traceability, support accountability, and assist

with compliance monitoring. To further strengthen login security, integrating two-factor authentication would be a valuable addition.

- **Implement Archive or History Feature**

  Currently, when an asset or linen item is rejected, disposed of, or removed, it is permanently deleted from the system. This can lead to the loss of important historical data that may be necessary for audits, internal reviews, or future reference. Introducing an archive feature would allow these records to be moved to a separate, accessible view instead of being deleted. This preserves the complete lifecycle of each item, supports better audit tracking, and allows for easier retrieval of mistakenly removed data. It also enables the generation of year-end or departmental review reports. Archived records can include timestamps, user actions, and remarks, ensuring transparency and accountability over time. This enhancement would greatly improve data integrity and support long-term operational oversight.

- **Ongoing Staff Training and User Feedback**

  To ensure smooth adoption, regular training sessions and up-to-date user manuals should be made available to all system users. Gathering feedback from hospital staff will help shape future updates, improve user experience, and ensure that the system continues to evolve in line with the actual operational needs of hospital.

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APPENDIX

A.1 User Manual

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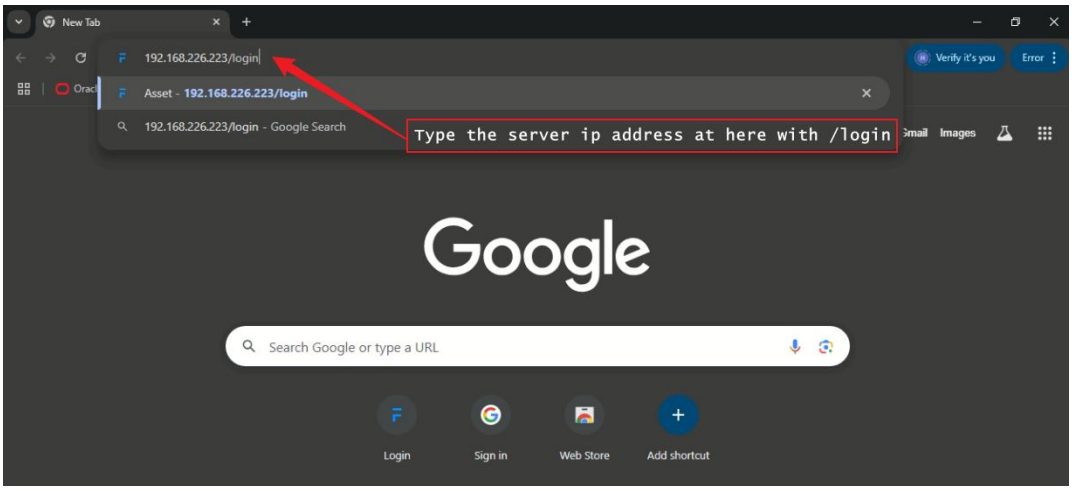
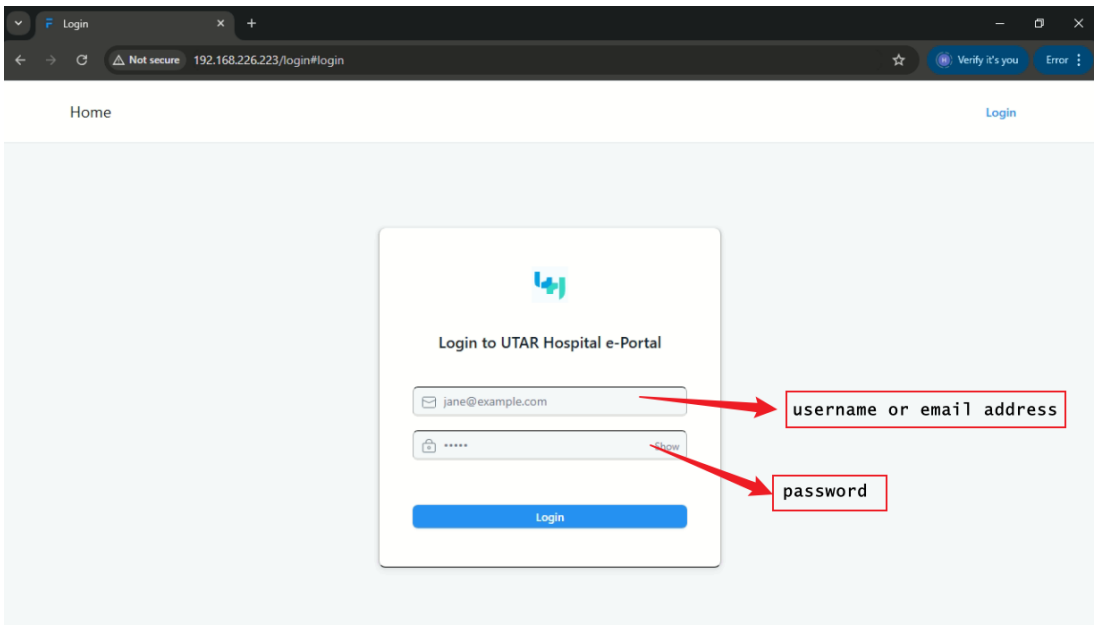
Steps to Login the ERPNext system

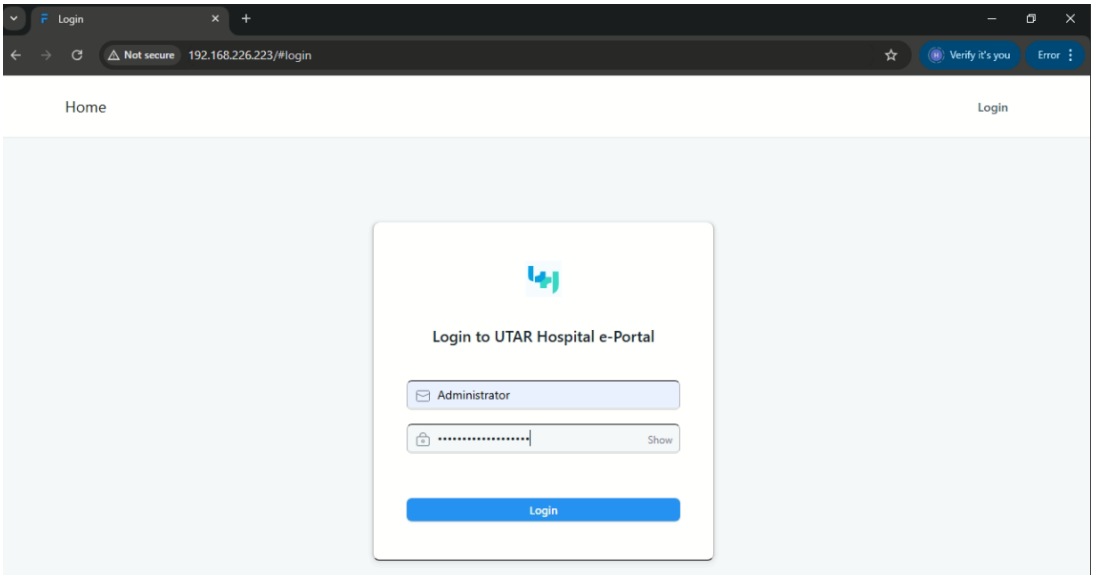
1. Connect to the hospital internal Wi-Fi as same as linked to the server.

2. Open the web browser and browse the server ip address with "/login". (e.g. 192.168.1.1/login)

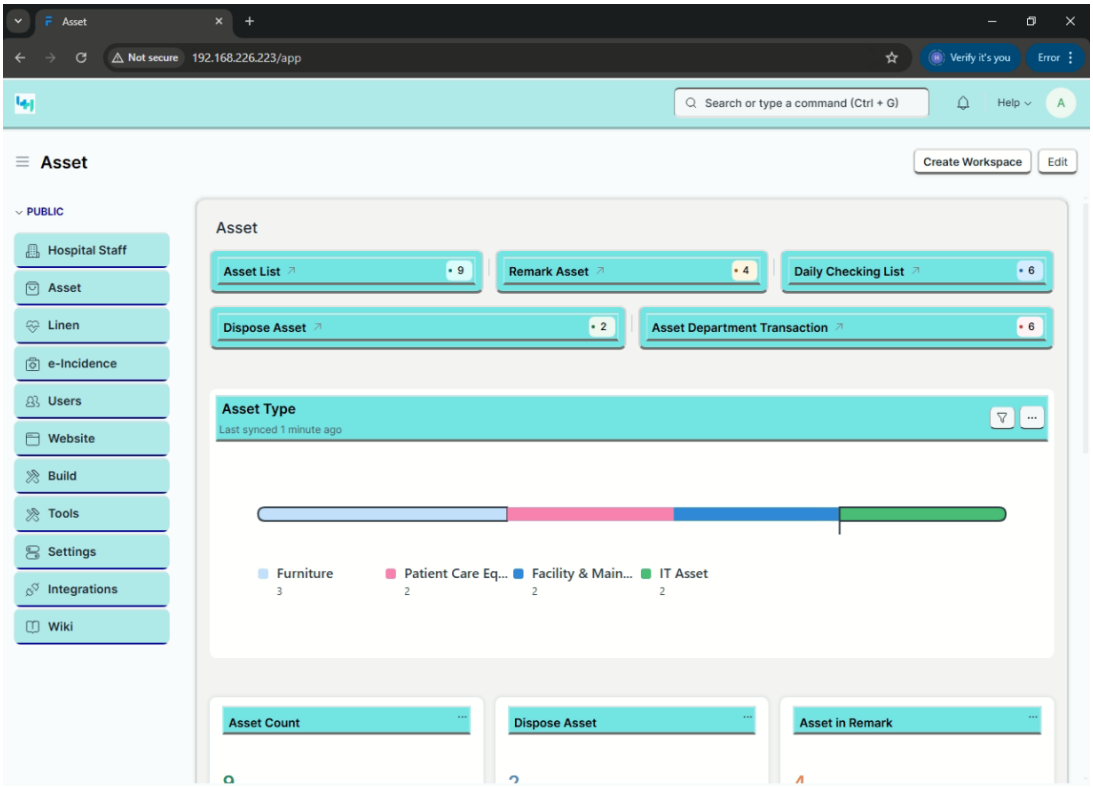


3. When navigating to the login page, enter the username or email address and password. For admin and login with the username and password to view the system.





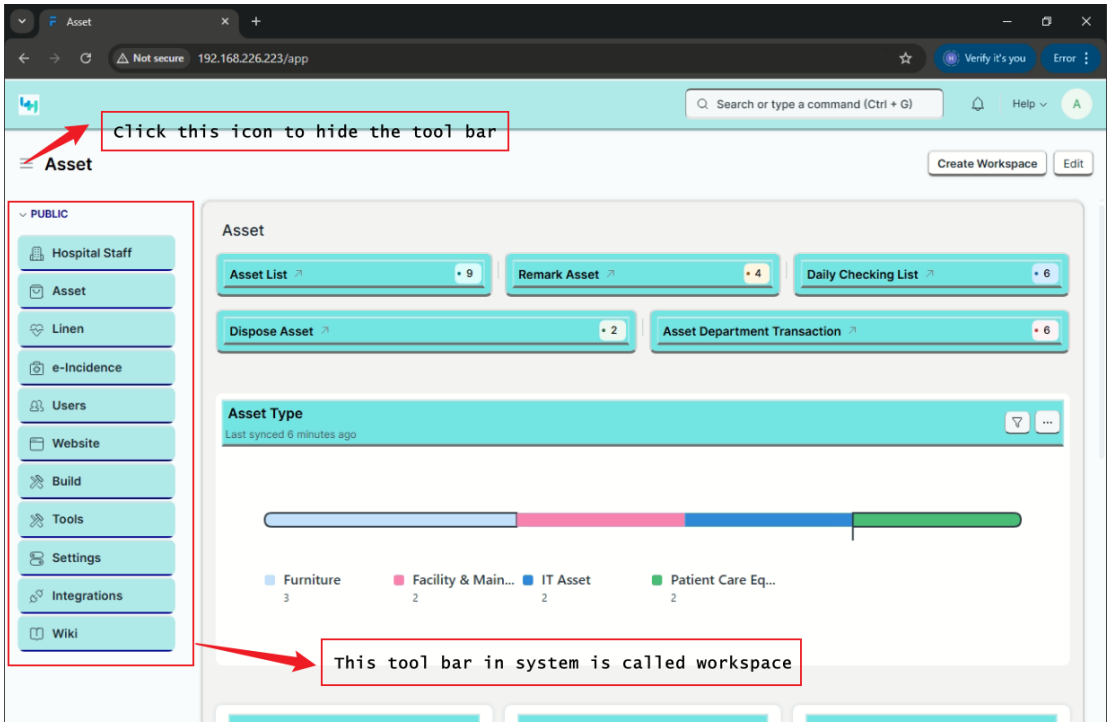
4. After successfully login to the system, it will show the default web page.



Overview of the system web page

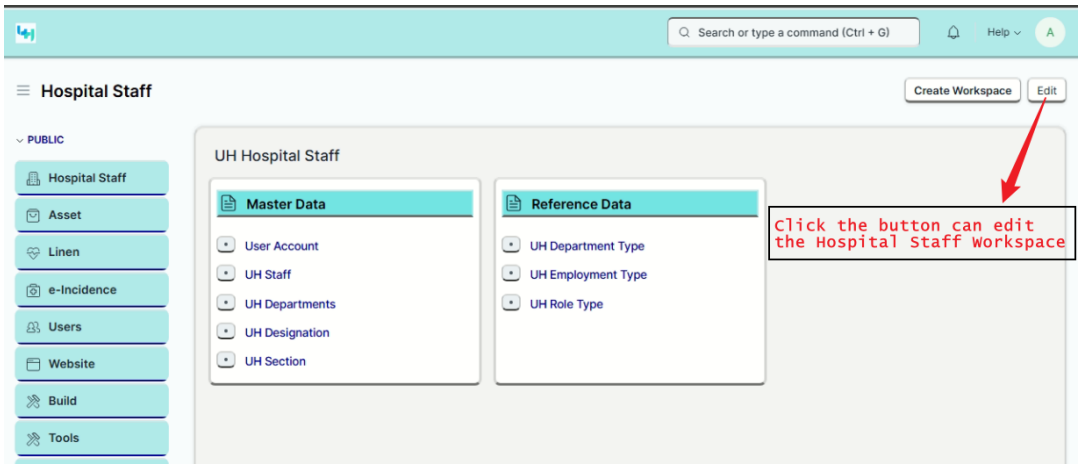
When users log in, they will see 11 workspace buttons on the toolbar.

**Each workspace provides access to different areas of the system to manage hospital operations.



1. Hospital Staff Workspace

This workspace is used to manage hospital staff information. It may include data like staff ID, roles and departments. Admins can control staff records or integrate these records with other operational modules (such as user accounts)



2. Asset Workspace

This workspace manages hospital assets like IT assets, wheelchairs, and medical equipment.
Users can:

- Register new assets manually or by importing from Excel.
- Edit asset information, view historical changes.
- Report issues with assets (using "Remark Asset" with approval workflow).
- Track asset daily checks and department transfer requests

When you enter the **Asset Workspace**, you will see:

Shortcuts (Top)

- **Asset List ➔** Shortcut to view and manage all hospital assets (add, edit, update asset records).
- **Remark Asset ➔** Shortcut to record issues with assets (e.g., broken wheelchair, maintenance required).
- **Daily Checking List ➔** Shortcut to view daily inspection records of assets (status checks).
- **Asset Department Transaction ➔** Shortcut to manage requests to move an asset to a new department or location.
- **Dispose Asset ➔** Shortcut to view assets that have been disposed of or removed from active use.

Number Cards

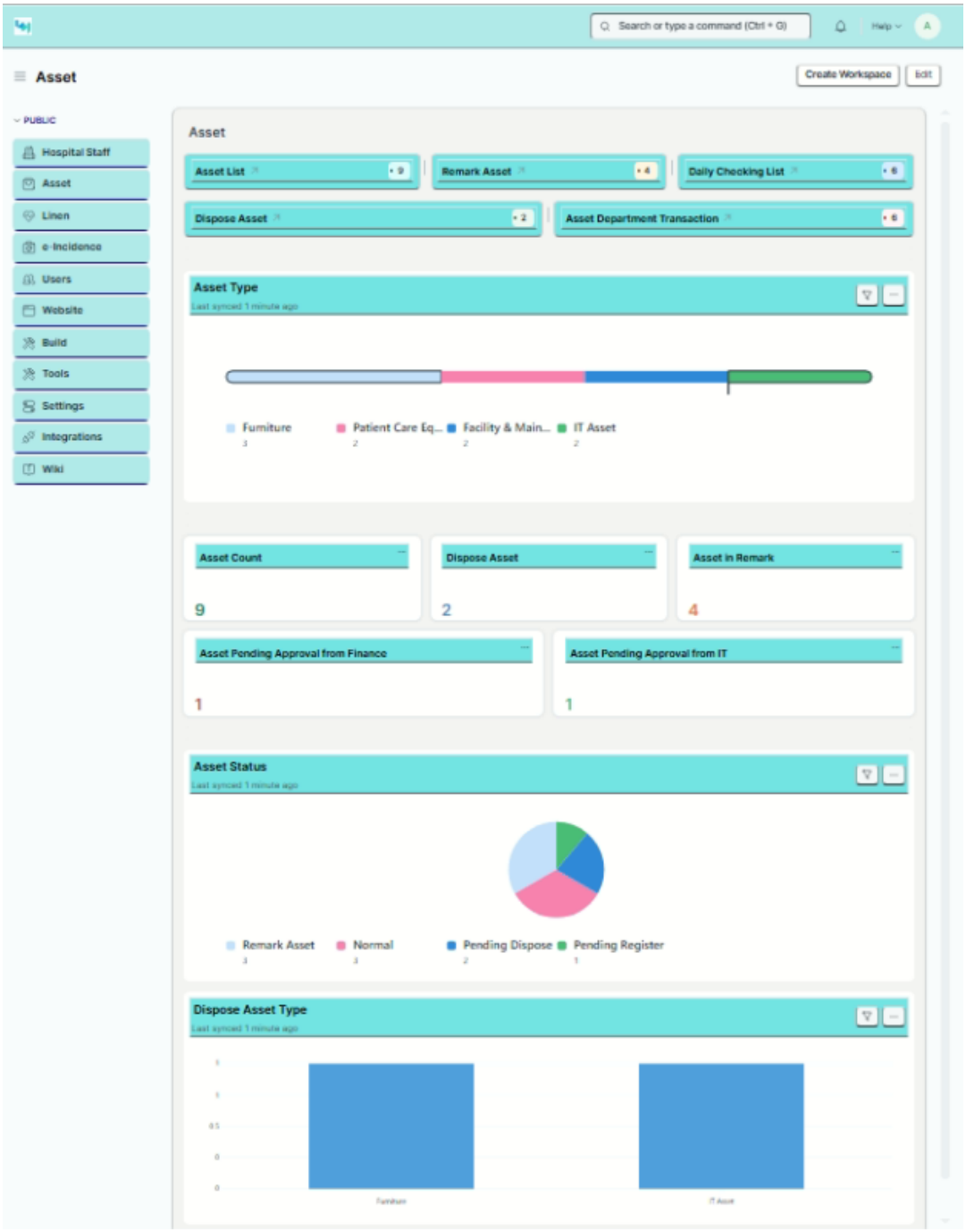
- Displays total numbers such as:
    - How many assets are registered.
    - How many assets are pending movement.
    - How many asset issues are reported.

Charts

- **Asset Type Chart ➔** Displays a bar showing types of assets (Beds, Wheelchairs, Monitors, etc.) based on categories.
- **Asset Status Chart ➔** Shows distribution by current status (Normal, Pending Dispose, Remark Asset, Pending Register).

- **Asset Dispose Type Chart ➔** Shows the types of assets that have been disposed of (e.g., Printer, Wheelchair). Helps to track which items are destroyed faster.

These charts give a **quick check** of the assets in the hospital, helping staff and admins manage equipment more effectively



3. Linen Workspace

This workspace focuses on hospital linen items like bedsheets, gowns, curtains. Users can:

- Add or import linen records.
- View or dispose of linen through workflows.
- Record daily linen checking activities.
- Create remarks for damaged or missing linen for administrator review

When you enter the **Linen Workspace**, you will see:

Shortcuts (Top)

- **Linen List ➔** Shortcut to view and manage all linen items (add, edit, update linen records).
- **Transaction Linen ➔** Shortcut to view logs of linen movements
- **Dispose Linen ➔** Shortcut to view linens that have been disposed of or removed from active use.
- **Remark Linen ➔** Shortcut to view linen remarks/issues raised (such as damage or loss reports).

