POLITEKNIK UNGKU OMAR

INVENTORY MANAGEMENT SYSTEM

MUHAMMAD ADAM BIN NOR AZMAN

(01BCT201F3021)

CIVIL ENGINEERING DEPARTMENT

SESSION 2 2022/2023

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A project report/thesis submitted in partial fulfillment of the requirement for the award of the Bachelor of Civil Engineering Technology with Honours

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STATEMENT OF AUTHENTICITY AND PROPRIETARY RIGHTS

INVENTORY MANAGEMENT SYSTEM

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ABSTRACT

Enventory management plays a crucial role in the construction industry by facilitating the efficient control and tracking of construction materials and equipment throughout the project lifecycle. Effective inventory management is vital to ensuring the timely completion of construction projects, minimizing cost overruns, and optimizing resource utilization. The inventory management system in construction integrates various features such as real-time tracking, procurement management, stock control, and reporting. Real-time tracking enables the system to monitor the movement of materials and equipment in real-time, providing stakeholders with accurate information about their location, availability, and utilization. Therefore, the objective of this research is to develop the application of Inventory Management System (IMS) by using BuildFire and to determine their effectiveness. In conclusion, the IMS designed specifically for the construction industry offers a comprehensive solution for managing construction materials and equipment effectively. Its real-time tracking, procurement management, stock control, and reporting capabilities empower construction companies to optimize inventory utilization, reduce costs, and improve project outcomes. Implementing such a system can significantly enhance efficiency, productivity, and profitability in the construction sector.

Keywords: *Inventory Management, Construction, materials, delay*

ABSTRAK

Pengurusan inventori memainkan peranan penting dalam industri pembinaan dengan memudahkan kawalan dan pengesanan bahan binaan dan peralatan yang cekap sepanjang kitaran hayat projek. Pengurusan inventori yang berkesan adalah penting untuk memastikan penyiapan projek pembinaan tepat pada masanya, meminimumkan lebihan kos, dan mengoptimumkan penggunaan sumber. Sistem pengurusan inventori dalam pembinaan menyepadukan pelbagai ciri seperti penjejakan masa nyata, pengurusan perolehan, kawalan stok dan pelaporan. Penjejakan masa nyata membolehkan sistem memantau pergerakan bahan dan peralatan dalam masa nyata, memberikan pihak berkepentingan maklumat yang tepat tentang lokasi, ketersediaan dan penggunaan mereka. Oleh itu, objektif penyelidikan ini adalah untuk membangunkan aplikasi Sistem Pengurusan Inventori (IMS) dengan menggunakan BuildFire dan untuk menentukan keberkesanannya. Kesimpulannya, IMS yang direka khusus untuk industri pembinaan menawarkan penyelesaian yang komprehensif untuk menguruskan bahan dan peralatan pembinaan dengan berkesan. Keupayaan pengesanan masa nyata, pengurusan perolehan, kawalan stok dan pelaporannya memperkasakan syarikat pembinaan untuk mengoptimumkan penggunaan inventori, mengurangkan kos dan meningkatkan hasil projek. Melaksanakan sistem sedemikian boleh meningkatkan kecekapan, produktiviti dan keuntungan dengan ketara dalam sektor pembinaan.

Kata Kunci: Pengurusan inventori, pebinaan, bahan, masa

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CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

Inventory management is crucial for successful and timely completion of construction projects. Inventory serves the purpose of storing materials on-site, ensuring their availability when needed. In the modern era of advanced technology, building materials play a vital role in various engineering fields. Construction activities heavily rely on these materials, which also make a substantial contribution to the national economy. The quality and quantity of construction projects are determined by the products produced by the building material sector (Harsh Malik and Pushpendra Kumar Sharma, 2022).

According to the definition of materials management, a management system is necessary for planning and regulating the quality and quantity of the material, timely equipment deployment, a decent pricing, and the appropriate quantity as needed. A management system called material management combines supplier material control, delivery, and buying. Based on those descriptions, materials management is commonly understood to be the process of selecting the proper source of materials, at the precise quality, at the exact time, and suited for low-cost building. For material cost control, it is necessary to have the capacity to coordinate and integrate supplier purchasing, shipping, and material control. Based on studies and developed a framework using an internet-based system which is in the material selection decision support system for projects that are under design or construction phase (Mansour N. Jadid, 2013).

1.2 PROBLEM STATEMENTS

The research was conducted to determine all of the issues plaguing the company as a result of the incorrect usage of inventory management. The problem was been identified at study area, which address major issues including materials shortage, wastage of material, lack of on-site control, time wasting by operatives and also delays with ordering materials on time. Each issue was categorised in accordance with the difficulties that often arise on the site as a result of incorrect inventory management, and a cause-and-effect diagram was made, where elements like inventory, time purchases, and wastage were all generally addressed to the procurement cycle.

According to the study area at Ava Residence, the main problem is the scarcity of supplies and the waste that follows from poor management. To coordinate the amount of material still on the job site, just the worker is used to count each week. The waste issue then develops when a worker or subcontractor removes the item without enough coordination, resulting in an excessive intake of commodities. These issues are related since the overconsumption of goods will lead to a shortage of materials.

Then, due to a lack of on-site management, a prior issue occurred, resulting in double handling and inefficient operations. The person in charge (PIC) had a lot of work to do, including not just coordinating the materials but also keeping track of how the work was progressing on the job site. As an example, PIC was required to manage the architect department's materials, which included sand, cement, brickwork, and skimcoat. When PIC does not have adequate resources assigned for the administration of materials, delays with ordering items on time will occur. The main lesson is that it is crucial to carefully evaluate how long it takes for supplies to arrive at a project site. This is due to the fact that it typically takes 5–6 days for material to arrive after a purchase. It must be managed properly since it can significantly affect how the work moves forward in order to avoid delays or stopwork on the construction site.

If the material management is not correctly set up, waste of the material may also be a factor in the issue. This issue arises from workers continually grabbing items to make their jobs simpler, but who ultimately squander those materials by opening them up but not using

them. If this issue is left unattended, it might have a negative impact on the budget for each item as well as lead to material waste.

It may not be necessary to continue using the current system, which involved having a worker to track the material on the job site. The issues that have been raised show that improper coordination of the materials results in both delays in the arrival of the materials and material waste on the job site. Additionally, there is material waste on the job site because there is no coordination that can be referred to online. This occurred as a result of the lack of a specialised application and a methodical approach.

1.3 OBJECTIVES

. This study's particular goals are as follows :

i. To identify the existing inventory management in study area.
ii. To develop the application of Inventory Management System (IMS) by using BuildFire
iii. To evaluate the effectiveness of the application IMS

1.4 SCOPE OF THE STUDY

The scope of this project is the AVA Residence development site in the Federal Territory of Kuala Lumpur, which is situated at Jalan Benteng Utara, Kiara Bay, 52000 Kuala Lumpur. The inventory management only focus on construction material in two blocks of 43-story serviced apartments and one parking block. The application's purpose is to address delays and material waste in the project, specifically targeting architect materials that have the potential to cause delays. Additionally, research study does not cover other factors like weather, machinery, or unrelated issues.

1.5 SIGNIFICANT OF STUDY

The results of this study will be helpful for the construction industry, since it is crucial for modern construction work and technology to understand the root causes of delays. Effective construction work depends on being able to identify the reason for the delay. As a consequence, the firm that adopts the suggested strategy based on the study's findings will be more successful, and their operations will become simple and straightforward. Apart from that, this application is user-friendly due to its simplicity of use and portability.

AVA Residence will specifically employ this new technology, the application to coordinate materials (IMS), on the construction site. Prior to the creation of this application, a worker was employed to coordinate the material on the building site. Other than that, the current process is not systematic because information was occasionally provided after hours and things were already present in minimal quantities. Due to the fact that all information will be contained in the application and that it may both speed up the development process and monitor the site's content, researchers are motivated to build such applications.

Moreover, the user-friendly nature and portability of the developed application further enhance its significance. The simplicity of use allows construction personnel to easily navigate and utilize the application, making it accessible to a wide range of users on construction sites. The portability of the application ensures that it can be easily carried and accessed on-site, providing real-time information and facilitating efficient coordination of materials.

The specific implementation of this technology, the Inventory Management System (IMS), at the AVA Residence construction site highlights the practical application and relevance of the study's findings. Prior to the development of the application, material coordination on the site relied on manual processes, which were often unorganized and prone to delays. With the IMS application, all relevant information will be centralized, enabling streamlined processes and efficient monitoring of material availability.

CHAPTER 2
LITERATURE REVIEW

2.1 BACKGROUND OF STUDY

Over the past two decades, the general practice in the building industry has seen a significant shift from manual to computer-supported techniques for knowledge processing. This chapter will focus on the ideas and theories of ongoing learning. In addition, this chapter will include background information on project monitoring technologies. The collection of pertinent information is crucial for producing high-quality writing. Both print and electronic mediums are available for getting the information. Print media sources include books, journals, articles, reports, and news on current events; electronic media sources include websites on the internet.

Additionally, a nation's ability to lead the developed world is greatly impacted by technical advancement. Mention Malaysia's progress and tout all of the work done to further it. It is still feasible to reduce the usage of conventional building methods notwithstanding this technological area (Chudley, 2011).

2.2 INVENTORY

Both the raw materials used in production and the finished commodities that are offered for sale are included in the definition of inventory. One of a company's most valuable assets is its inventory since it is one of the main sources of revenue creation and, consequently, a source of profits for the company's shareholders.

Any company's inventory is a crucial asset. It is described as the assortment of raw materials or completed products kept on hand by a corporation for the regular conduct

of business. Inventory may be divided into three categories: finished goods, often known as items that are ready for sale, work-in-progress (WIP), and raw materials, which are any resources necessary to manufacture finished goods. On the balance sheet of a corporation, it is listed as a current Inventory, which acts as a stopgap between production and order fulfilment, is categorised as a current asset on a company's balance sheet as previously said. The cost of goods sold (COGS) category on the income statement is where the carrying cost of an inventory item is transferred when it is sold.

Inventory can be valued in three ways. These methods are the:

1) The first-in, first-out (FIFO) method states that the price of the earliest purchased materials is used to determine the cost of the items sold. On the other hand, the cost of the most recent materials acquired serves as the basis for the carrying cost of the remaining inventory.
2) The cost of the most recent materials purchased is used to calculate the cost of goods sold, while the value of the remaining inventory is calculated using the cost of the oldest materials acquired, according to the last-in, first-out (LIFO) method.
3) The weighted average technique, which calls for valuing both inventory and COGS in accordance with the typical price of all commodities purchased throughout the course of the accounting period.

2.2.1 Type of Inventory

Inventory is generally categorized as raw materials, work-in-progress, and finished goods. The Internal Revenue Service (IRS) also classifies merchandise and supplies as additional categories of inventory. Based on their reports, items which included in inventory is merchandise or stock in trade, raw material, work in process, finished product and also supplies that physically become apart of the item intended for sale. Unprocessed resources are utilised to create goods as raw materials. Examples of raw materials include steel and aluminum for the production of window frames and railings, flour for bread bakeries, and crude oil stored by refineries.

2.3 MANAGEMENT

Management is the process of organising a company's resources and actions in order to accomplish certain goals as effectively and efficiently as feasible. The successful fulfilment of duties with the least amount of expense is referred to as efficiency in management. The accomplishment of activities within predetermined deadlines to produce measurable results is a key component of effective management. The following are some of the core traits of management:

1. Multi-dimensional

The majority of management manages and controls the service or production cycle of a business or organisation. Managers collaborate closely with their team members and offer direction. A manager views each employee as both a unique person with unique requirements and as a member of the bigger team. Managers must persuade their teams to use each member's special abilities to advance the objectives of the company in order to be effective.

2. Dynamic

No matter the economic, socio-political, or technical developments taking place in its surroundings, management is a dynamic role that constantly changes and adapts. For instance, the quick adoption of screens and digital gadgets may result in a drop-in revenue for a paper firm. Whether the business can continue to exist relies on how well its management can adjust to changing market demands.

3. Intangible

Despite the fact that management is not a material good, its existence may alter how an organisation runs. Ideologies, rules, and interactions among people make up management. The ratios of targets achieved, the degree of employee satisfaction, and the general efficiency of the business are all improved by good management.