Number Cards

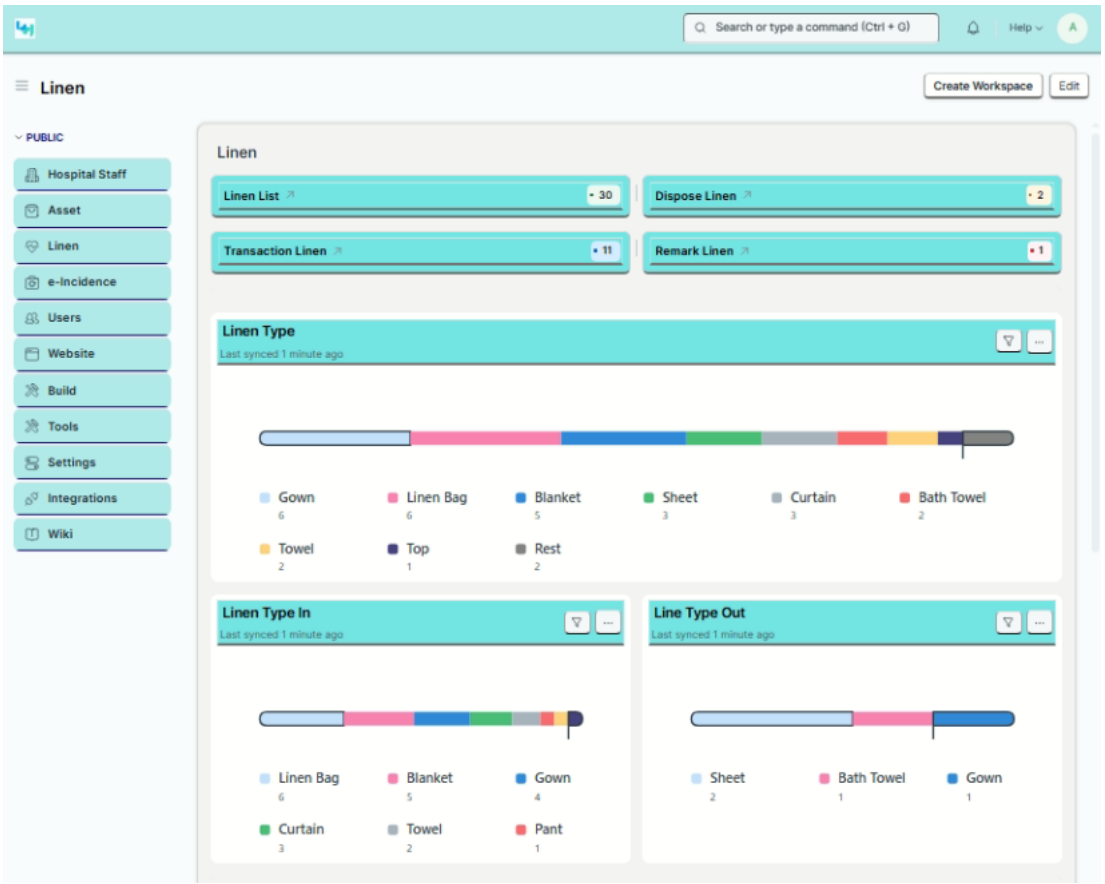
- Displays total numbers such as:
    - How many linen records are in each list.
    - Quick view of the number of Transaction Linen, Dispose Linen, and Remark Linen items.

Charts

- **Linen Type Chart ➔** Shows a colourful bar representing different types of linens (e.g., Gown, Blanket, Curtain, Bath Towel). Helps visualize what type of linens are most common.
- **Linen Type In Chart ➔** Displays the types of linens being received back into the system (clean or processed items).
- **Linen Type Out Chart ➔** Displays the types of linens that are sent out (dirty linens or items sent for washing).

- **Linen Status Chart ➔** Shows the current status of all linens (e.g., Clean Linen, Dirty Linen, Pending Register, Dispose Linen). Gives a quick overview of linen condition inside the hospital.
- **Linen Location Chart ➔** Displays how many linens are located in hospital or laundry.
- **Linen Transaction Chart ➔** Tracks the number of linen transactions over time (e.g., how many transactions in daily or monthly).
- **Linen Dispose Type Chart ➔** Shows the types of linens that have been disposed of (e.g., Gowns, Sheets). Helps to track which items are wearing out faster.
- **Linen Dispose Graph** (by Month) **➔** Displays a line graph showing the number of linens disposed of each month.

These charts are **live updated** to monitor linen flow easily without reading long lists



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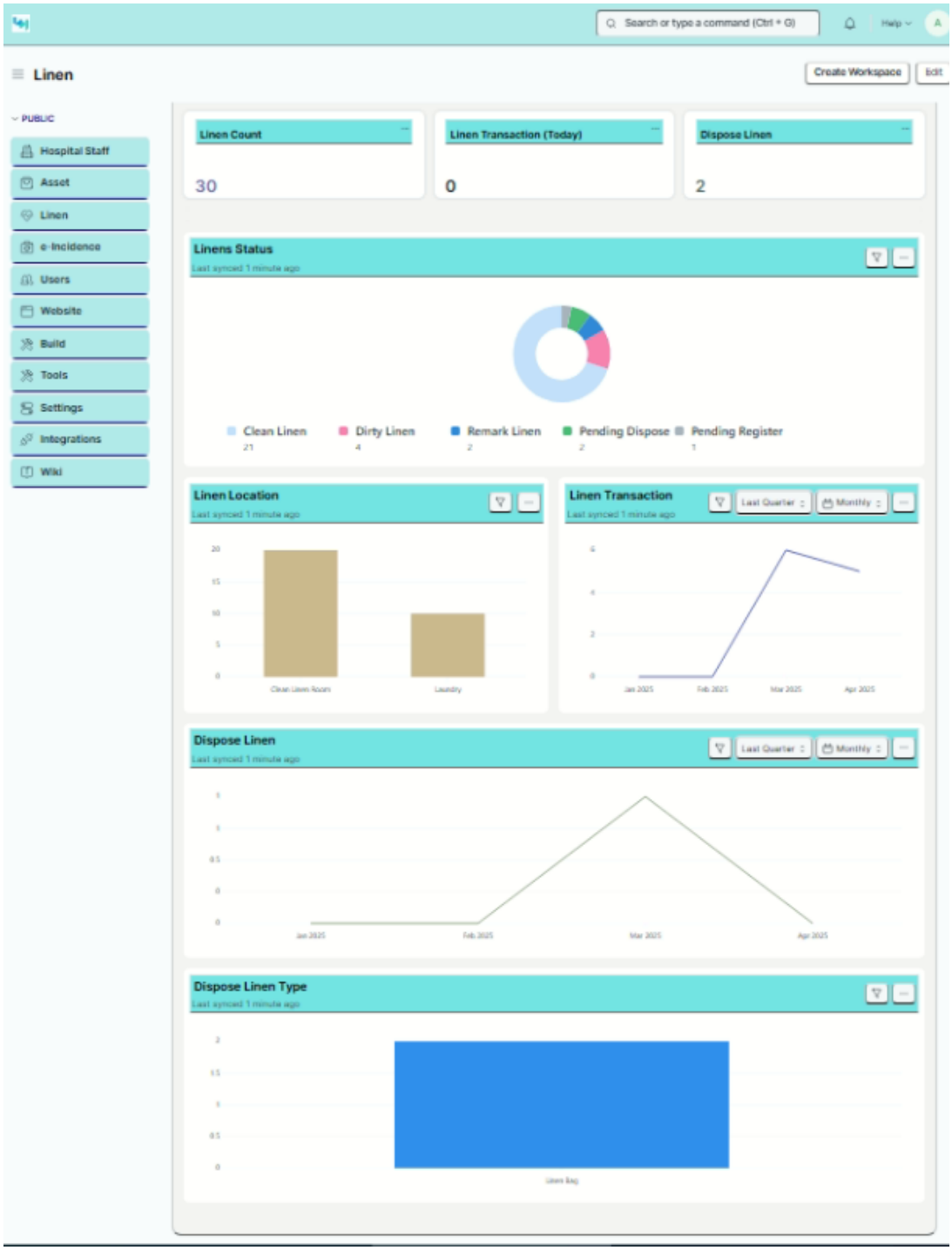
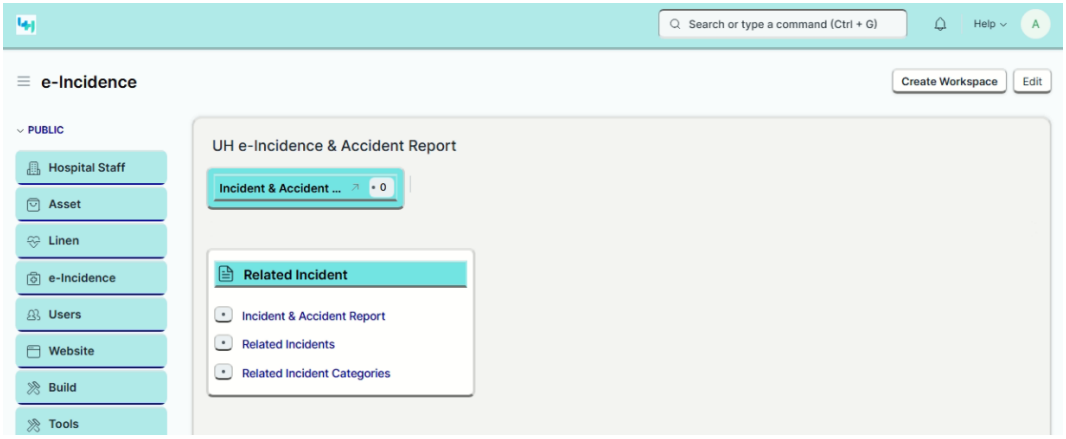

Search or type a command (Ctrl + G)
Help
Linen
Create Workspace
Edit
PUBLIC
Hospital Staff
Asset
Linen
e-Incidence
Users
Website
Build
Tools
Settings
Integrations
Wiki
Linen Count
30
Linen Transaction (Today)
0
Dispose Linen
2
Linens Status
Last synced 1 minute ago
Clean Linen
21
Dirty Linen
4
Remark Linen
2
Pending Dispose
2
Pending Register
1
Linen Location
Last synced 1 minute ago
Clean Linen Room
Laundry
Linen Transaction
Last synced 1 minute ago
Last Quarter
Monthly
Jan 2025
Feb 2025
Mar 2025
Apr 2025
Dispose Linen
Last synced 1 minute ago
Last Quarter
Monthly
Jan 2025
Feb 2025
Mar 2025
Apr 2025
Dispose Linen Type
Last synced 1 minute ago
Linen Bag

4. e-Incidence Workspace

This workspace is for managing hospital incidents (such as accidents).
Users can:

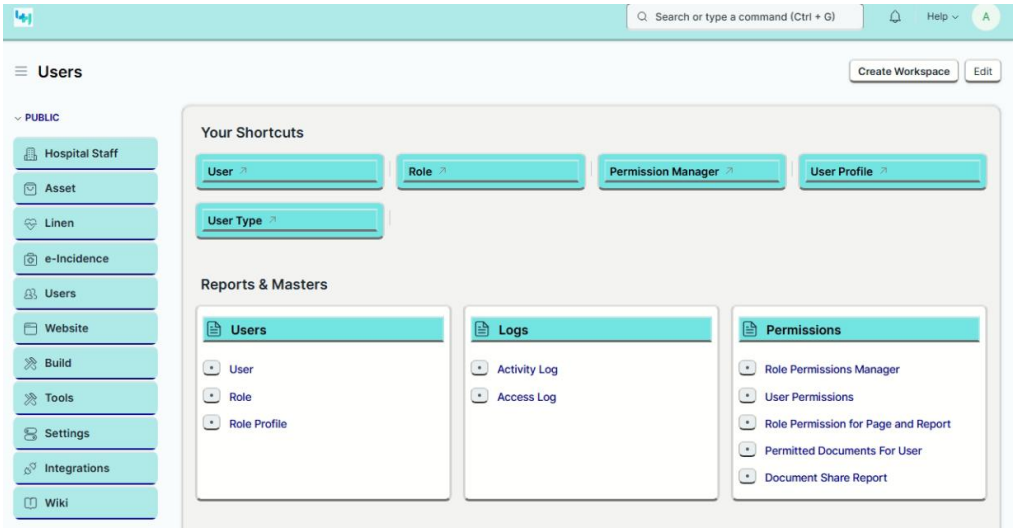
- Report incidents for administrative action.
- Track incident statuses (e.g., Pending, Investigated, Closed).



5. Users Workspace

This workspace is used for **user account management**.
Admins can:

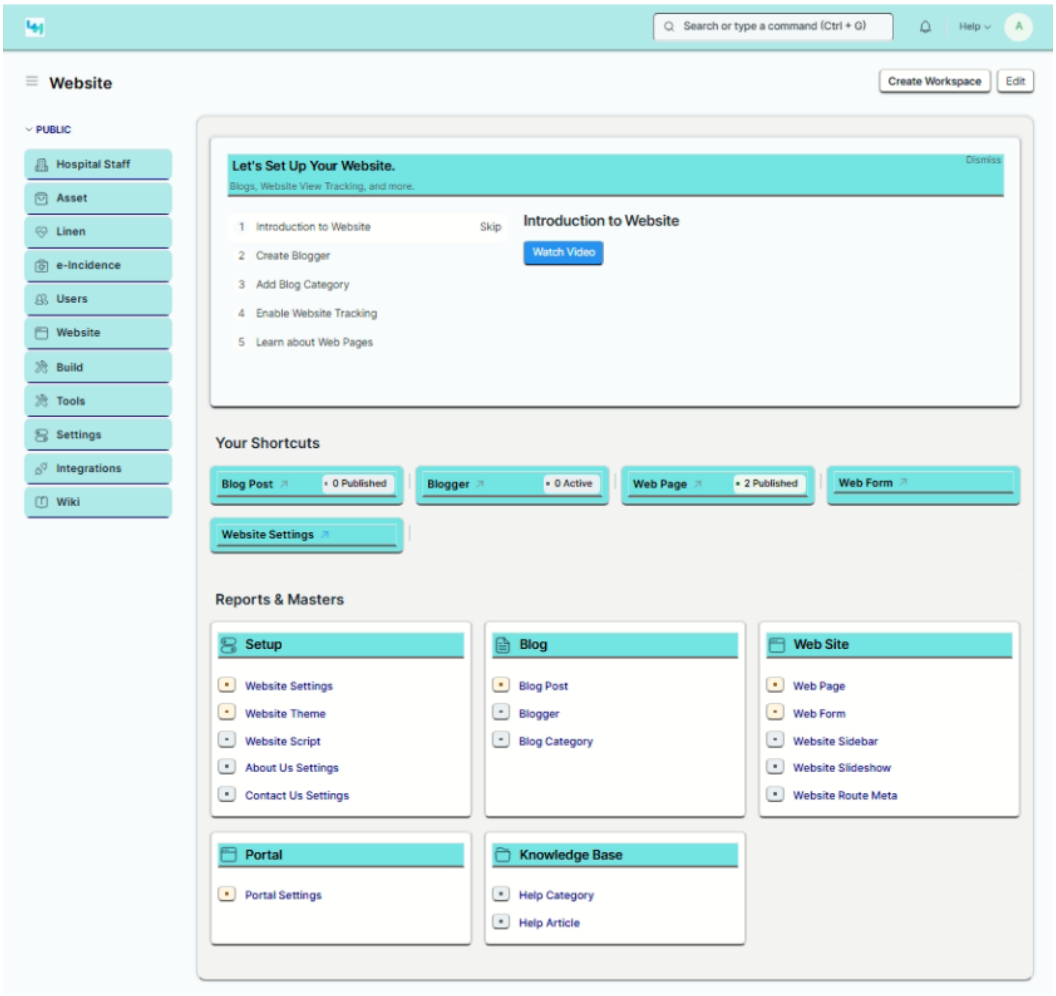
- Create, edit, or delete users.
- Assign roles (e.g., Staff, Admin, IT Support).
- Set module permissions to control which workspaces users can access.
- Bulk-import users through Excel files



6. Website Workspace

This workspace is for managing the ERP's internal or external website pages. Users can:

- Create, edit, or delete web pages.
- Manage site settings like banners, logos, footers.
- Organize public content (useful if the system is integrated with a public hospital portal)

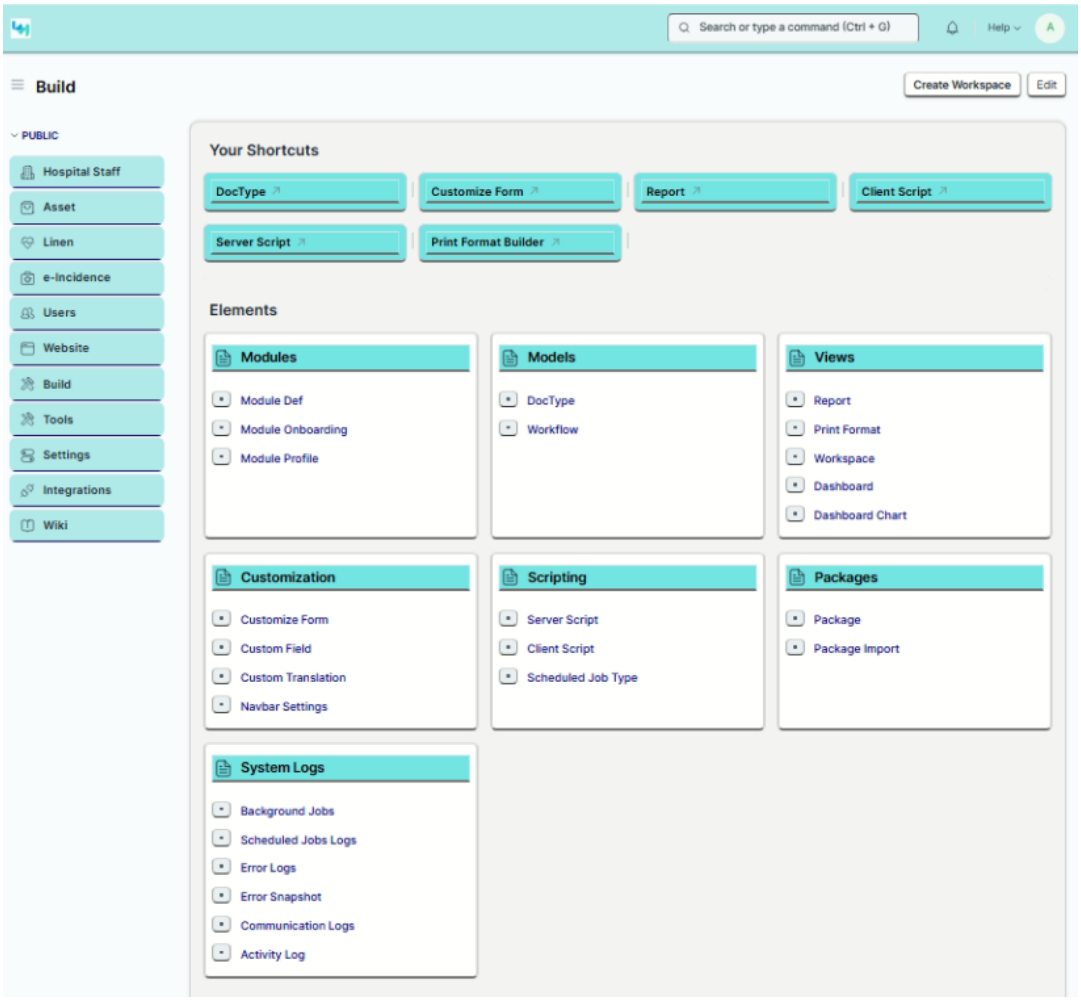


7. Build Workspace

This is a **developer/admin-focused workspace** to customize the system. Users can:

- Create or edit DocTypes (the structure of records, like list).
- Add custom fields, scripts, workflows.
- Configure new modules or adjust existing ones.