2.3.1 Objective Of Management

Management can have mainly three types of objectives which is organisational objective, social objective and personnel objective. These three types of objectives contain the different method and statement.

1. Organisational Objective

All parties involved in the business, such as the government, consumers, and employees, should have their interests taken into account by management. For the organisation, managers are in charge of creating and achieving goals. An organization's main goal is often to expand through making the most of its people, material, and financial resources. There are three universal organisational goals for any company:

i. **Survive** : To cover its operating expenses, a business must earn sufficient income.

ii. **Profit** : Profit serves as motivation and is necessary to offset the tremendous expenses and dangers involved with operating a firm.

iii. **Growth** : Increases in sales volume, employee count, and capital expenditure may all be used to gauge a company's development.

2. Social Objective

The management is partially accountable for generating positive social effects through their job. Businesses opt to achieve this in a variety of ways. Others may use equitable salaries and opportunities, while others may use environmentally sustainable production techniques. Larger businesses frequently support or finance efforts that offer necessities like healthcare and education. Companies frequently start CSR (Corporate Social Responsibility) efforts that assist society in various ways depending on the size of their activities.

3. Personnel Objective

Typically, management makes decisions about the financial rewards, wages, benefits, and social programmes for their employees. Corporate outings and holiday bonuses, as well as other events that foster peer recognition and connection, support the social growth and development of the workforce.

2.3.2 Importance of Management

In construction, management play a big role because all the thing that relate with progress will depends based on the management system. There are some reasons why management is important:

1. Helps in Achieving Group Goals

In order to accomplish goals, it organises the production components, assembles and organises the resources, and integrates the resources in a useful way. It focuses collective efforts on achieving predetermined objectives.

2. Optimum Utilization of Resources

The management makes effective use of all available material and human resources. As a result, management is more effective. Management chooses the best alternate use in industry out of a variety of applications to maximise the exploitation of scarce resources.

It employs specialists and professionals, and using their services maximises their use of their abilities and knowledge while minimising waste. There is no underuse of any resource when both workers and equipment are operating at their optimum capacity.

3. Reduces Costs

By employing appropriate planning, the least amount of input, and the greatest output, it achieves maximum outcomes with the least amount of input. The finest possible combination is achieved when management leverages its physical, human, and financial resources. Cost-cutting is facilitated by this.

4. Establishes Sound Organization

No effort duplication (smooth and coordinated functions). One of management's goals that is in line with the goals of the organisation is to create a solid organisational structure. In order to achieve this, management must establish a strong system of authority and responsibility that clearly defines who is responsible for what, who can give instructions to whom, and who is superior to whom. The proper people with the appropriate abilities, education, and qualifications are hired by management to fill various jobs. All positions should be open to everyone.

5. Establishes Equilibrium

It gives the organisation the ability to adapt to a changing environment. It remains up to date with shifting environment. The original coordination of the organisation must be altered according to the change in the external environment. It therefore adjusts organisations to changing societal needs and market demands. It oversees the development and continuation of the organisation.

6. Essentials for Prosperity of Society

Effective management produces improved economic output, which in turn contributes to raising human welfare. By preventing the squandering of limited resources, good management makes a tough work simpler.

The standard of living is raised. By fostering job possibilities that produce revenue in the hands, it enhances the profit, which is advantageous to company and society, getting the most output for the least amount of money spent. Organization develops novel items and societally useful research

2.3.3 Levels Of Management

1 Top Management

The chairman, chief executive officer, chief operating officer, president, and vice-president are often the senior-most executives in a firm. They are responsible for merging various corporate parts and managing the work of several departments. In order to set goals that would assure the company's existence and the welfare of its stakeholders, they also analyse the business environment and its ramifications.

2 Middle Management

The middle management, which is mostly made up of division heads, serves as a conduit between operational management and top management. Division/department chiefs are mentors to operational managers and receive direction from senior managers. In order to guarantee that the various divisions and departments adhere to corporate policies and decisions, it is their responsibility to comprehend the policies developed by the top management.

3 Operational Management

Direct supervision of employee efforts is provided by supervisors, section leaders, or forepersons. They oversee quality control and make sure that the task is completed before the deadline. Plans that outline the power and responsibilities of supervisors are created by the top management**.**

2.4 INVENTORY MANAGEMENT

According to the definition of materials management, a management system is necessary for planning and regulating the quality and quantity of the material, timely equipment deployment, a decent pricing, and the appropriate quantity as needed. A management system called material management combines supplier material control, delivery, and buying. Based on those descriptions, materials management is commonly understood to be the process of selecting the proper source of materials, at the precise quality, at the exact time, and suited for low-cost building. For material cost control, it is necessary to have the capacity to coordinate and integrate supplier purchasing, shipping, and material control. The studied and developed a framework using an internet-based system which is in the material selection decision support system for projects that are under design or construction phase (Mansour N. Jadid 2013).

The process of ordering, storing, using, and selling a company's inventory is referred to as inventory management. This covers the storage and processing of such commodities as well as the management of raw materials, components, and completed goods. Depending on a company's demands, there are several forms of inventory management, each having advantages and disadvantages (Rashmi Ranjan Panigrahi et al 2019).

2.4.1 Inventory Management Methods

A company will employ a variety of inventory management techniques depending on the kind of business or product being examined. Just-in-time (JIT) production, materials requirement planning(MRP), economic order quantity (EOQ), and days sales of inventory are a few of these management techniques (DSI). These are the four most used techniques for inventory analysis, however there are more.

1. Just-in-Time Management (JIT)

In the 1960s and 1970s, Japan served as the birthplace of this production paradigm. The largest development contribution came from Toyota Motor (TM). By maintaining just the inventory necessary to make and sell items, the technique enables businesses to save considerable sums of money and minimise waste. This strategy lowers the price of surplus inventory liquidation or disposal as well as storage and insurance fees (Hansan et al 2015).

JIT inventory control may be dangerous. If demand unpredictably increases, the manufacturer might not be able to find the inventory it needs to fulfil that demand, which would hurt its image with consumers and send business to rivals. A problems can arise from even the tiniest delays; if a crucial input is not received "just in time," a bottleneck might develop (Singh and Singh 2013).

2. Materials Requirement Planning (MRP)

The manufacturers' ability to accurately estimate their inventory needs and effectively convey those needs to their suppliers of raw materials is based on reliable sales records, which are a requirement for this inventory management technique. In accordance with anticipated orders, a ski manufacturer, for instance, may use an MRP inventory system to guarantee that materials like plastic, fiberglass, wood, and aluminum are on hand. A manufacturer's failure to fill orders is caused by their inability to effectively estimate revenues and plan inventory acquisitions (Samueland Ondiek 2014).

3. Economic Order Quantity (EOQ)

By determining the amount of units a business should add to its inventory with each batch order to minimise the overall costs of its inventory while assuming continuous customer demand, this model is utilised in inventory management. In the model, holding and setup expenses are included in the costs of inventory (Patil and Pataskar 2013).

The EOQ model aims to make sure that the correct quantity of inventory is ordered every batch sothat a firm does not have to place orders too frequently or have an excess of inventory on hand. It's based on the supposition that there is a trade-off between

inventory setup costs and holding costs, and that overall inventory costs are minimised when setup costs and holding costs are both reduced.

4. Days Sales of Inventory (DSI)

This financial ratio shows how long it typically takes a business to convert its inventory, which includes finished items, into sales in days. The definition of DSI, which is also known as the average age of inventory, days inventory outstanding (DIO), days in inventory (DII), days sales in inventory, or days inventory, varies.

The number indicates the inventory's liquidity and how long the current stock of an organization's inventory will survive. Though the average DSI varies from industry to industry, in general, a lower DSI is desired since it signifies a quicker time to clear outthe inventory.

2.5 INDUSTRY REVOLUTION IR 4.0

Figure 2.1 : What is IR 4.0

The development of infrastructure or other assets actually creates value in the broad, flat construction sector, which considerably supports all other businesses. The workers in the construction industry devote just around 30% of their working time to their primary activity. Take into account how quickly "augmented reality, drones, 3D scanning and printing, Building Information Modelling (BIM), autonomous equipment, and also improved building materials" have reached market maturity in the present. The first three industrial revolutions saw the development of mechanical, electrical, and information technologies, all of which aimed to increase the efficiency of commercial operations.

The complexity, capacity for innovation, and flexibility are a few examples of how one may describe the three future-related aspects associated with IR 4.0. Furthermore, it is possible that its component, such as interoperability, virtualization, decentralisation, real-time capabilities, service orientation, and modularity, gave rise to the six design ideas (Mohd Shahir Liew, 2018).

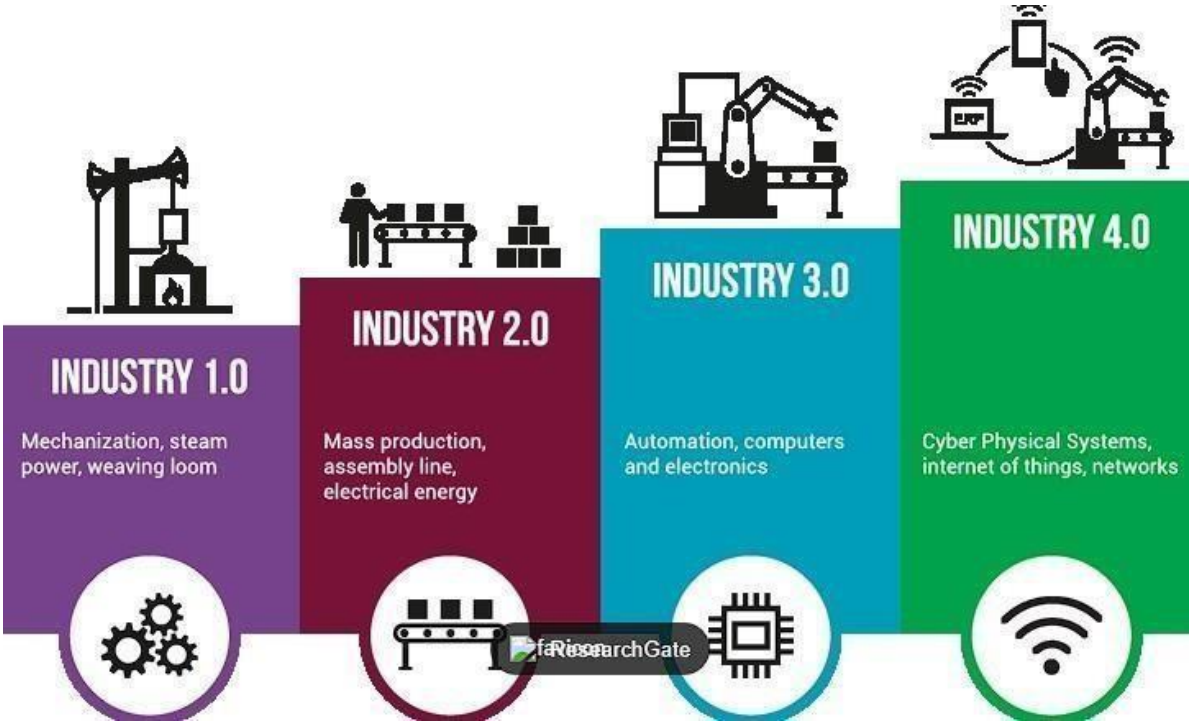


Figure 2.2: IR 4.0

2.5.1 Future Opportunities and Challenges in Construction Industry.

The sector has undergone three previous revaluations, each of which had an impact on its productivity and working methods. Steam power served as the fundamental force for development in the nineteenth century, while electricity and considerable computerization began to emerge more prominently in the twentieth. The industry will achieve IR 4.0 epoch in the twenty-first century with intelligence as its key component. The blurring of the boundaries between the physical, digital, and biological scopes is how IR 4.0 is characterised (Wesam S Alaloul, 2018)

The IoT, IoS, and intelligent units are the four key components of IR 4.0, together with CPS (connection between the physical and cybernetic domains). However, machine-to-machine (M2M) connections and intelligent goods are not considered to be autonomous parts. The M2M is a component of IoT and intelligent technologies that may help create employment and also enhance consumer demand with the additional money (compensation influence), yet the adoption of new production technologies and also processes can eliminate certain present jobs (redundancy influence).