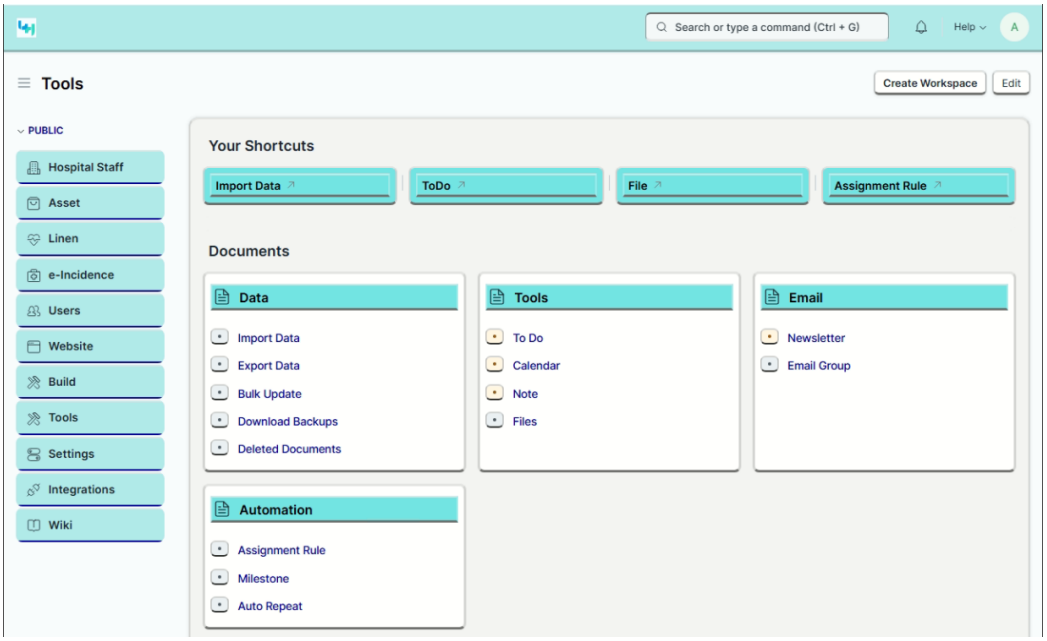
Example: Creating a new doctype, setting custom workflows.



8. Tools Workspace

This workspace contains utilities and admin tools, such as:

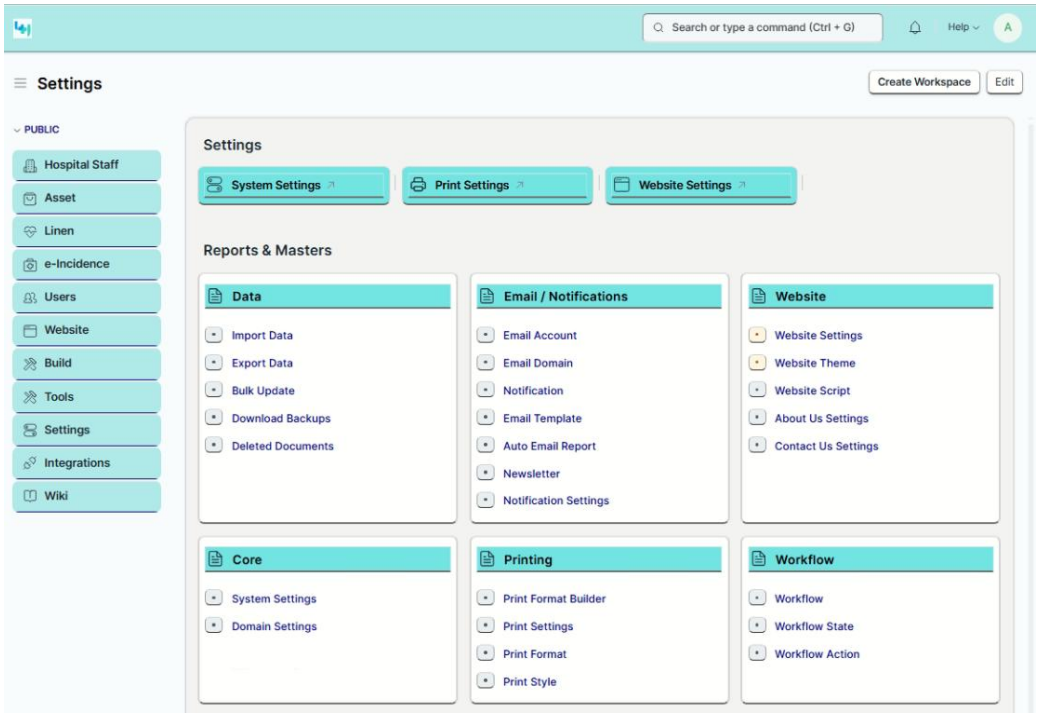
- Data Import / Export.
- Managing backups.



9. Settings Workspace

This workspace contains **all the system-wide settings**, including:

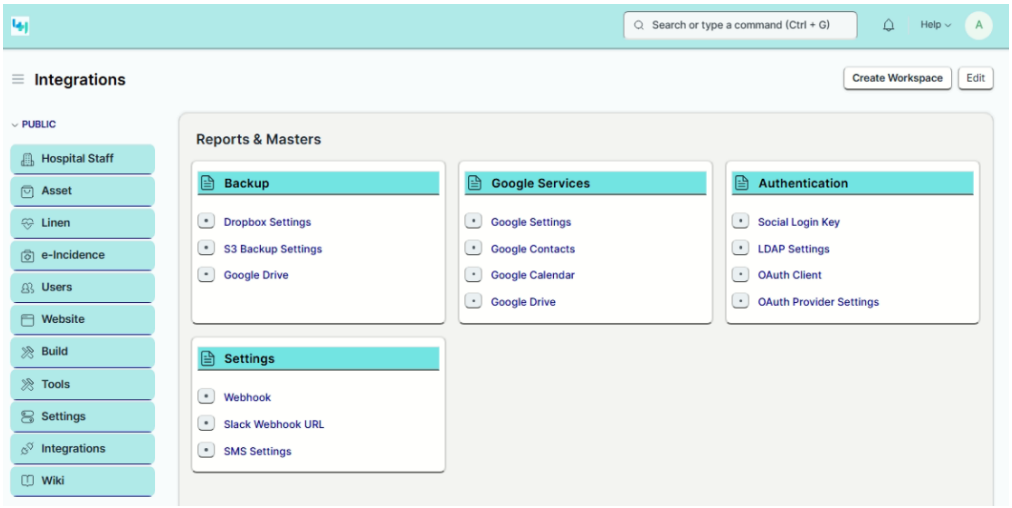
- Email server configuration.
- Password and login policies.
- System language and regional settings.
- Security permissions and notification templates



10. Integrations Workspace

This workspace is used to connect ERP with external applications.
Admins can set up:

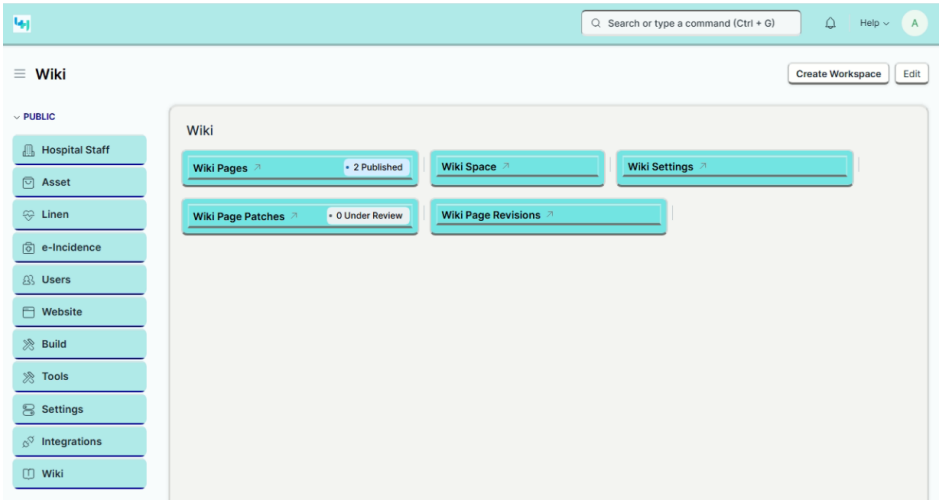
- API integrations.
- Webhooks.
- Third-party service integrations like payment gateways, messaging services, accounting software



11. Wiki Workspace

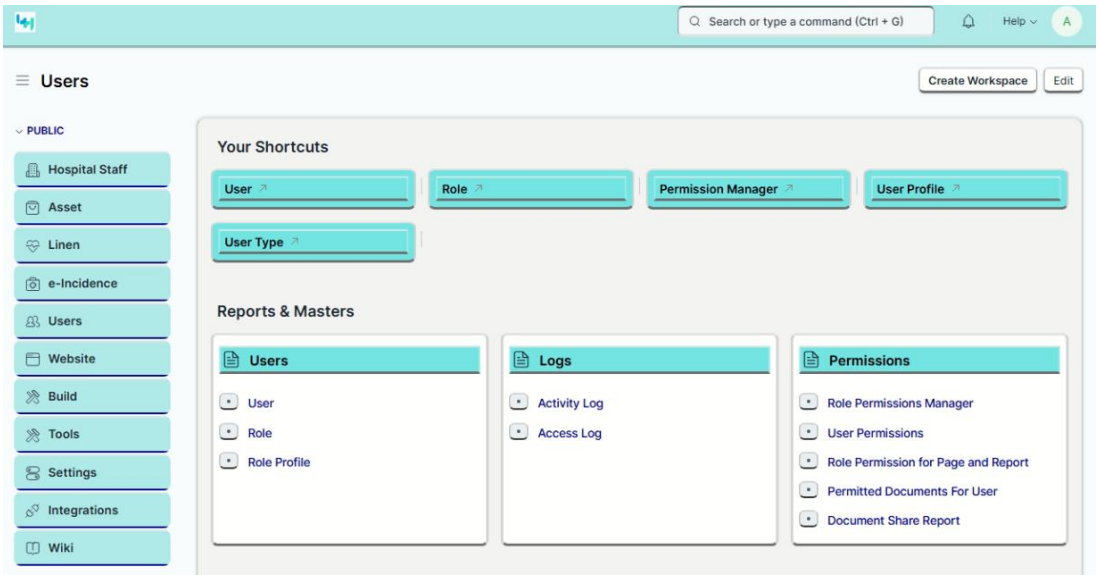
This is the **knowledge base workspace**.
Users can:

- Create and maintain internal documentation.
- Upload manuals, SOPs, training guides and store all knowledge resources for easy access



Steps to create/add new user into system

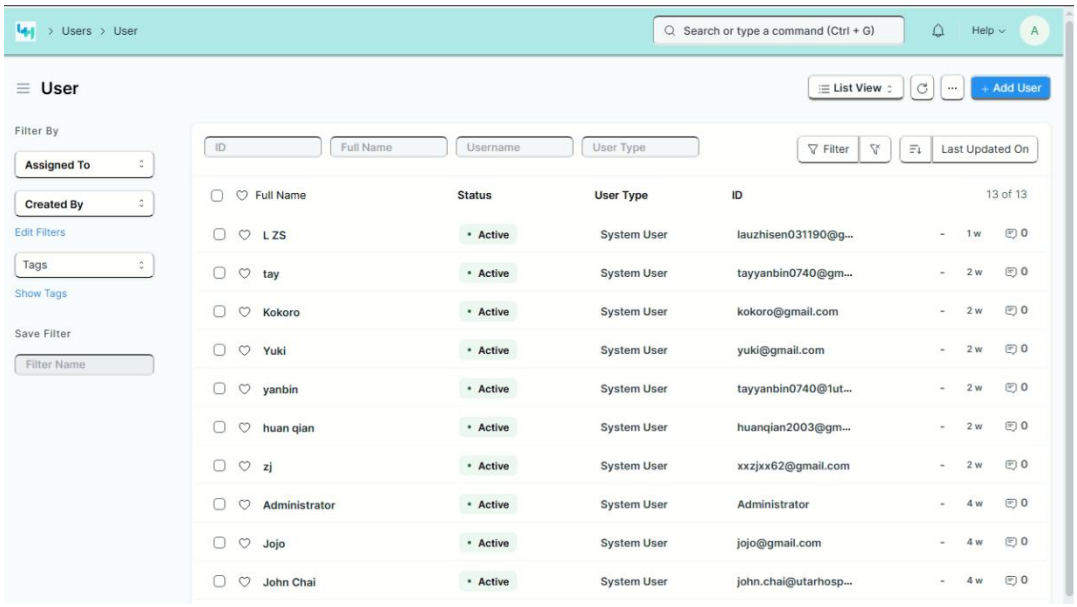
1. After successfully logging into the system, the user will see the main system homepage screen. Click the “User” workspace to access and view the information of user.



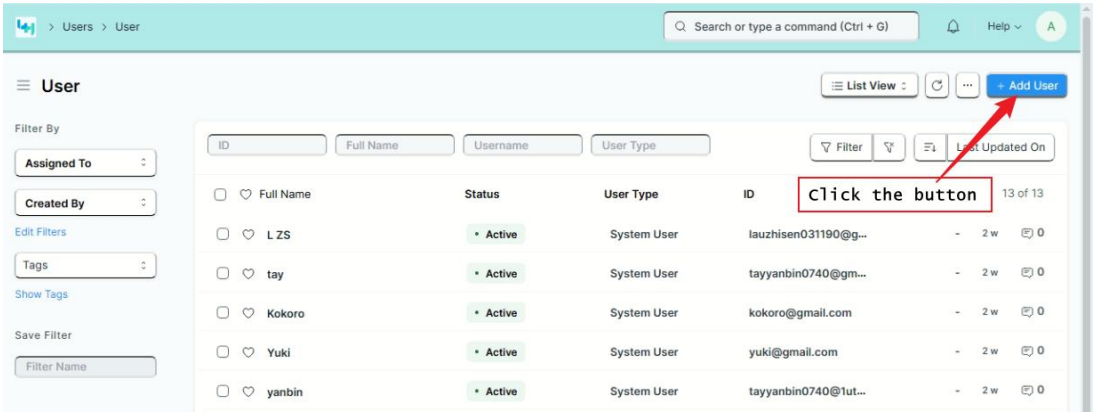
In the Users workspace, it has shown some shortcuts that is allowed to faster access that doctypes.

*Doctypes are used to create the forms that users interact with to create, edit, and view data.

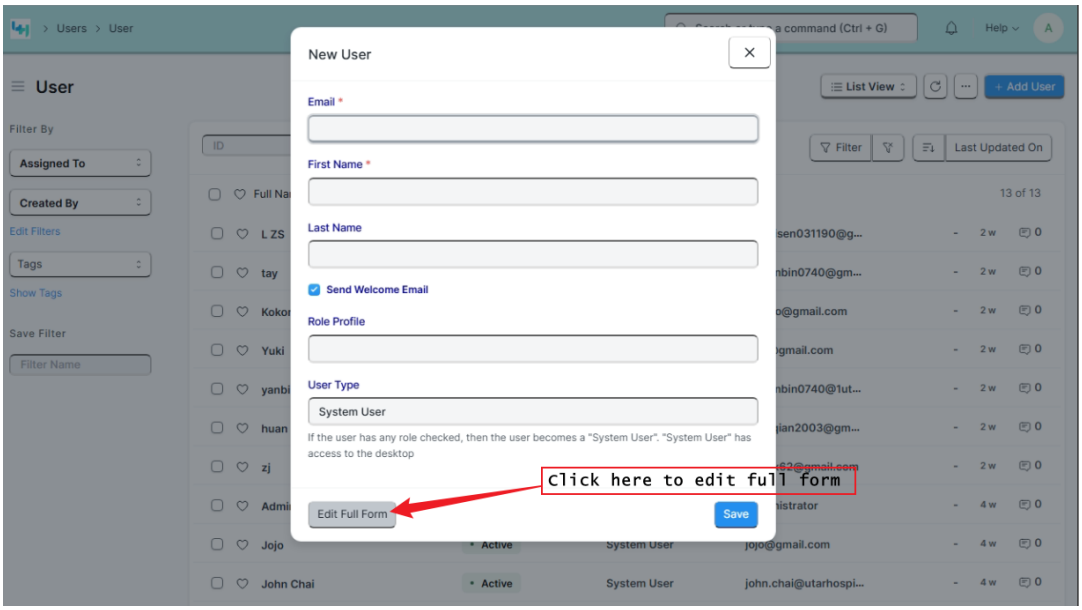
2. Next, click the “User” shortcut button in the Users workspace to access the user list. Below is the view of user list.



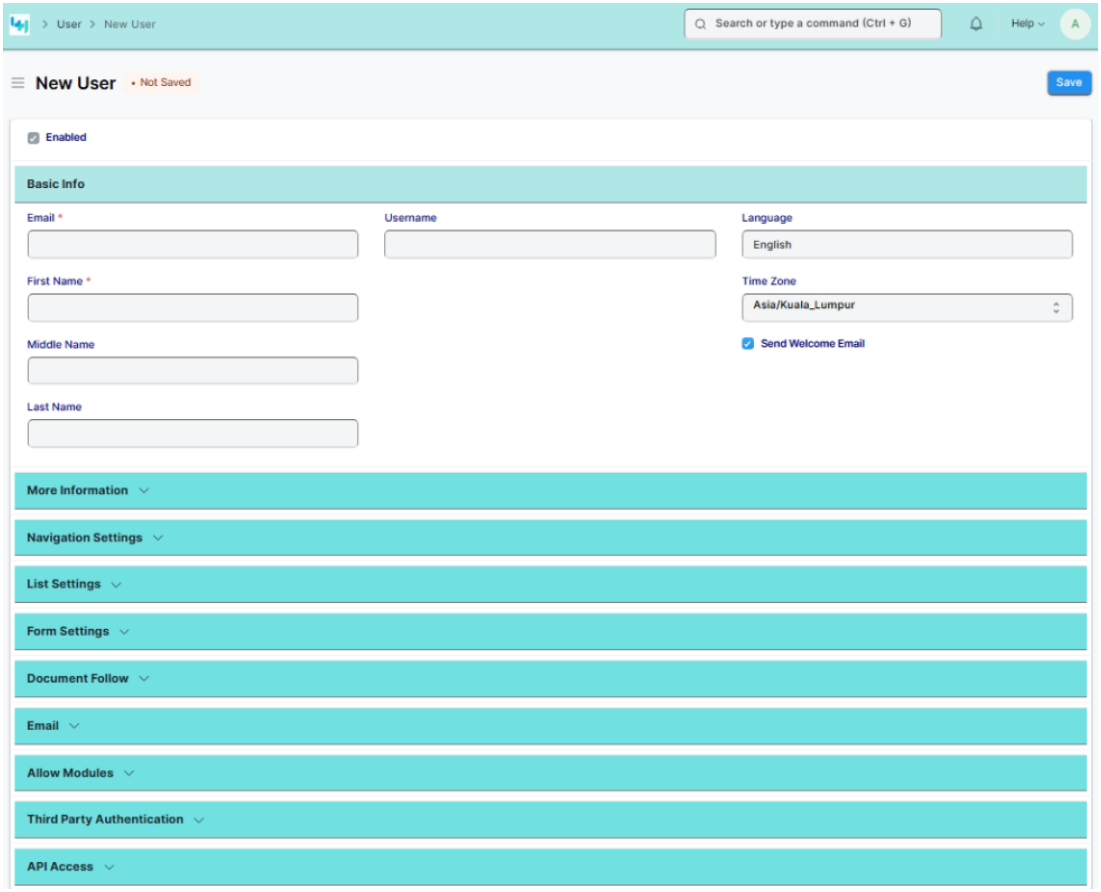
3. Click the “+ Add User” button to add/create new user by opening a blank registration form



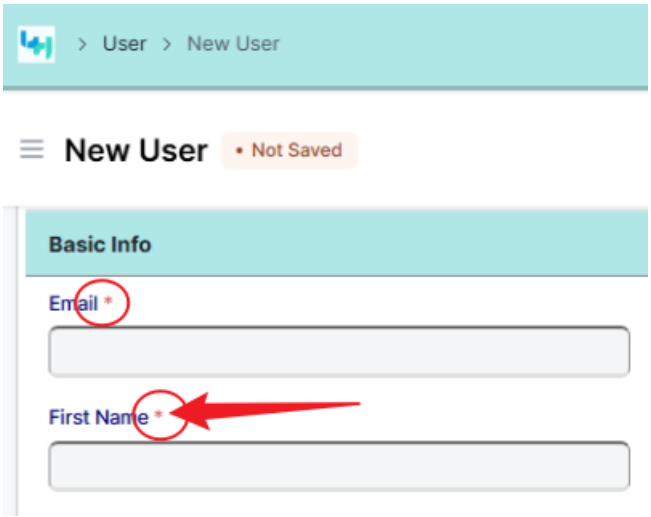
4. After clicking the “+ Add User" button, the system will pop up “New User” form. Click the “Edit Full Form” at the bottom to edit full user form.



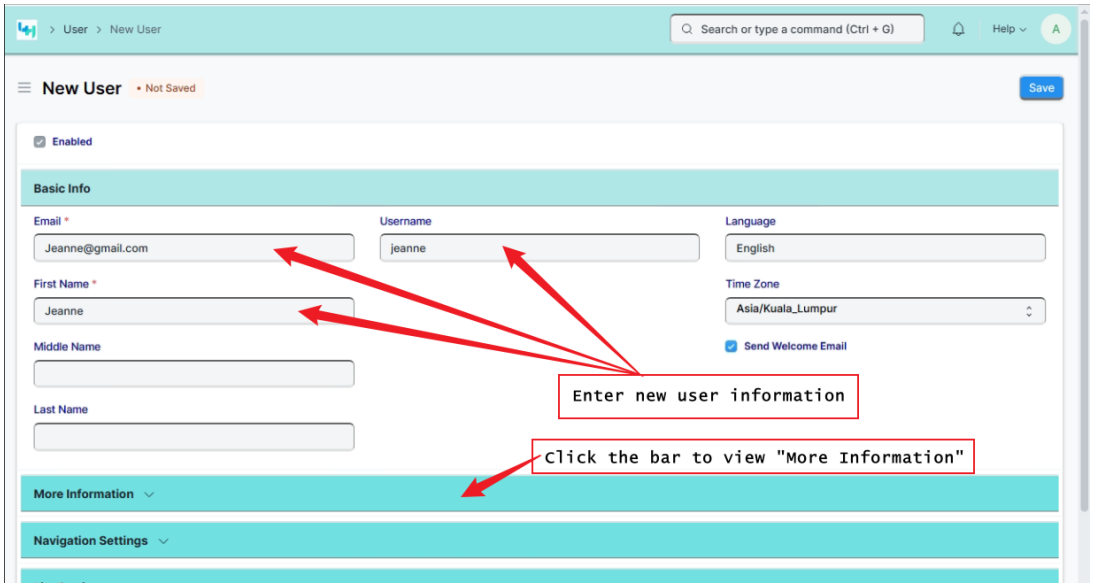
5. Overview of the full user form. This will show all fields that need to be filled out for new user.



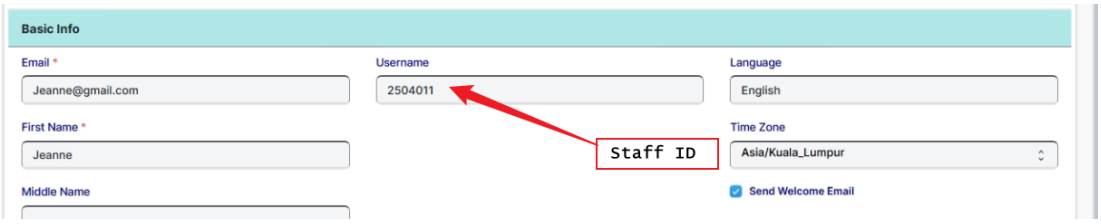
Please note that the symbol "*" behind the word is mean that cannot leave it empty!



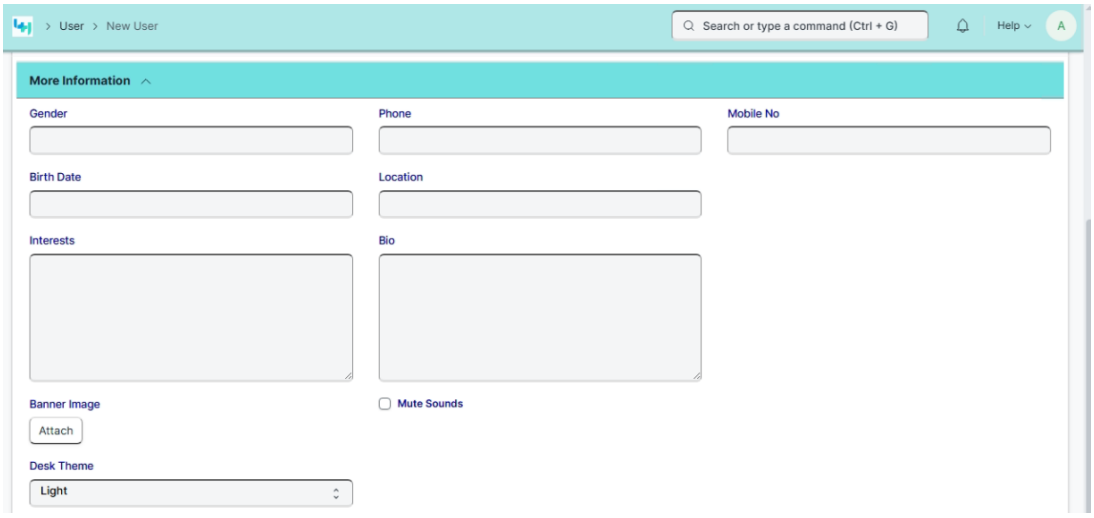
6. Enter the new user information like email, username to login the system, first name.



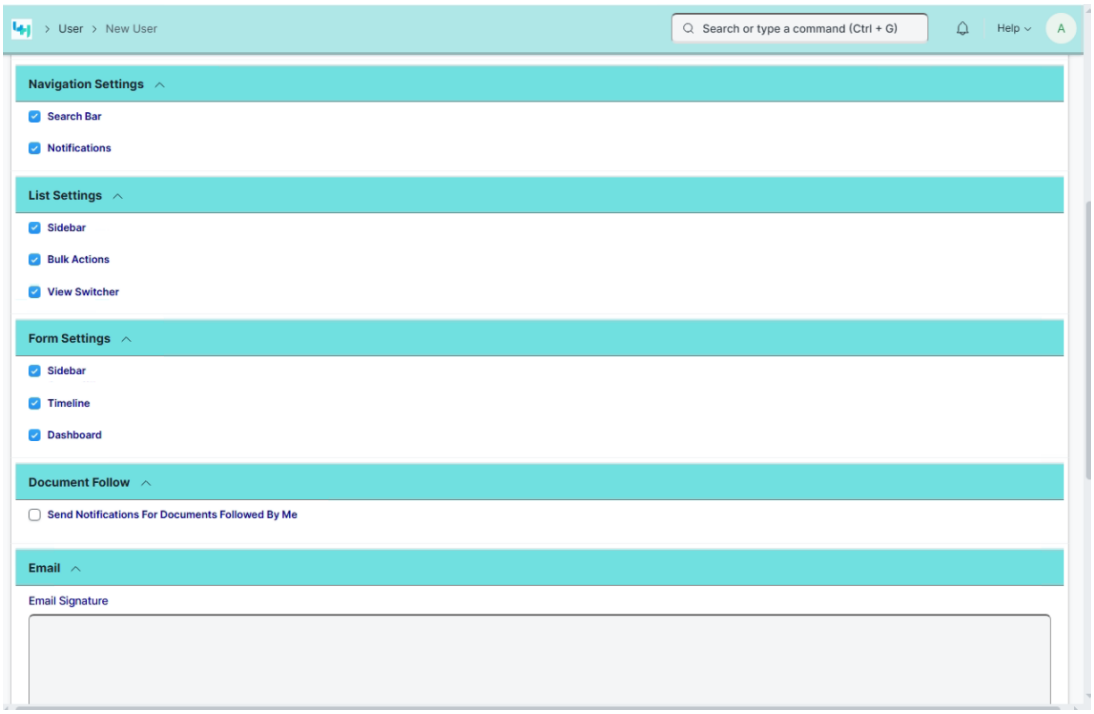
** For easy and fast to login the system, the username can enter and set in short but unique (e.g. Staff ID – 250411)

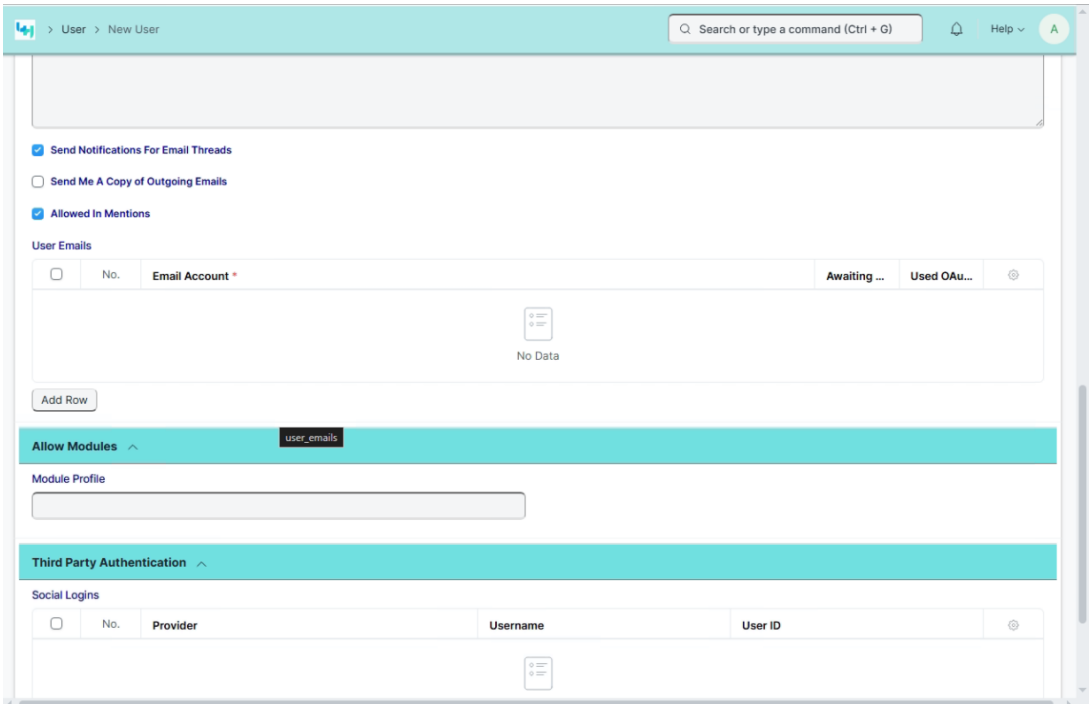


7. After clicking the "More Information" bar, there is optional to enter new user other information like gender, mobile number, birth date, etc.

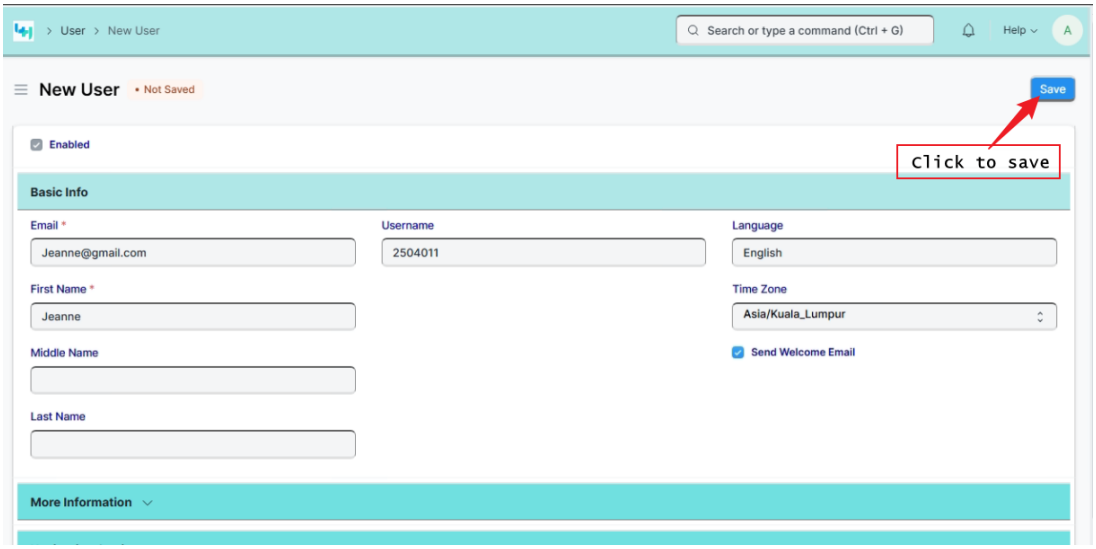


8. The following setting can be set as default.

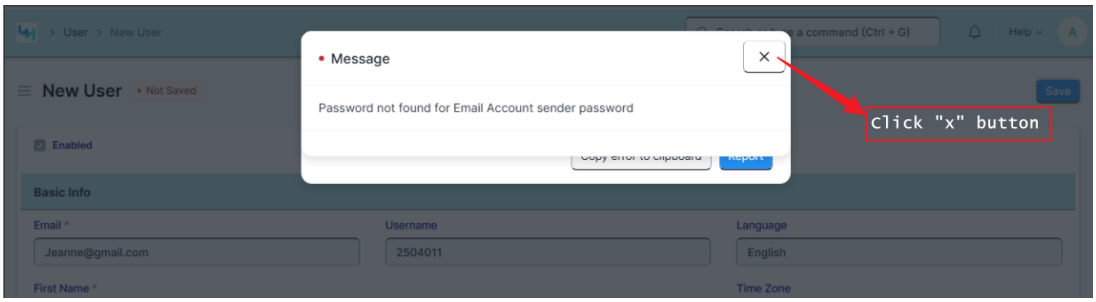

User
New User
Search or type a command (Ctrl + G)
Help
A
Navigation Settings
Search Bar
Notifications
List Settings
Sidebar
Bulk Actions
View Switcher
Form Settings
Sidebar
Timeline
Dashboard
Document Follow
Send Notifications For Documents Followed By Me
Email
Email Signature


User
New User
Search or type a command (Ctrl + G)
Help
A
Send Notifications For Email Threads
Send Me A Copy of Outgoing Emails
Allowed In Mentions
User Emails
No.
Email Account *
Awaiting ...
Used OAu...
No Data
Add Row
user_emails
Allow Modules
Module Profile
Third Party Authentication
Social Logins
No.
Provider
Username
User ID

9. Click the “save” button to save the entered new user’s information.

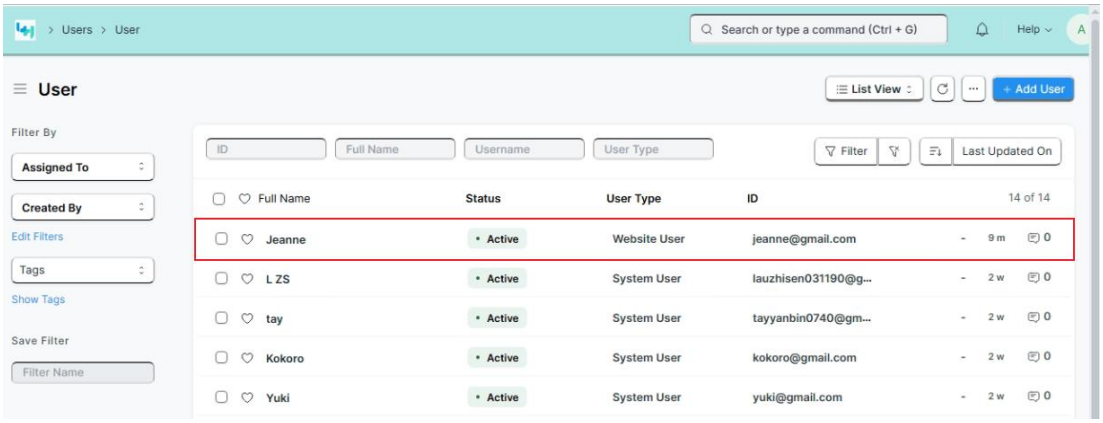


10. After clicking “save” button, it will pop up some alert messages. Just click “X” button.

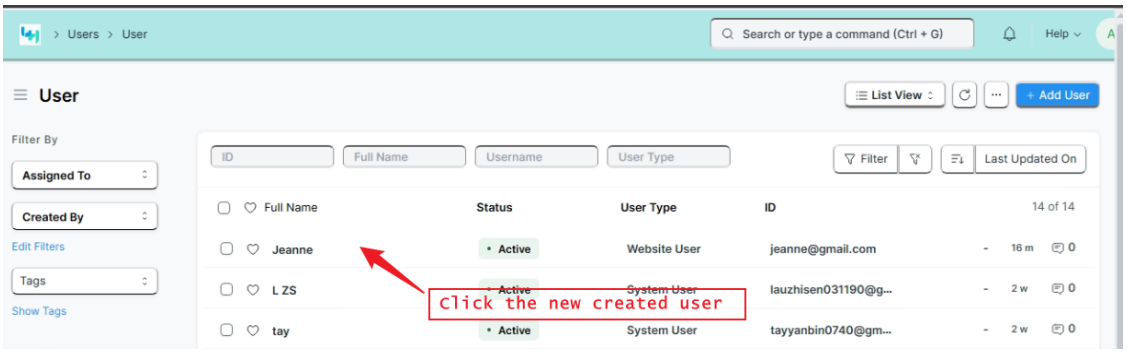


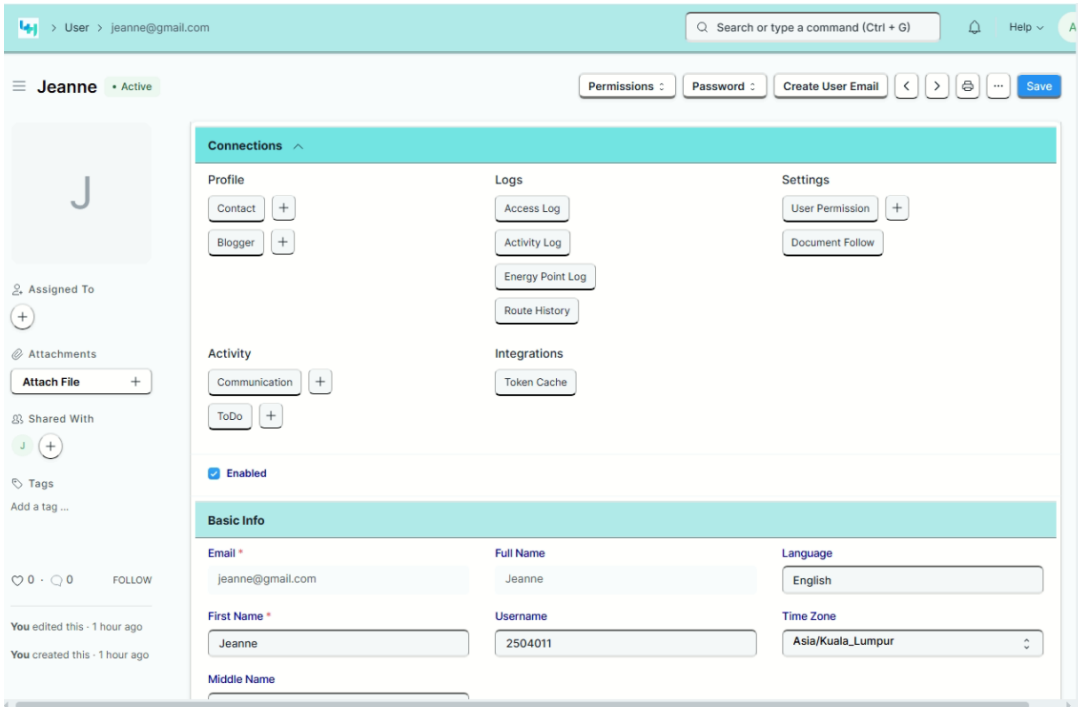
11. Move the cursor to click the “User” word to check whether the new created user is added.