2.6 BUILDFIRE

BuildFire is the top mobile app development platform of choice for companies, groups, people, resellers, and programmers. Without knowing any code, anyone can develop sophisticated apps using BuildFire's click and edit interface and robust built-in features in only a few minutes. Additionally, using our open development site, this app's designer will be able to improve our "out-of-the-box" features or add whole new bespoke functionality. The developer for Buildfire combine the strength of click-and-edit mobile app creation with the capability to go deeply and endlessly modify.

Figure 2.3: Buildfire Software

BuildFire is less complicated and easy to use than other platforms. From among the various plugins available, select the functionality the user need, and the system will launch. By utilising BuildFire,users may put their own functions into the code. If a user looks for a feature that isn't available, they are not concerned. The open development framework provided by BuildFire can be used by users to meet these unique requirements. No other platform provides the convenience of click-and-edit editing along with the flexibility of custom programming.

This software were chosen because its meet all the criteria users need and no need to develop a native app from scratch. If user develop a native app from scratch, they need to repeat doing a same thing which can lead to time wastage. It will be more difficult for users to enter the market, and doing so will result in lengthier development cycles, greater expenses, and a narrower talent pool. Users must create two different applications, one for iOS and one for Android. Similar to how skilled web developers quit creating sites for the public, not because they lack ability, but rather because they would be better off concentrating on fundamental business logic.

The same holds true with BuildFire. Designers handle the app's designs, layouts, logins, and basic functions. Additionally, it will provide user access to an infinite number of third-party plugins so that you user may concentrate on the essential business features particular to their organisation.

The user also gained additional benefit from using this programme as a platform to develop the desired application. Buildfire will take care of any maintenance issues, so developers don't have to worry about maintaining all of their apps. The cost of a Buildfire membership includes all upcoming upkeep, app store submission, upgrades, and customer support.

Therefore, developers will just work on creating value-added features while leaving the rest to Buildfire. Developers may use Buildfire to create and maintain their application. It's no longer necessary to contact the IT department each time a change or update is needed. The developer just has to maintain the content; Buildfire will handle the rest, including app submissions, hosting, and maintenance.

CHAPTER 3
METHODOLOGY

3.1 INTRODUCTION

This chapter will provide an explanation of the system development process and approach. Additionally, this chapter will outline the techniques used to identify the issue, and the right system will be applied throughout the project, from the beginning to the finish. Figure 3.1 provides a detailed explanation of the study methodology.

To assess the efficacy of the application that was produced, the observation must be made by implementation while working on this activity. This chapter also includes examples of design modelling. Studies were conducted utilizing both primary and secondary sources to increase the project's value. The primary source includes observations that have been made as well as questionnaires. Data gathering and analysis serve as the secondary source for this information.

This chapter will include a description of the process flow that will be utilised for this project and how it will be applied to the working conditions on site. This remark will be made, and those involved will include the project manager, the site engineer, the plannerengineer, and others.

The Design Thinking Process utilised in this application will also be covered in this chapter. The design thinking method consists of five phases, including empathy, define, ideate, prototype, and test. To determine if the consumer is happy or not with the solution, a prototype will be tested with the customer. The prototype will be updated with any additions that can be made to make it better.

The interview process at AVA Residence must include administering the questionnaire

to the construction team. To determine whether this application system is effective, observation must be conducted throughout deployment. The questionnaire is intended to be disseminated in order to learn about perceptions and information that may be relevant to this research endeavor. In addition, the questionnaire's objective is to obtain input from users on whether they support or oppose the application's ability to track and monitor construction site delays.