12. The new created user is successfully added to the system.

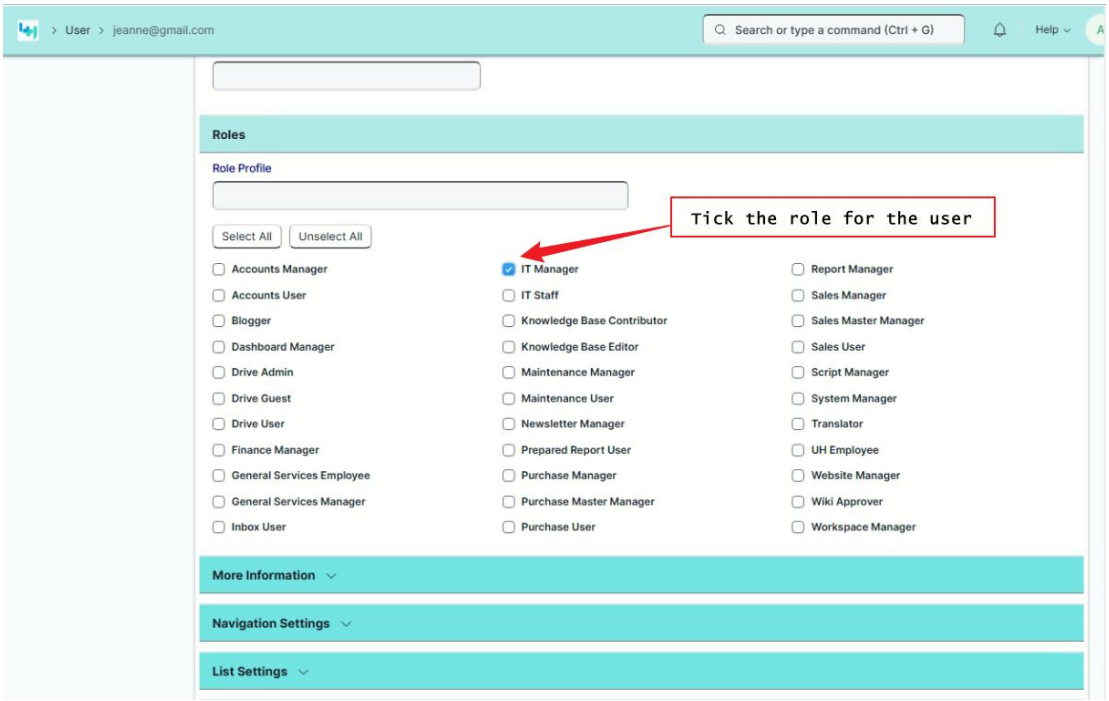


13. Click the new created user to enter user system password, add role to user and set allowed module



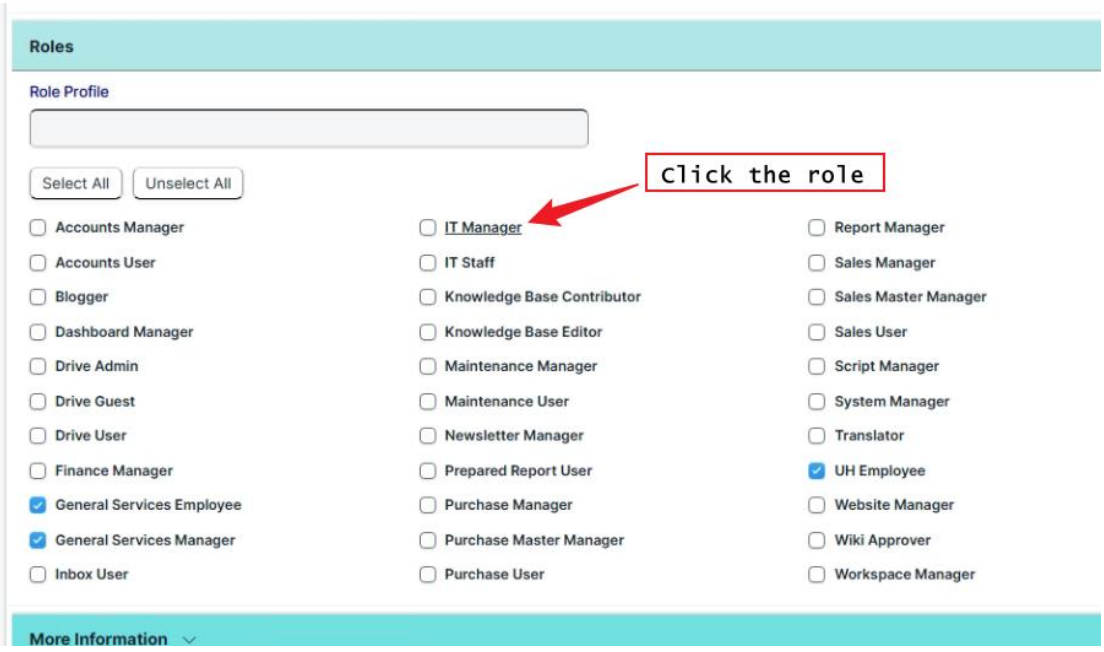


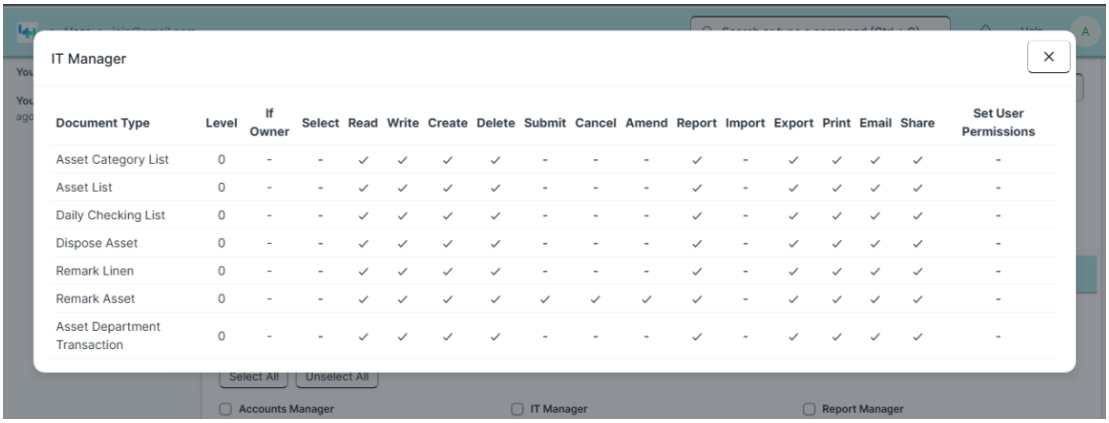
14. Select and tick the representative role for user



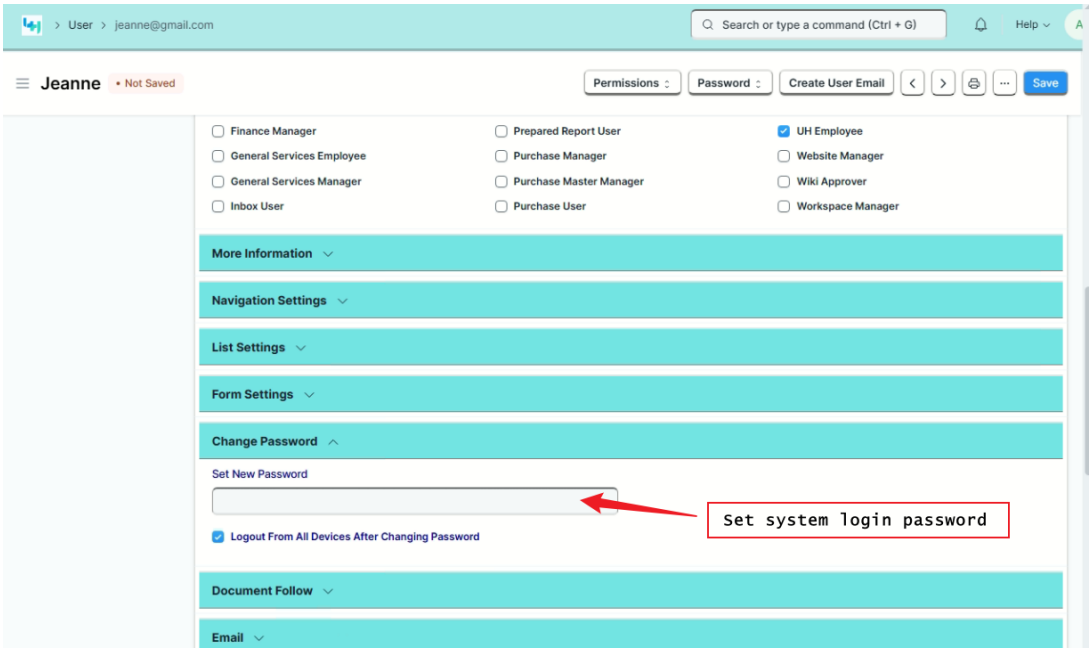
*The role is set for allow user to have access do action in the system

**Can click the role see view that each role has access to do what action in the system

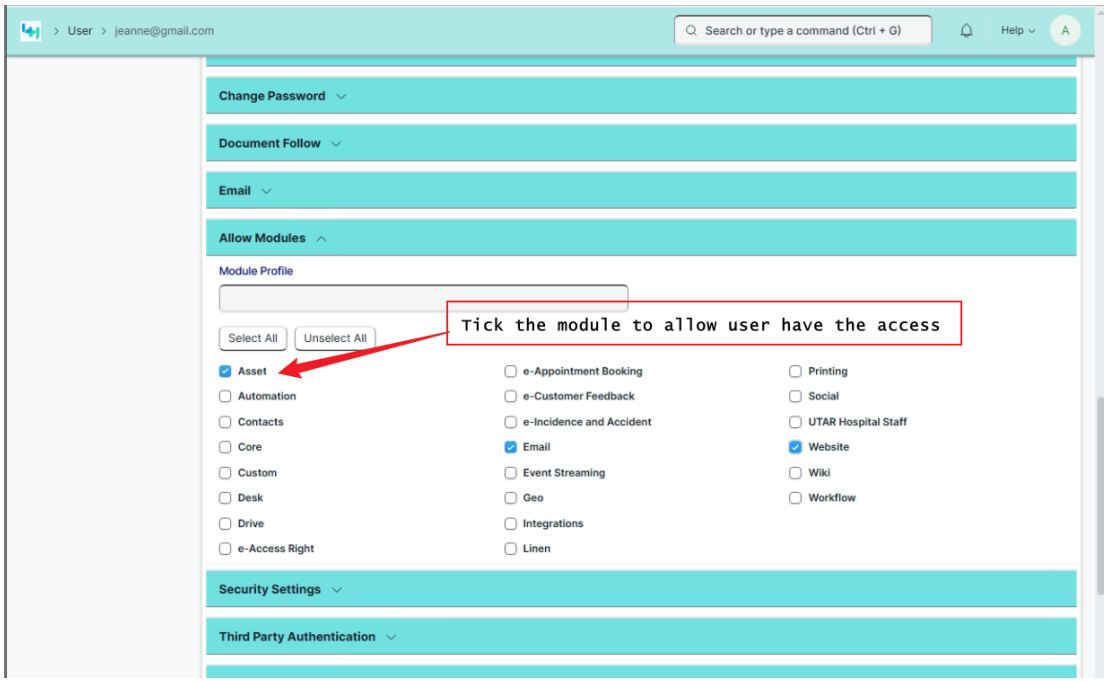




15. Scroll down and click the “Change Password” bar to set the password for user to login system. The password must strictly follow the password rules (include uppercase letters, lowercase letters, numbers, and symbols).

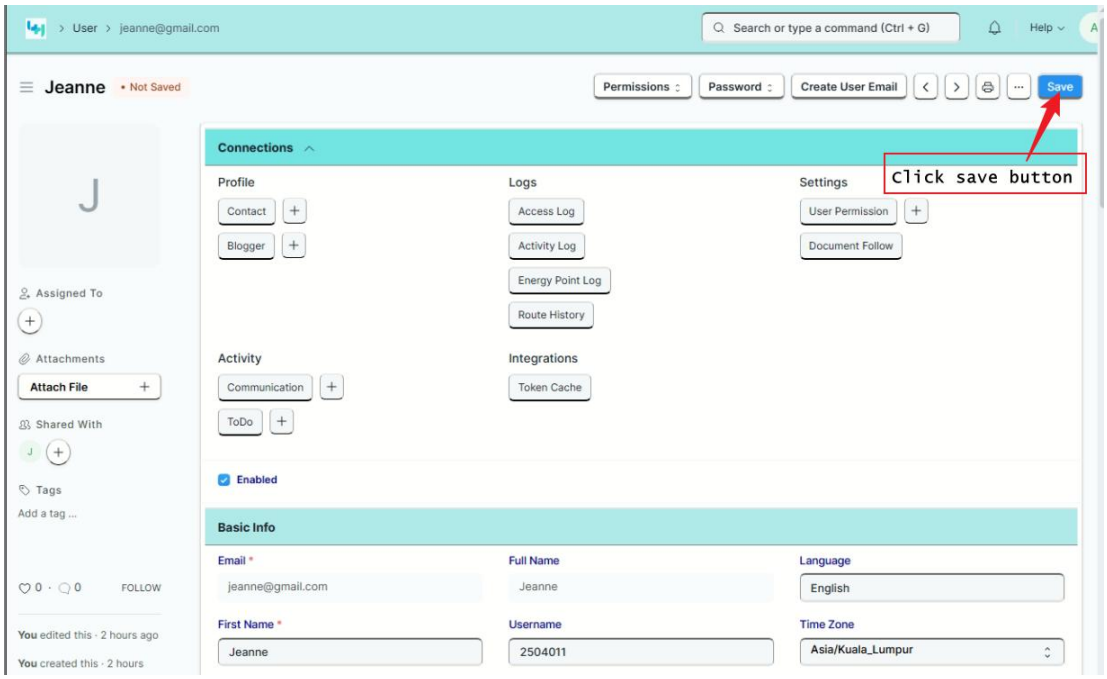


16. Next, select and tick the modules profile to user, allowing user to have the access to that module.



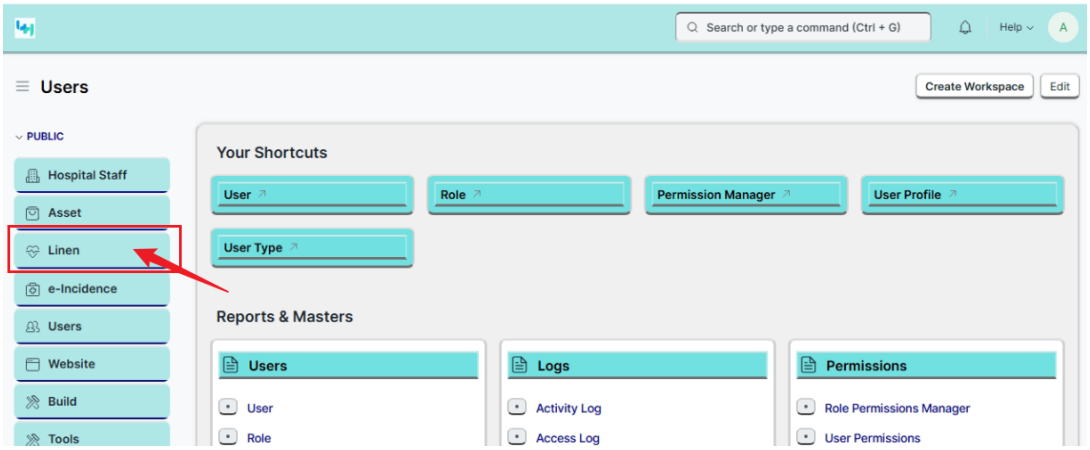
* Each module represents a distinct area of business management like linen, asset

17. Lastly, click the “save” button to save all the changed.

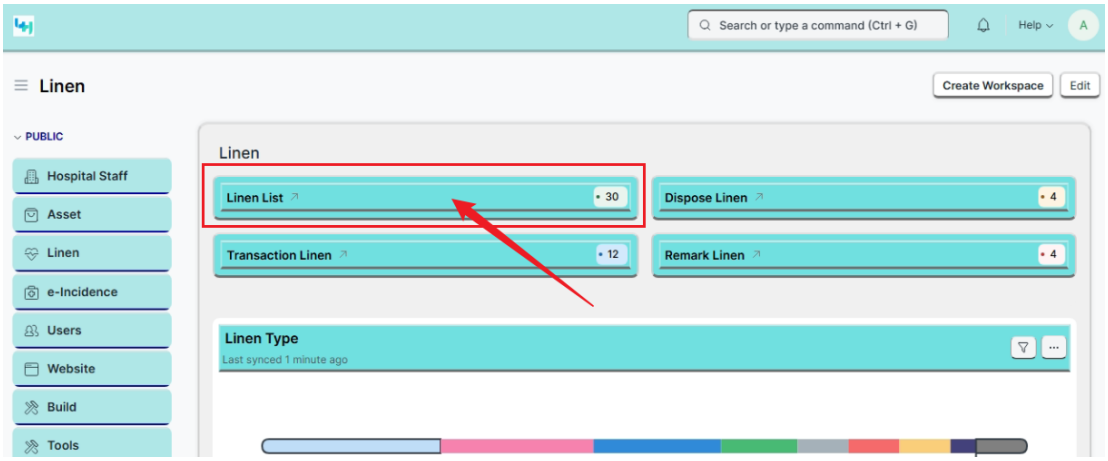


Steps to add/register new linen item via system

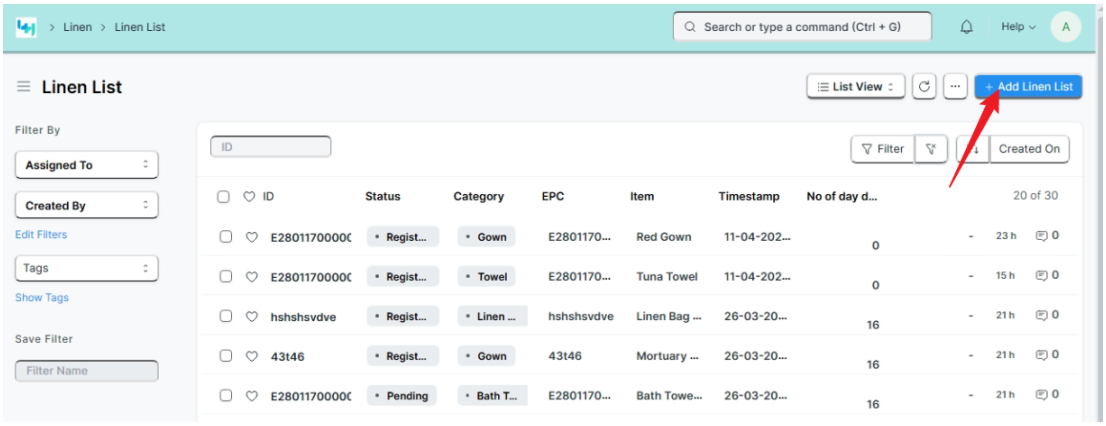
1. After successfully logging into the system, the user will see the main system homepage screen. Click the “Linen” workspace to access and view the information of linen item.



2. Next, click the “Linen List” shortcut button in the Linen workspace to access the linen list, viewing all linen items registered in the system.

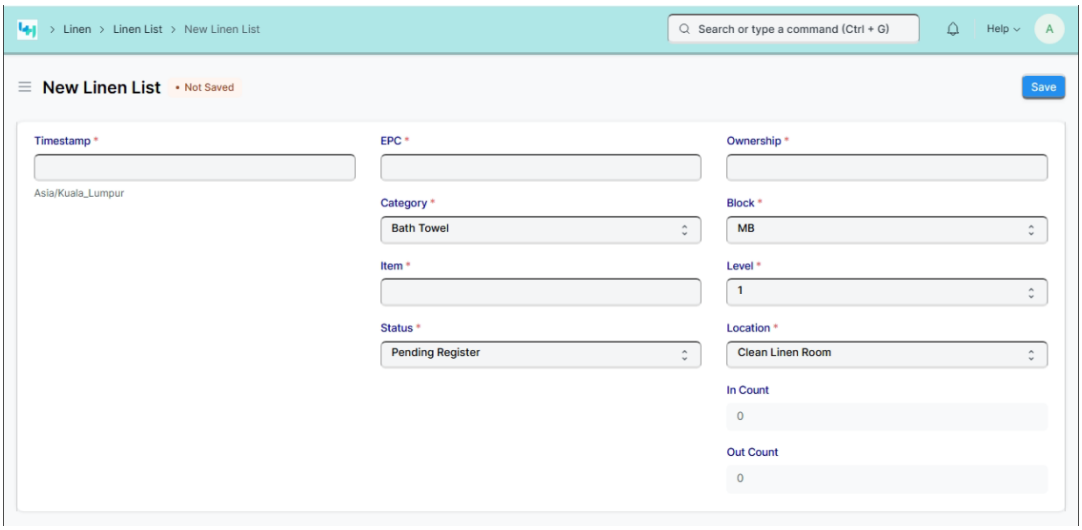


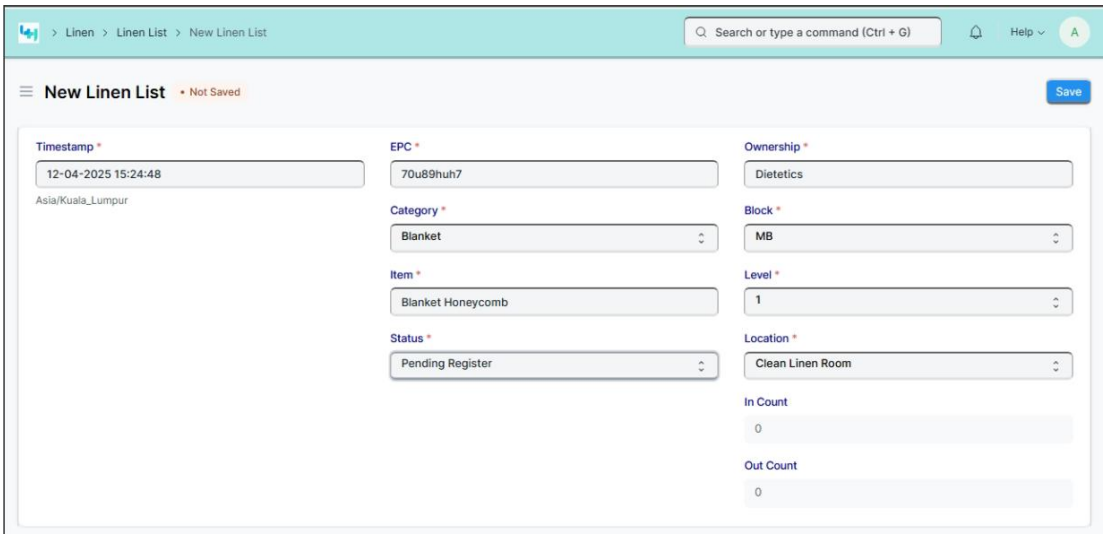
3. Click the "+ Add Linen List" button in the linen list to add or create new linen item



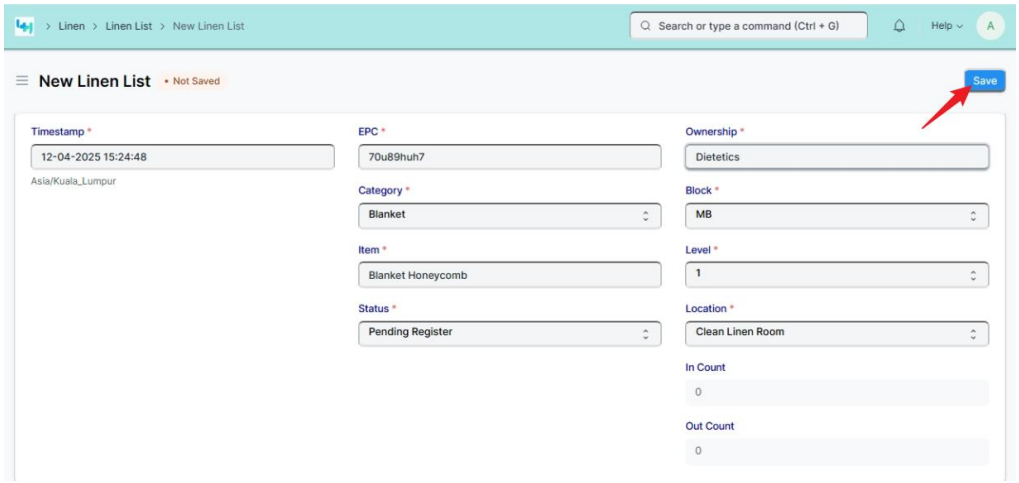
4. Enter all the information of new linen

** Do not need to change the status

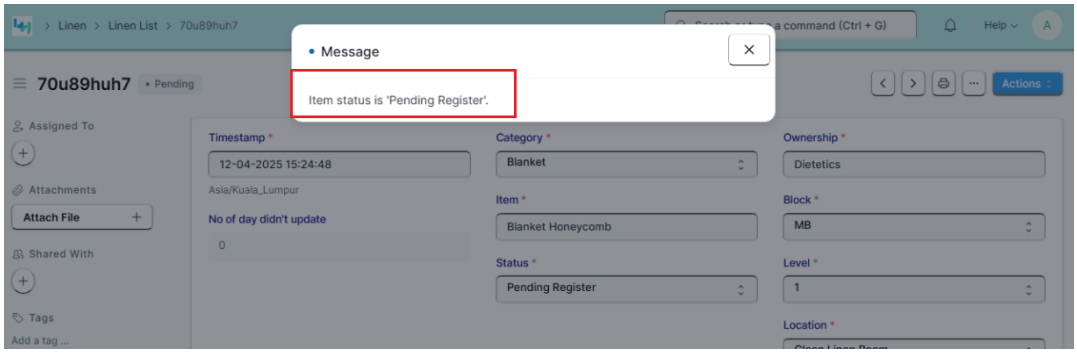




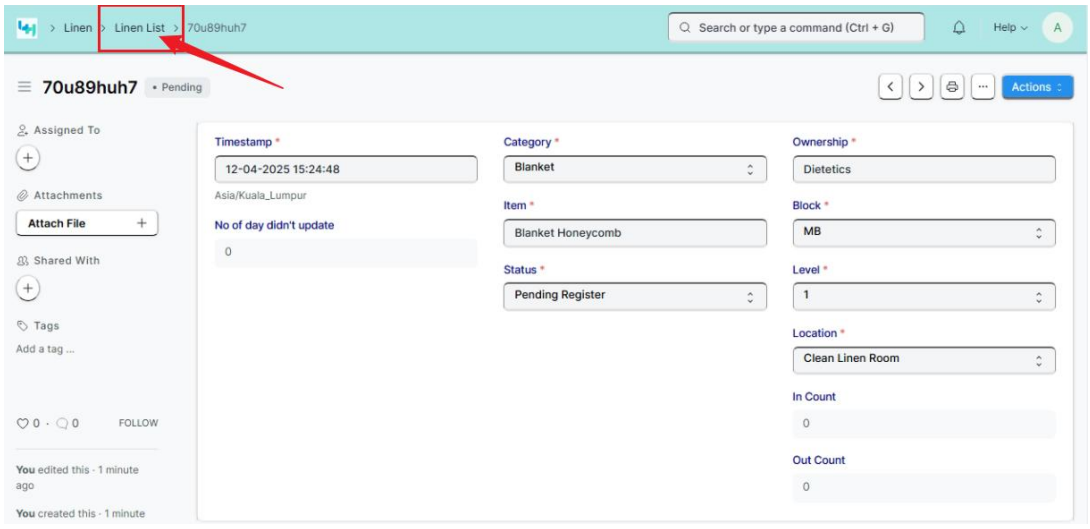
5. Click the save button to save all the changed.

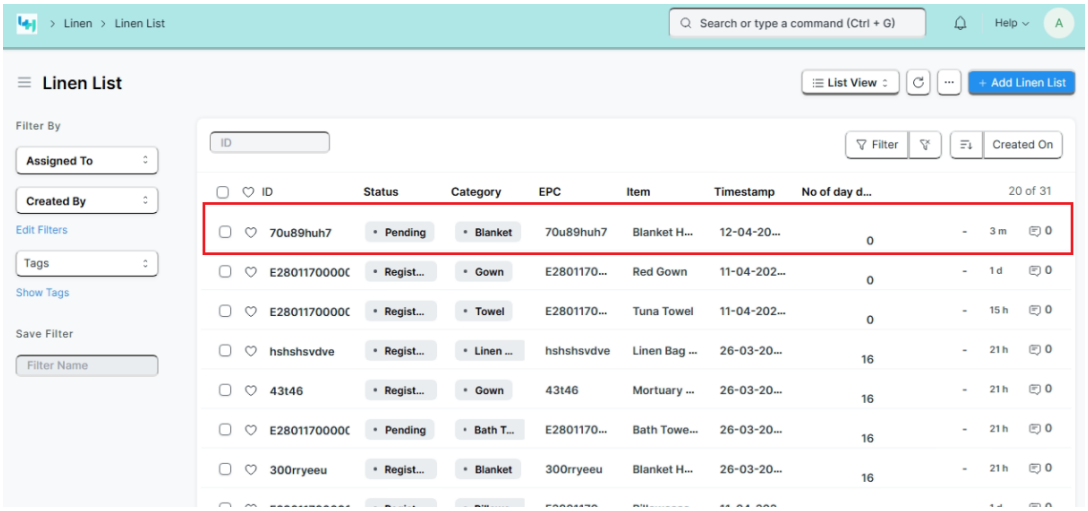


6. System will pop out an alert message that this item is in "pending register" status and the item is successfully created and added to the system.



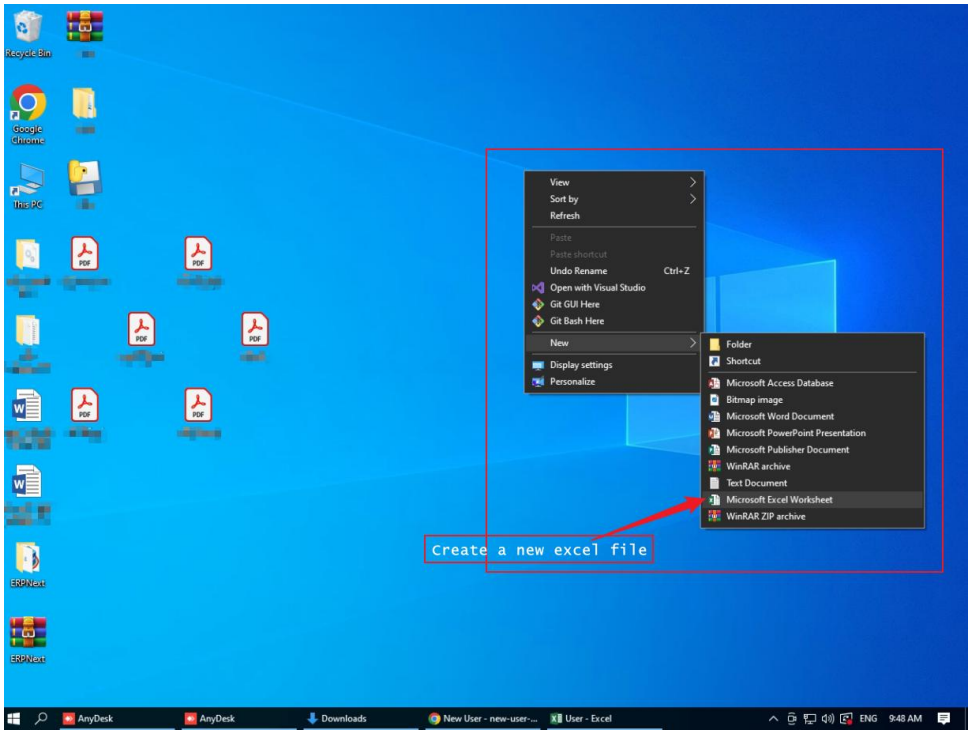
7. Next, click the words of "Linen List" to navigate to linen list to check whether the new added linen item is shown in the list.

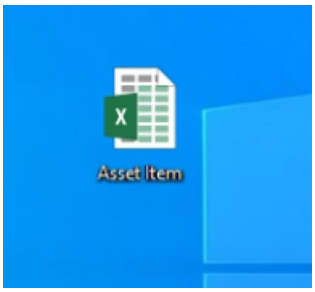



Linen > Linen List
Search or type a command (Ctrl + G)
Help
A
Linen List
List View
Add Linen List
Filter By
Assigned To
Created By
Edit Filters
Tags
Show Tags
Save Filter
Filter Name
ID
Filter
Created On
20 of 31
ID Status Category EPC Item Timestamp No of day d...
70u89huh7 Pending Blanket 70u89huh7 Blanket H... 12-04-20... 0 - 3 m 0
E2801170000(Regist... Gown E2801170... Red Gown 11-04-202... 0 - 1 d 0
E2801170000(Regist... Towel E2801170... Tuna Towel 11-04-202... 0 - 15 h 0
hshshsvdve Regist... Linen ... hshshsvdve Linen Bag ... 26-03-20... 16 - 21 h 0
43t46 Regist... Gown 43t46 Mortuary ... 26-03-20... 16 - 21 h 0
E2801170000(Pending Bath T... E2801170... Bath Towe... 26-03-20... 16 - 21 h 0
300rryeeu Regist... Blanket 300rryeeu Blanket H... 26-03-20... 16 - 21 h 0

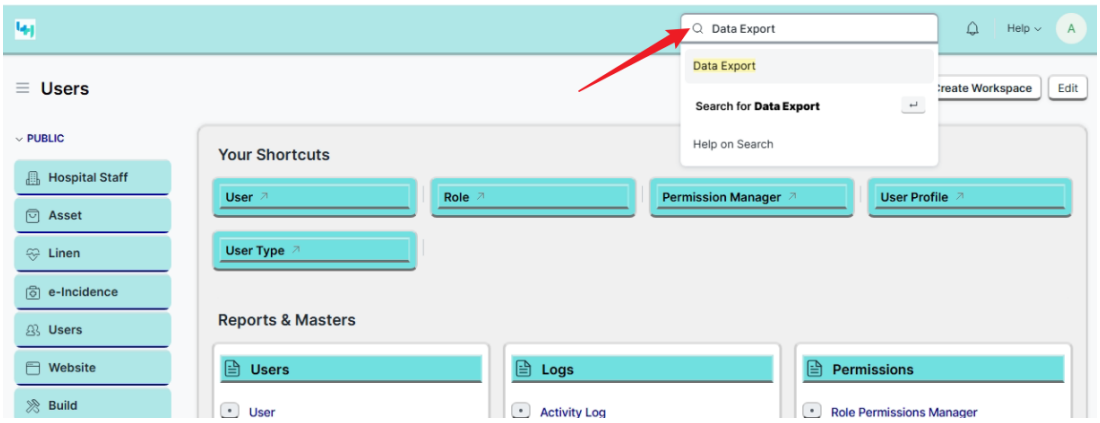
Steps to add new asset item by importing excel file

1. Create and open a new excel file (e.g. create a new excel file in desktop and named Asset Item)



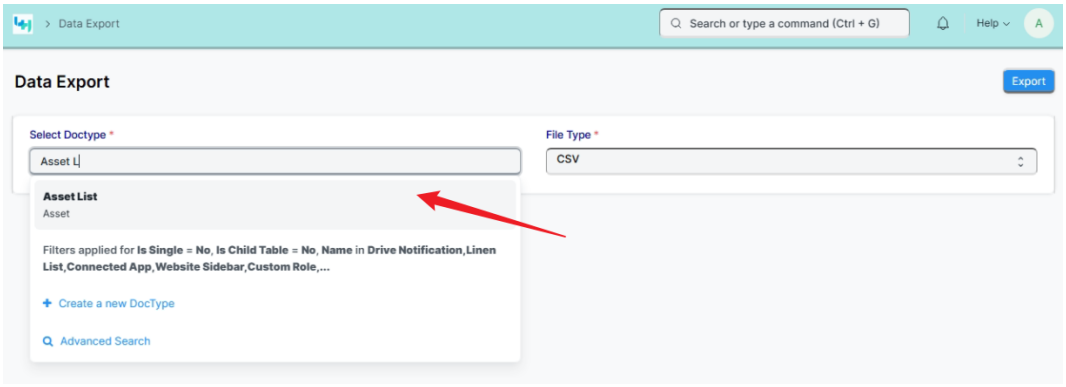


2. Open the system and type “Data Export” in search bar and click it.

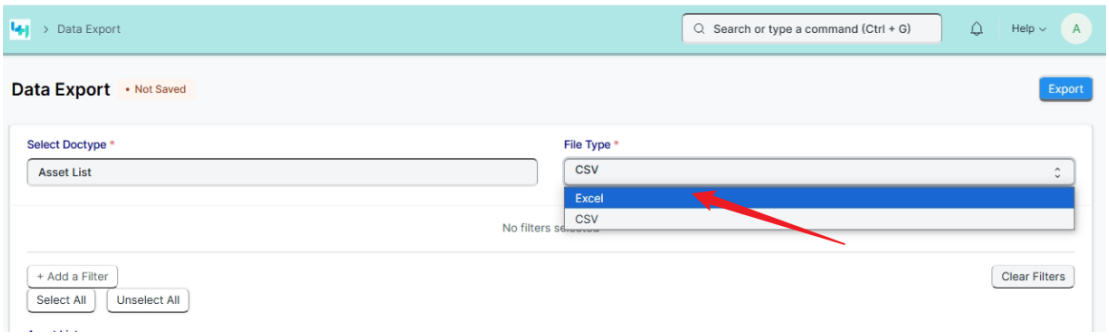


3. After opening “Data Export”, enter the Doctype name that wants to import. When the Doctype is showed then click it. (e.g. Asset List)

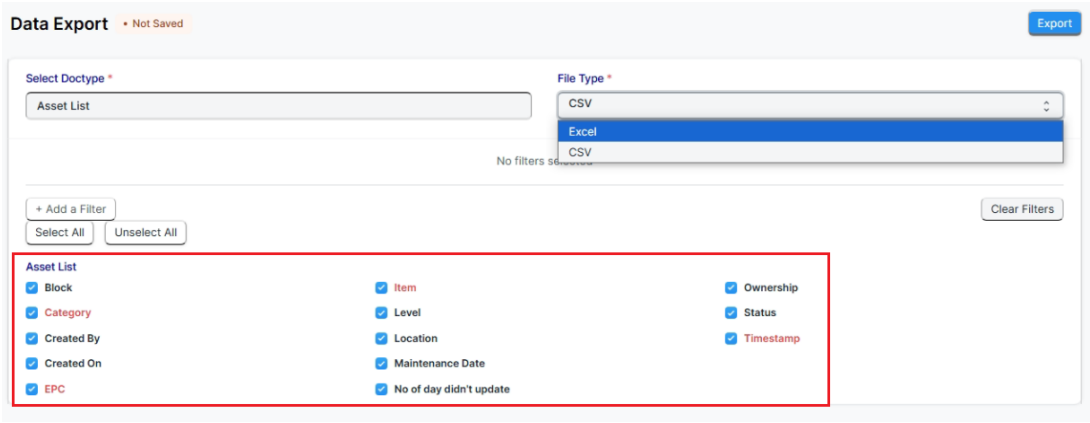
**Please make sure the data want to import to that doctype list is available



4. Change the File Type from CSV to Excel.



5. From the Data Export form, you can refer to or copy the Label Name of data that wants to import which is to prevent any typo and error name label. Label Name: - Block, Category, EPC, Item, Level, Location, Maintenance Date, Ownership & Timestamp

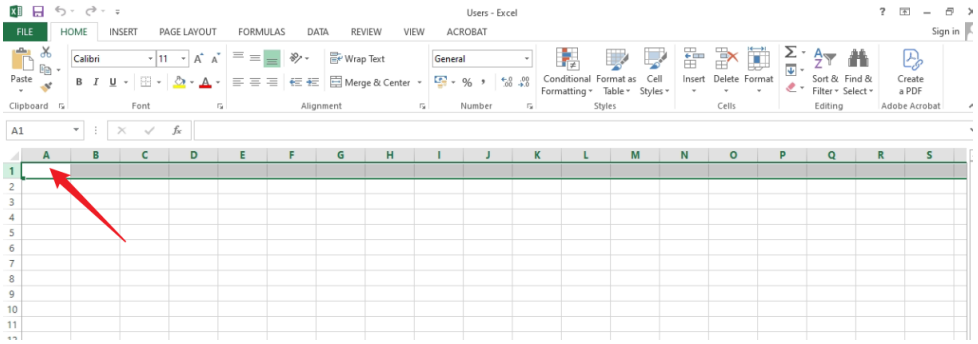


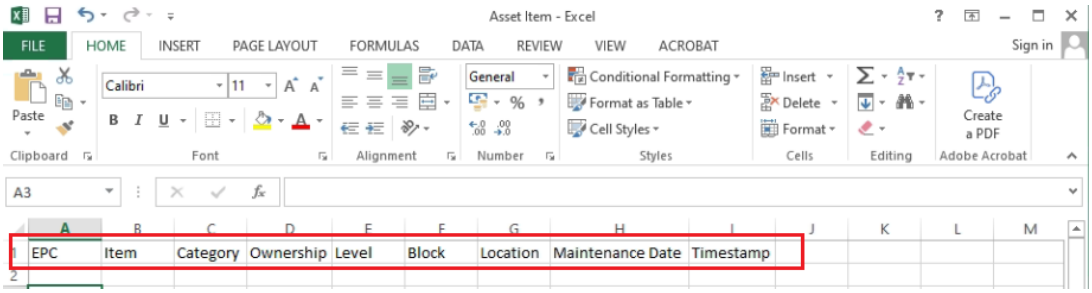
**The label name information must strictly follow the name that is available in system

**No of day didn't update is auto updated via system's script, no need to import manually

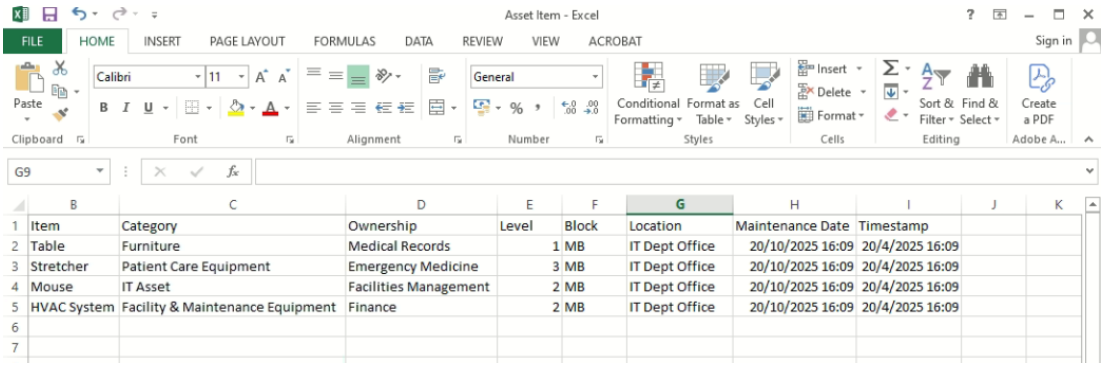
** Status of the new item will have default value "Pending Register" when new create.