3.2 RESEARCH METHODOLOGY

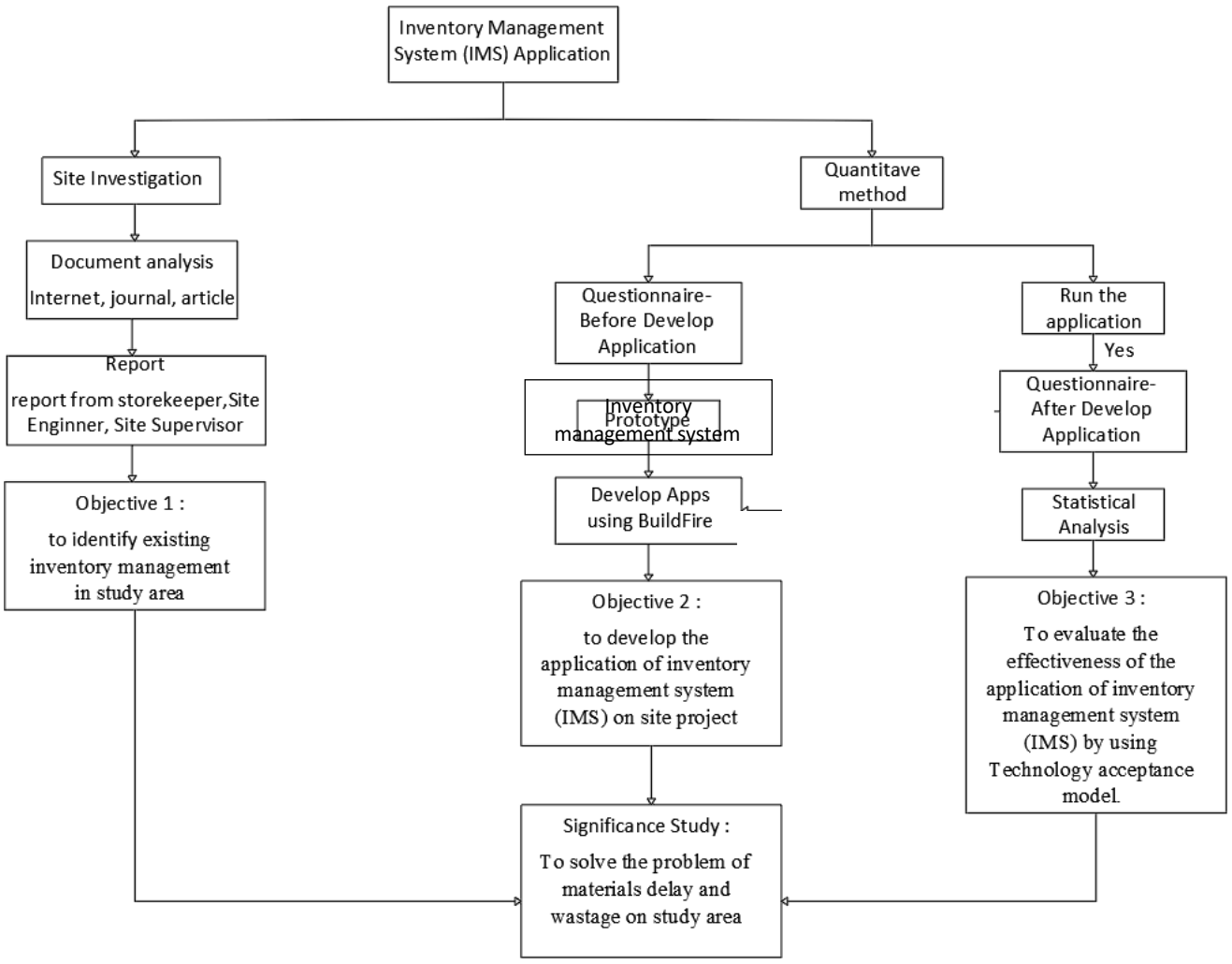


Figure 3.1 Flow of Methodology

3.3 DESIGN RESEARCH

The framework for the study methodologies and approaches that a researcher chooses is called design research. The structure that enables the researcher to successfully conduct research. The planning of every observation depends heavily on this methodology. To find the issues that will arise during implementation, it is necessary to monitor the steps.

Typically, design research refers to the framework used to both organise and carry out specific research. Design research is an essential component of the study since it addresses all four key issues, including the conceptual framework, deciding who and what to investigate using certain instruments, and the processes to be followed while gathering and analysing data. The goal of design research is to discuss and explain the methodology employed by the researcher to create a plan of the study that will provide an accurate evaluation in establishing the usability utilising this application.

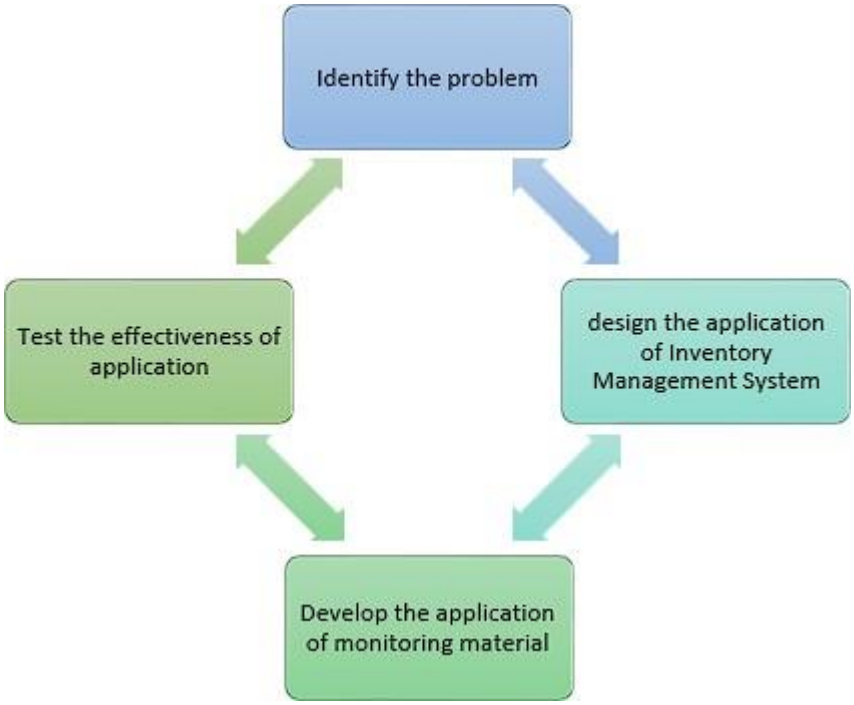


Figure 3.2 : The method of illustrate to create application

3.4 DESIGN THINKING PROCESS

The methodology for original problem-solving is defined by design thinking. Instead of having a one-size-fits-all mentality. It promotes a comprehensive viewpoint where uncertainty and ambiguity are accepted and embraced in order to consider all aspects of the issue. Any circumstance in life may benefit from applying a design mentality, which encourages thinking strategically and responding with insight.

The methodology was developed with the firm conviction that all decisions must be made with the end user in mind. The benefits of design thinking include that by having empathy for the user, you can make experiences and products that really assist people and even transform their lives.

Empathy, define, ideate, prototype, and last but not least test are the five phases in the design thinking process.

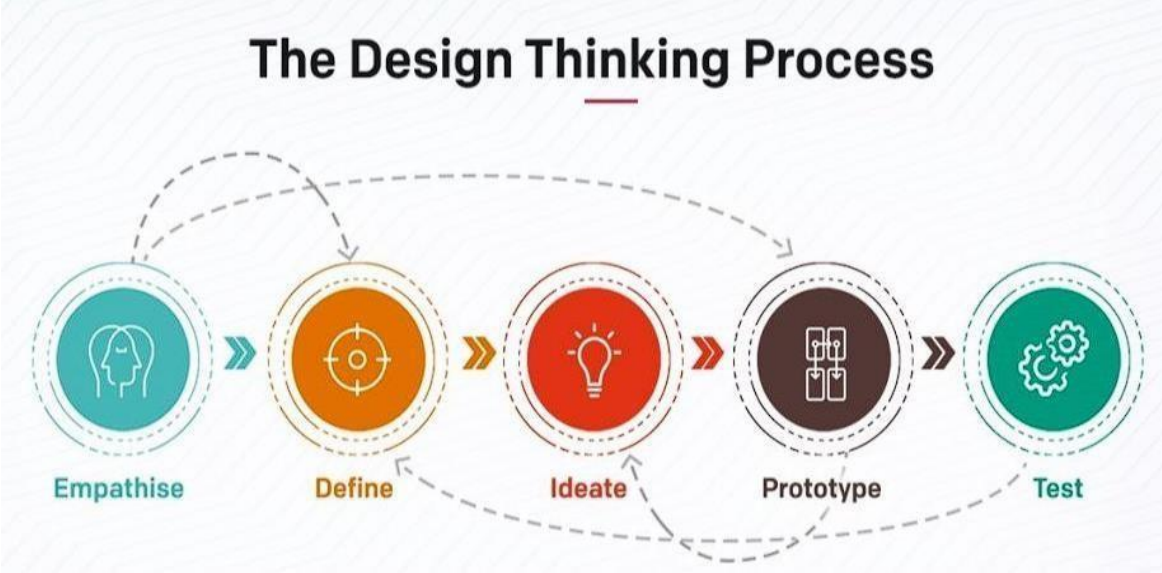


Figure 3.3: The design thinking process

3.5 RESEARCH FRAMEWORK

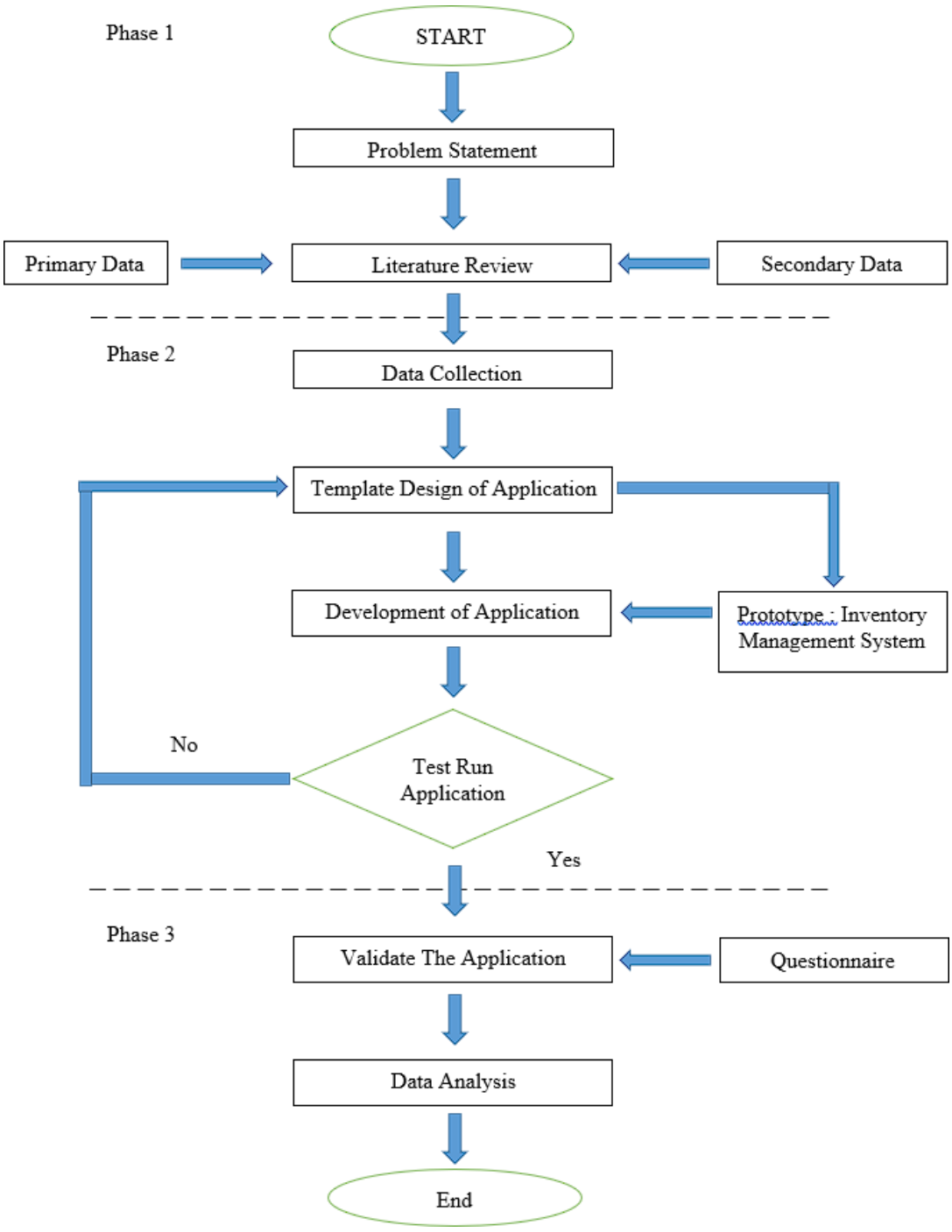


Figure 3.4: Flow of Research Framework

This method is applied to complete the project's goals and produce a great outcome. It will describe the approach taken by this study. This chapter will cover every step of the study process, including the population, the population frame, and the interview sample methods. Finally, this chapter gives a thorough description of the chosen mode of analysis and datagathering technique.

Implementing the observation would be done while working on a job to assess the viability of the application. In this chapter, concept simulation is also demonstrated. The project will benefit from the use of primary and secondary sources. Surveys and observations have been undertaken for the primary source. While it comes from data collecting and analysis for the secondary source.

Additionally, the approaches to be taken will be fully explained in light of the difficulties at hand as well as the selection of appropriate systems when put to use and when selected appropriately inside of the platform to apply. This is concentrated on current work, based on all relevant work, references such records, interviews, interactions, and other variables.

3.6 EXISTING INVENTORY MANAGEMENT IN CONSTRUCTION

3.6.1 Study Area

The proposed development at the building site includes two blocks with 43-story serviced apartments and one parking block. It includes the following:

a) Block A - 43 Levels (435 units)

b) Block B - 43 Levels (435 units)

c) 8 Levels of Parking Block and 1 Level of sub-basement

On Lot Pt 26690 (Plot 5), Mukim Batu, Kuala Lumpur District, Federal Territory of Kuala Lumpur, is where the planned property is located. The project began in June 2021, and it will likely take another 32 months to finish.

Figure 3.4: Site Ava Residence

3.6.2 Site Investigation

Students' grasp of practical building methods is improved through interactive activities like construction site investigations. Students may have a real-world spatiotemporal experience of a building project through site exploration, which also creates an interactive learning environment for them. Site investigation not only enables us to learn more about materials and the building process on a scientific and practical level, but it also enables us to pinpoint the issue or issue that is causing the material shortage on the job site. In order to prevent delays and architectural work, it’s critical to identify material issues at thebuilding site.