6. Open that excel file and enter the data label name that wants to import via excel file in the first row.



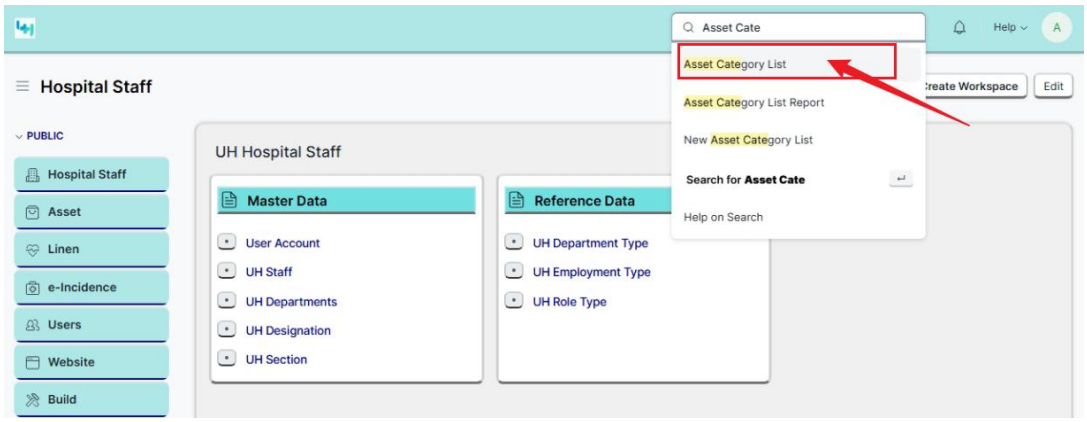


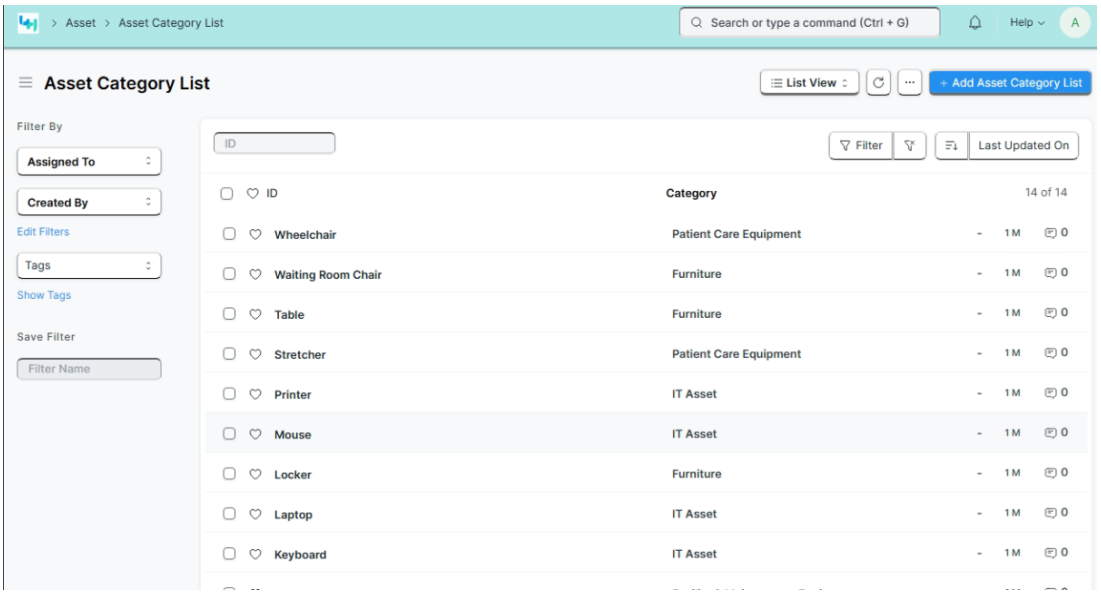
7. Enter the list of asset item information to create new asset items via import. Below are showed some examples of how to enter the asset item information on the excel sheet.



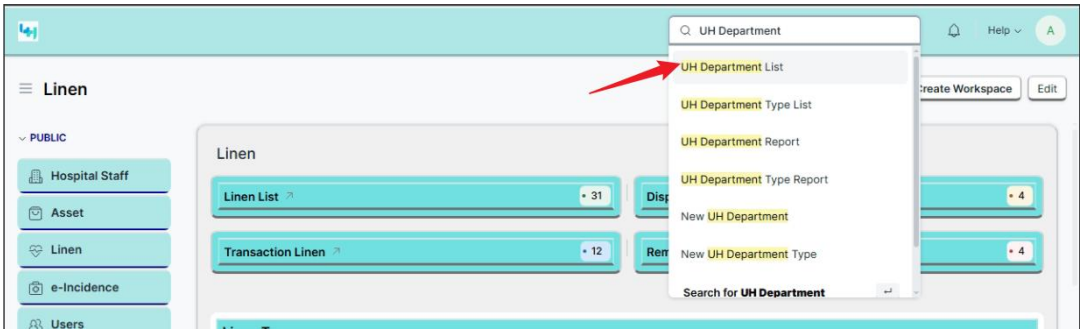
	B	C	D	E	F	G	H	I
1	Item	Category	Ownership	Level	Block	Location	Maintenance Date	Timestamp
2	Table	Furniture	Medical Records	1	MB	IT Dept Office	20/10/2025 16:09	20/4/2025 16:09
3	Stretcher	Patient Care Equipment	Emergency Medicine	3	MB	IT Dept Office	20/10/2025 16:09	20/4/2025 16:09
4	Mouse	IT Asset	Facilities Management	2	MB	IT Dept Office	20/10/2025 16:09	20/4/2025 16:09
5	HVAC System	Facility & Maintenance Equipment	Finance	2	MB	IT Dept Office	20/10/2025 16:09	20/4/2025 16:09
6								
7								

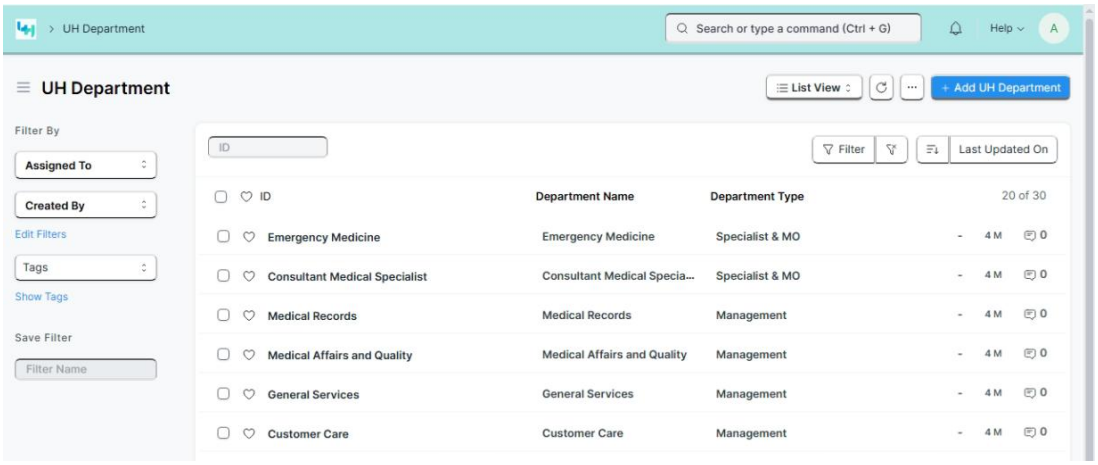
**To view the name of each item and their category can type “Asset Category List” in search bar



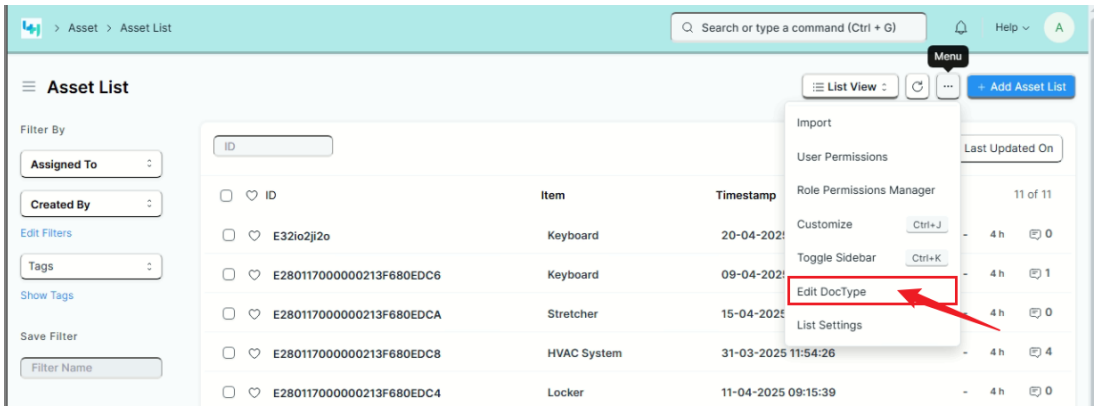


**To view the name of ownership can type “UH Department List” in search bar

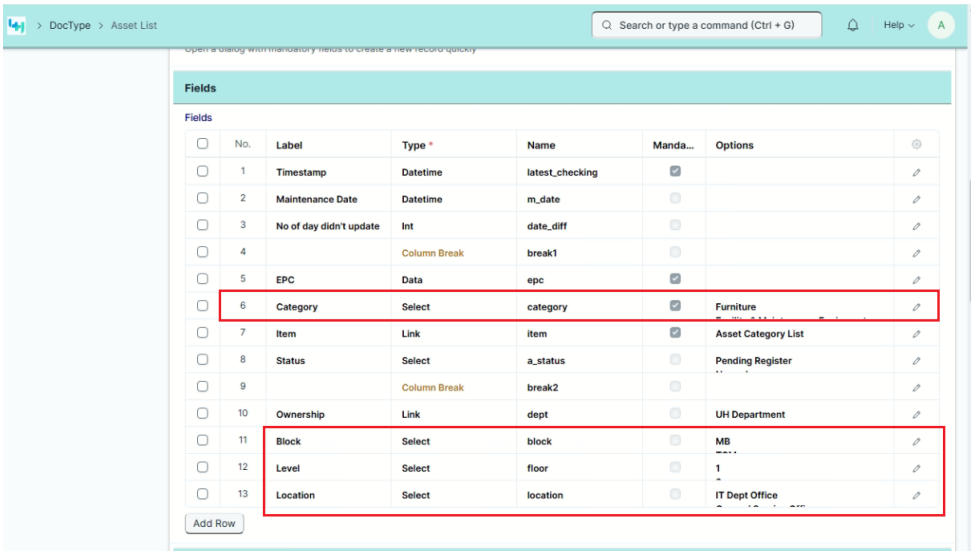




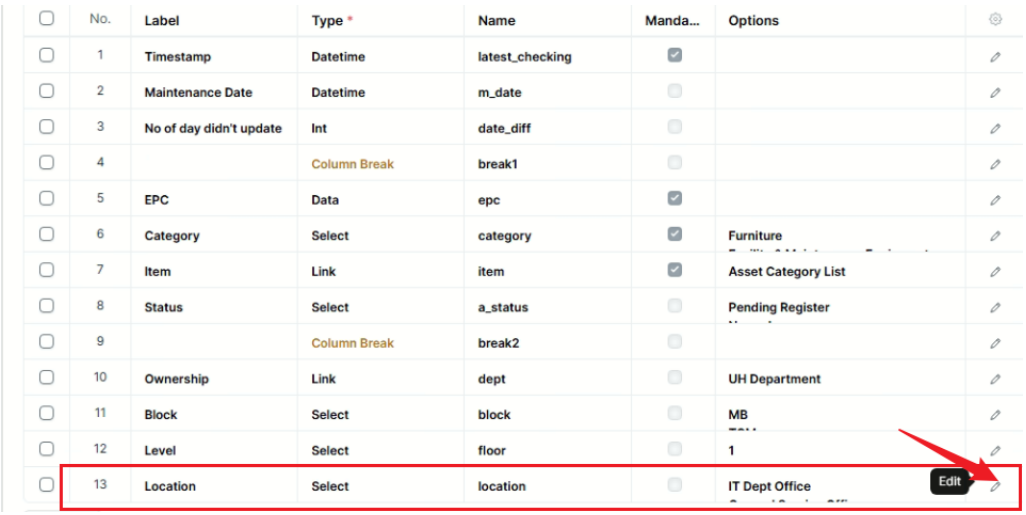
**To view the name of Block, Level and Location can open "Asset List". After clicking the "Menu" icon button, click the "Edit DocType"



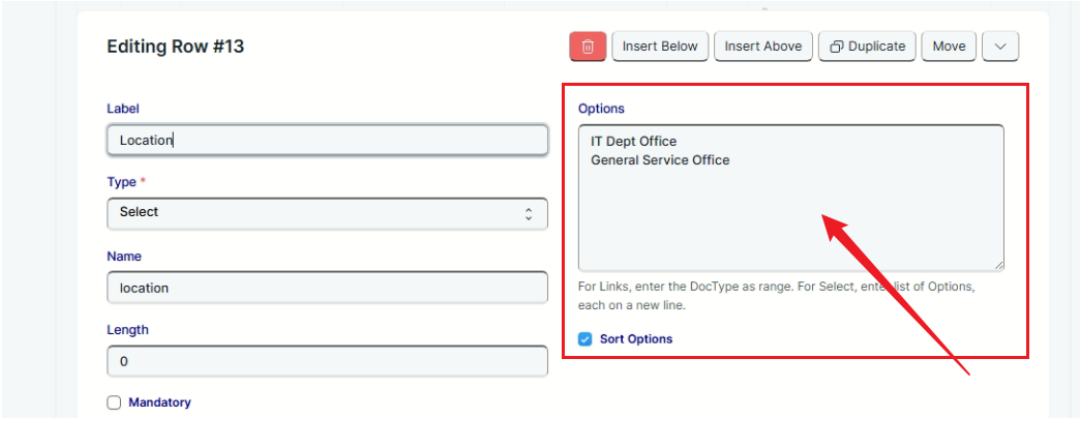
**Scrolling down can see the "Fields". Since Block, Level and Location's field type is "select" so can view, delete, edit or add new selections.

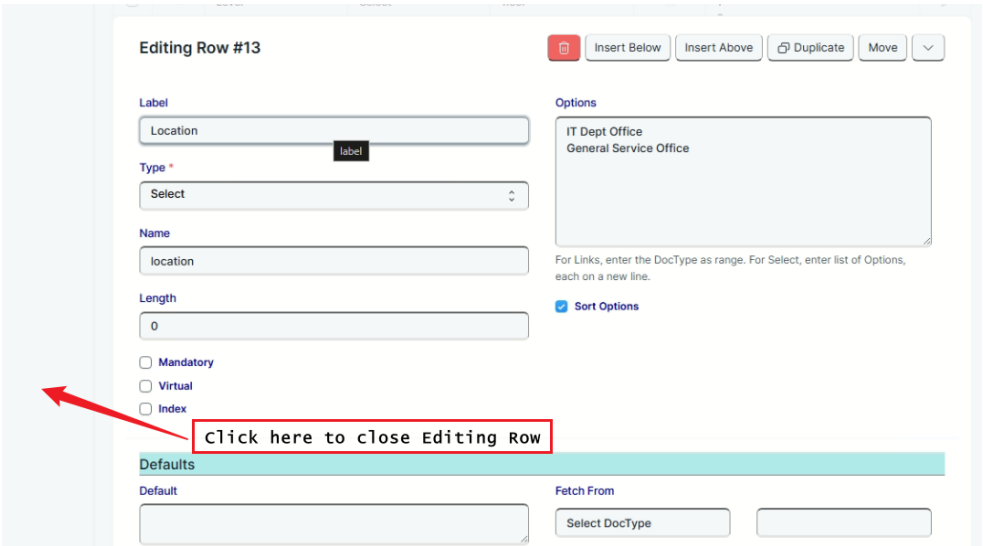


**Click the pencil icon and view the name of the Location selection. There is showed that only 2 options can be selected for Location. To close the “Editing Row” just click any white opacity place.

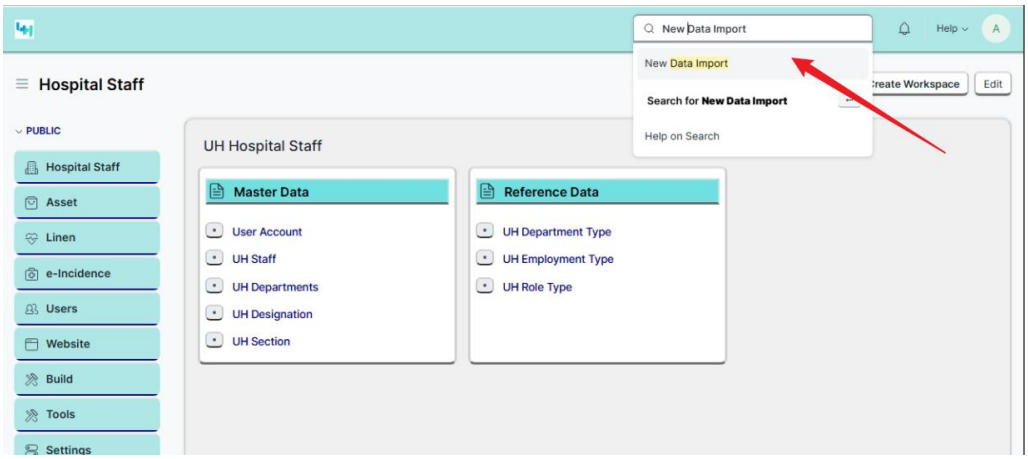


**Can Delete or add new selection for location field at here

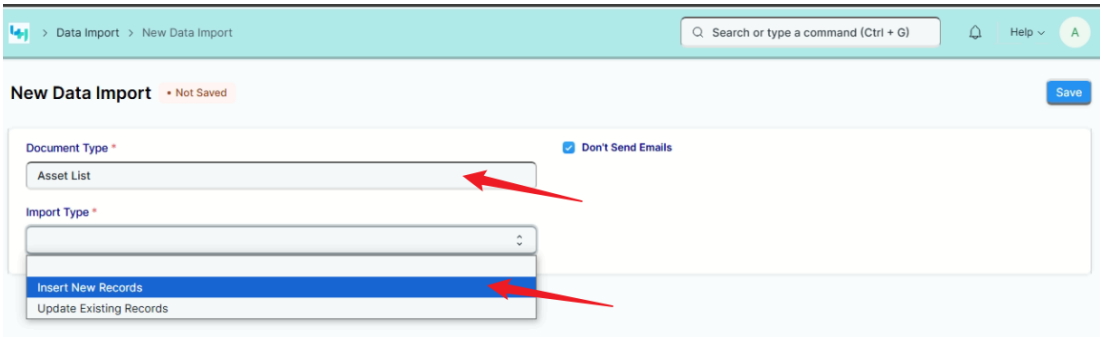




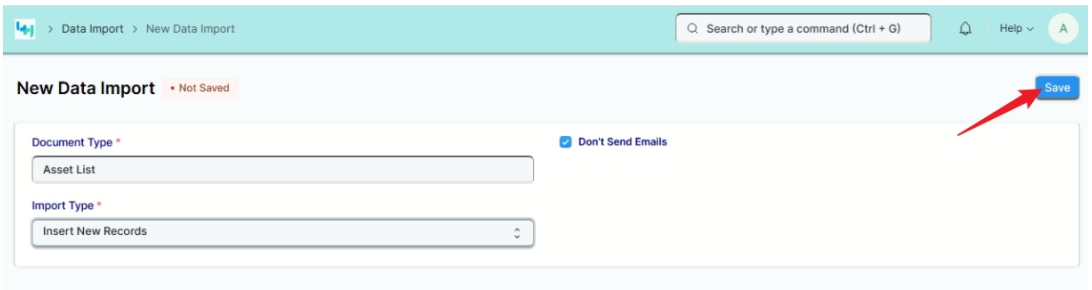
8. After saving the file, open the system again. Type the “New Data Import” in search bar and click it.



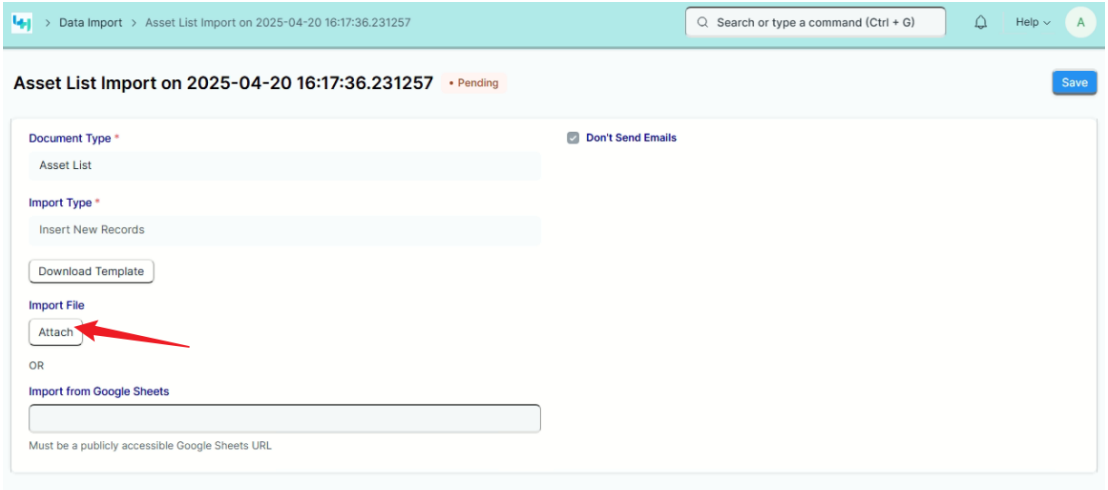
9. Enter the name of doctype type that want to import (“Asset List”) and select “Insert New Records” as import type.

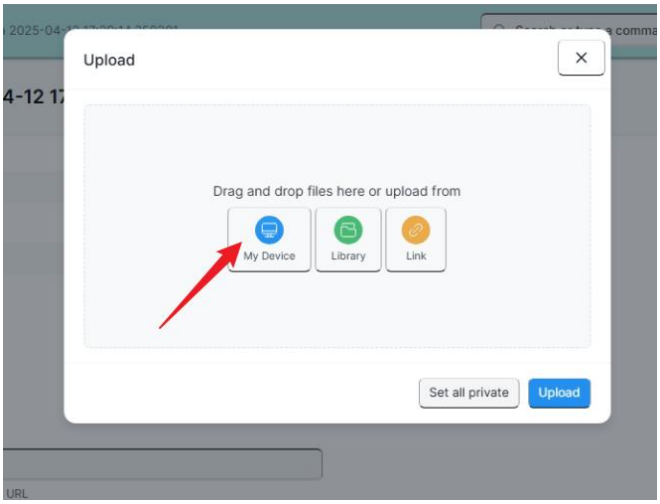


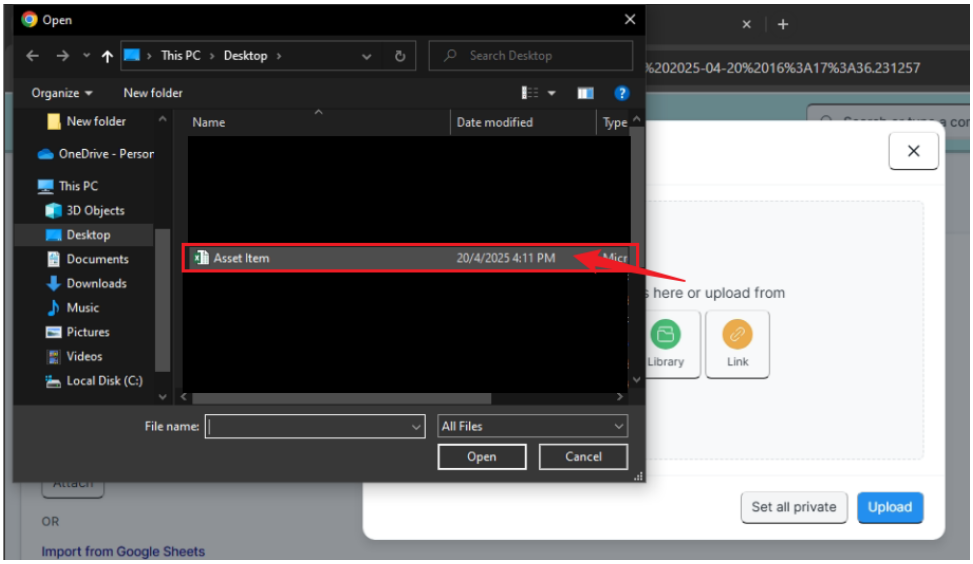
10. Click the “Save” button



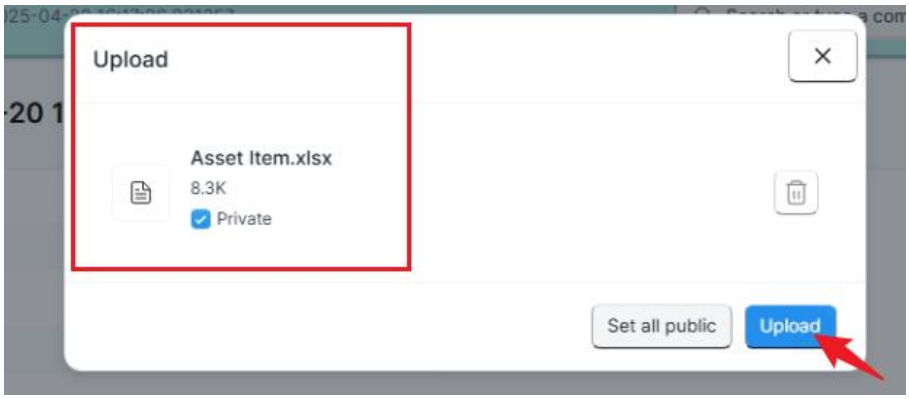
11. Click the “Attach” button and select the that excel file from device.



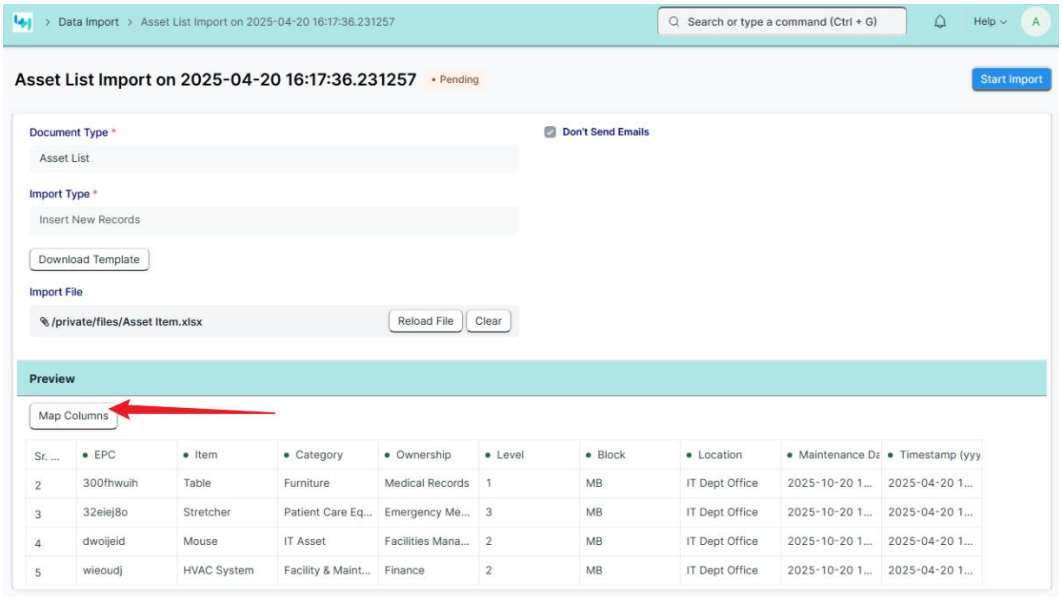




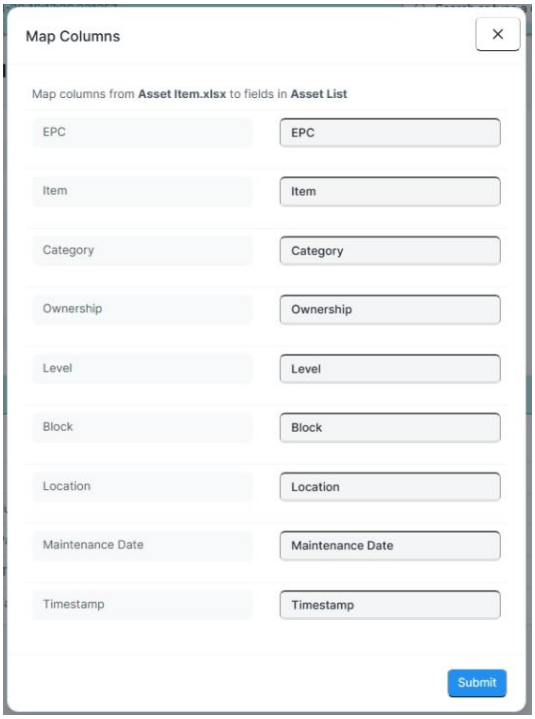
12. After selecting the “Asset Item” excel file, click the upload button.



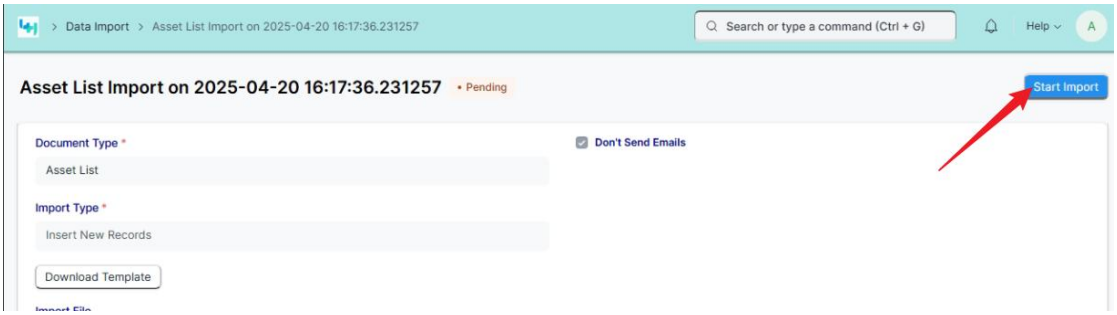
13. Click the “Map Columns”



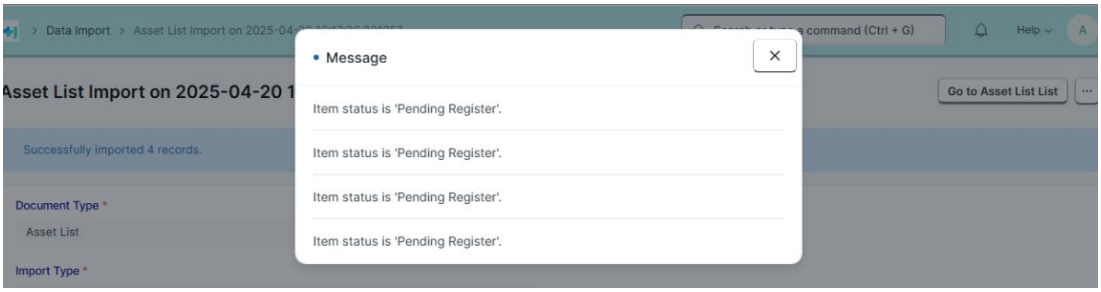
14. Check whether didn't have item is default set in "Don't Import" and make sure all the name is correct. Then click the submit button.



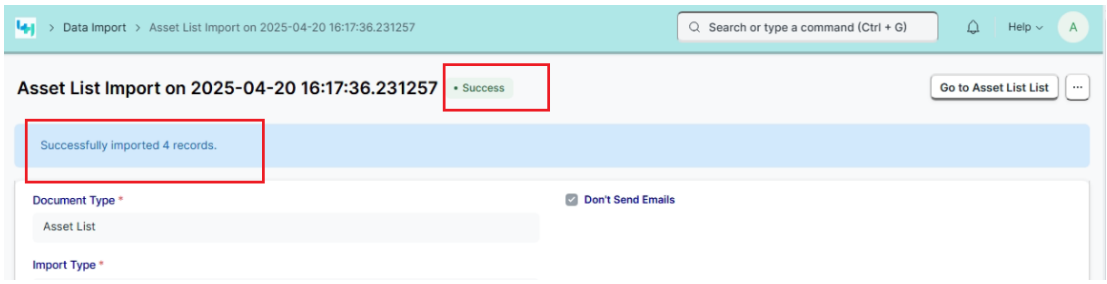
15. Click the "Start Import" button.



16. When successfully importing the asset item information, system will show the item status is "pending register".

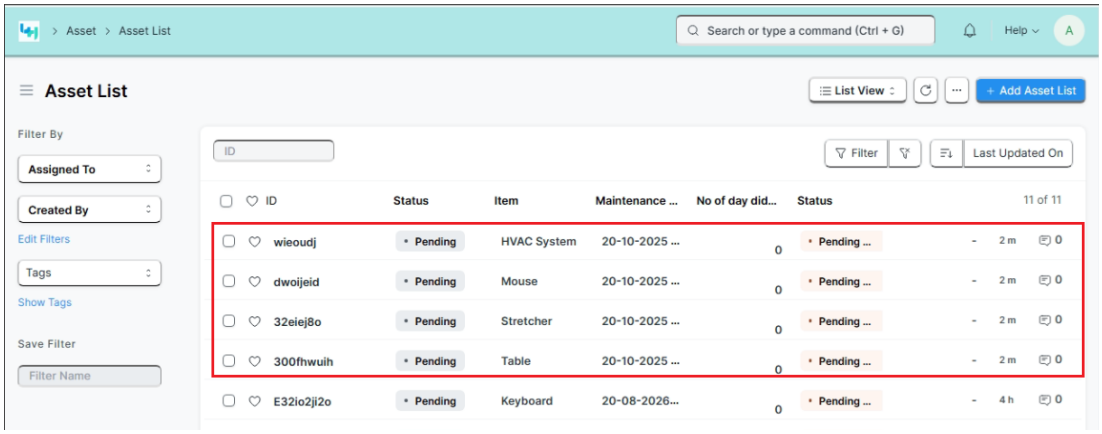


17. System will show that the import file is successfully

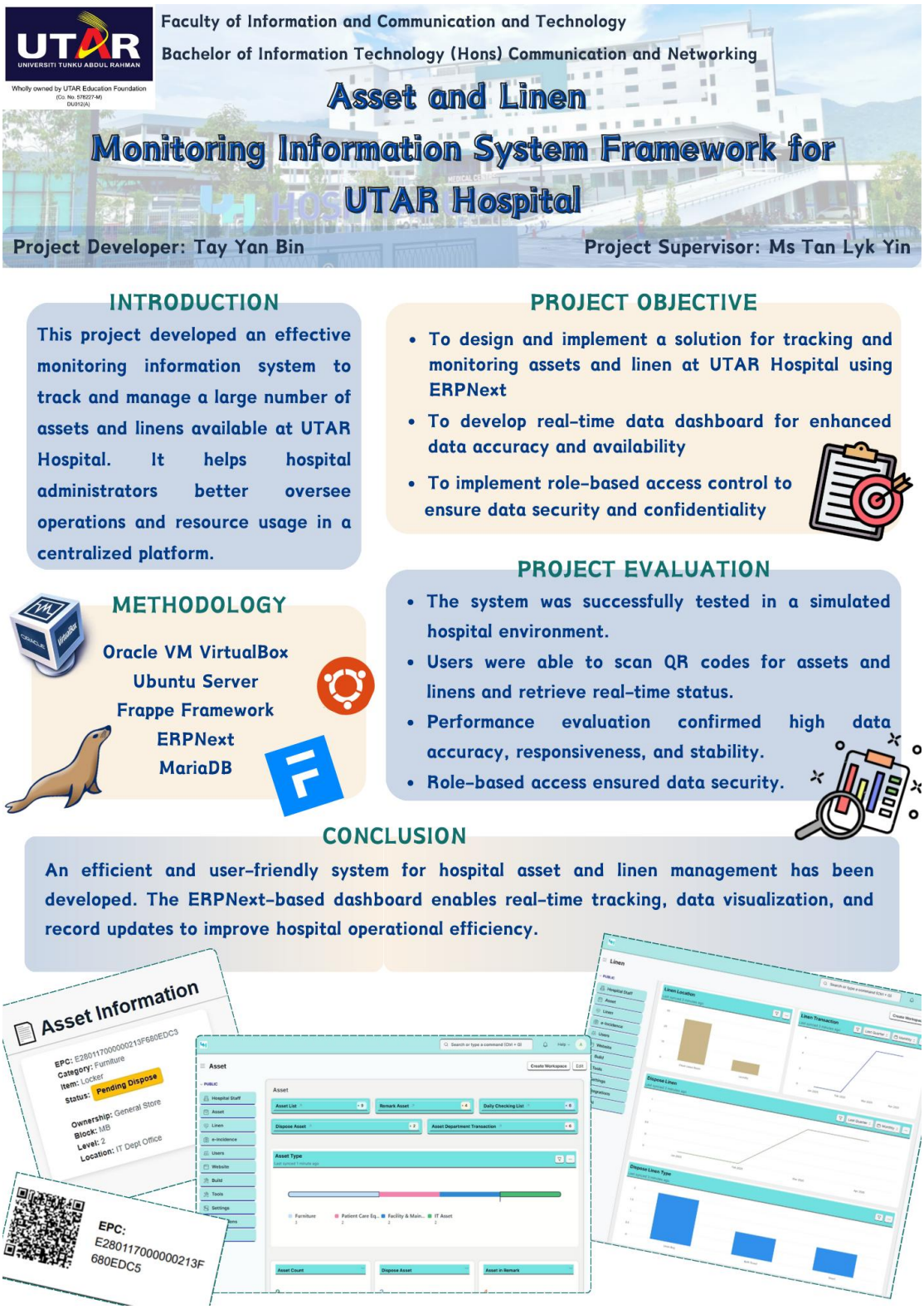


**Please strictly follow the format to insert the data else might cause error to import and need to import again.

18. New import asset items will show in the asset list.



POSTER


UTAR
UNIVERSITI TUNKU ABDUL RAHMAN
Wholly owned by UTAR Education Foundation
(Co. No. 578227-M)
DU012(A)
Faculty of Information and Communication and Technology
Bachelor of Information Technology (Hons) Communication and Networking
Asset and Linen
Monitoring Information System Framework for
UTAR Hospital
Project Developer: Tay Yan Bin
Project Supervisor: Ms Tan Lyk Yin
INTRODUCTION
This project developed an effective monitoring information system to track and manage a large number of assets and linens available at UTAR Hospital. It helps hospital administrators better oversee operations and resource usage in a centralized platform.
PROJECT OBJECTIVE
To design and implement a solution for tracking and monitoring assets and linen at UTAR Hospital using ERPNext
To develop real-time data dashboard for enhanced data accuracy and availability
To implement role-based access control to ensure data security and confidentiality
METHODOLOGY
Oracle VM VirtualBox
Ubuntu Server
Frappe Framework
ERPNext
MariaDB
PROJECT EVALUATION
The system was successfully tested in a simulated hospital environment.
Users were able to scan QR codes for assets and linens and retrieve real-time status.
Performance evaluation confirmed high data accuracy, responsiveness, and stability.
Role-based access ensured data security.
CONCLUSION
An efficient and user-friendly system for hospital asset and linen management has been developed. The ERPNext-based dashboard enables real-time tracking, data visualization, and record updates to improve hospital operational efficiency.
Asset Information
EPC: E280117000000213F680EDC3
Category: Furniture
Item: Locker
Status: Pending Dispose
Ownership: General Store
Block: MB
Level: 2
Location: IT Dept Office
EPC: E280117000000213F680EDC5