3.6.3 Document Analysis

An exhaustive overview of a particular subject from earlier study is the result of document analysis. Article research, journal research, book research, and other sources are used in those studies. We may learn about inventory management's definition, kinds, and other topics via a survey of the literature.

3.6.4 Quantitative Method

Systematic research of phenomena using quantitative methods is described as the collection of measurable data and use of statistical, mathematical, or computational methods. Using sampling techniques and the distribution of online surveys, online polls, questionnaires, etc., the quantitative method gathers data from current and future clients.

3.6.5 Prototype

Because it enables us to test our ideas rapidly and make changes to them in a timely manner, prototyping is a crucial component of Design Thinking and user experience design in general. A prototype can also be something that a user can utilise. It can converse with a storyboard, a wall of post-it notes, a gadget you construct, an activity replay, or even a wall of post-its. To achieve this goal and inform consumers about the usage of various applications on a prototype platform, utilise a diagram.

Users (Site Manager, Engineers, Site Supervisor, and Admin Coordinator) have been given a clearer understanding of this application's description. This, in their judgement, satisfies their requirements. A storyboard, a wall of post-it notes, a device you created, a role-playing game, or anything else that a user may interact with can be a prototype.

i. For Staff User

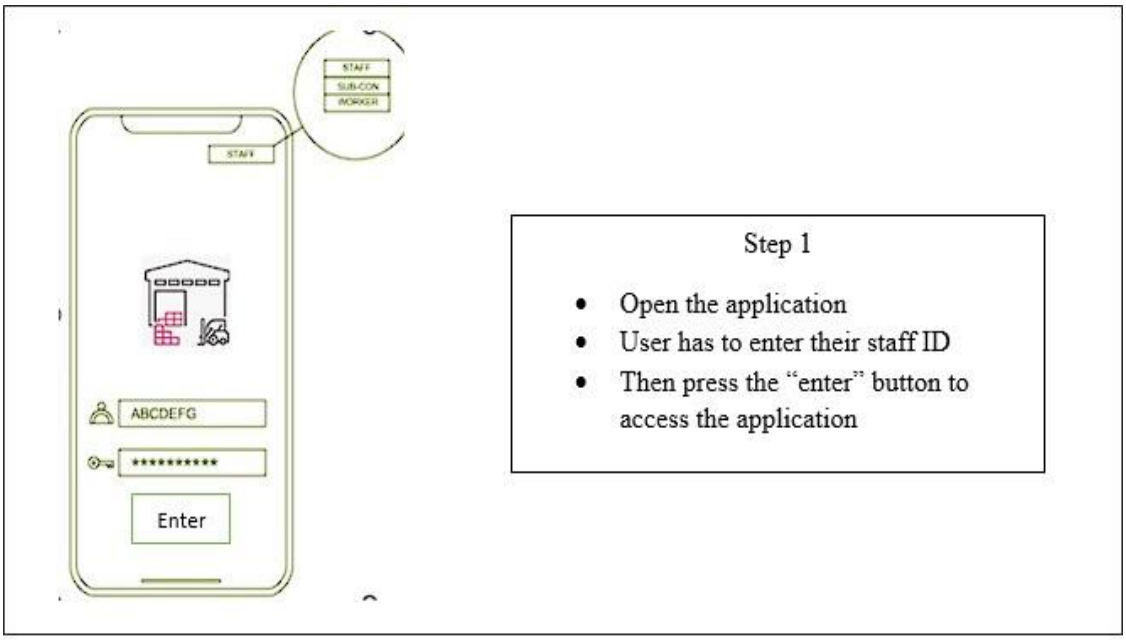


Figure 3.5: Step 1

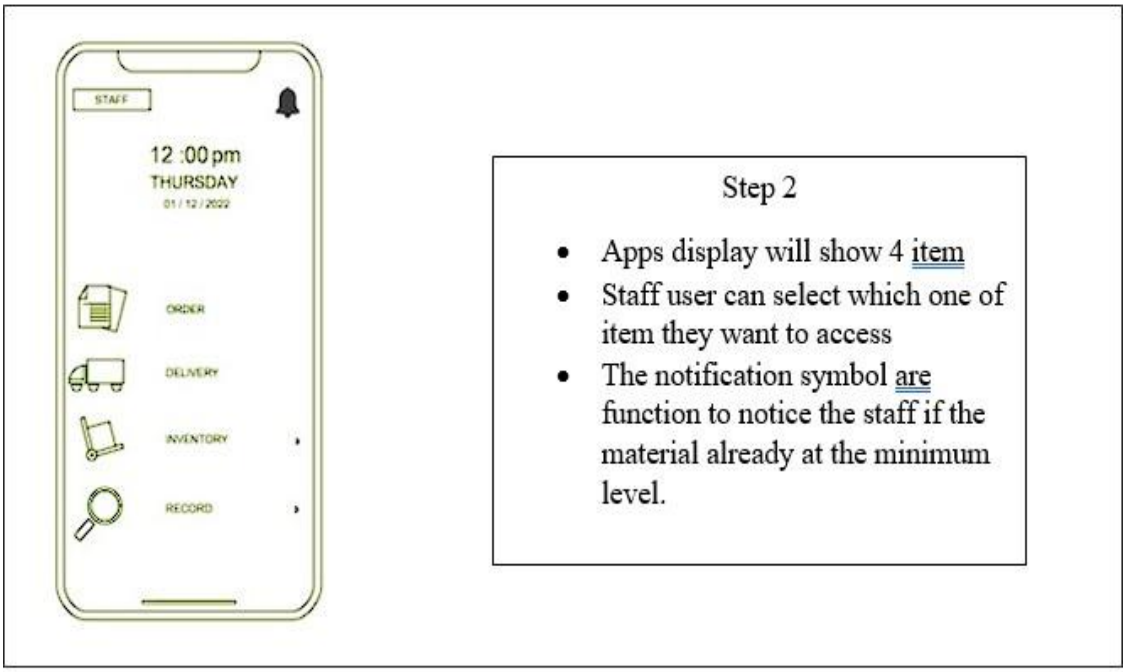
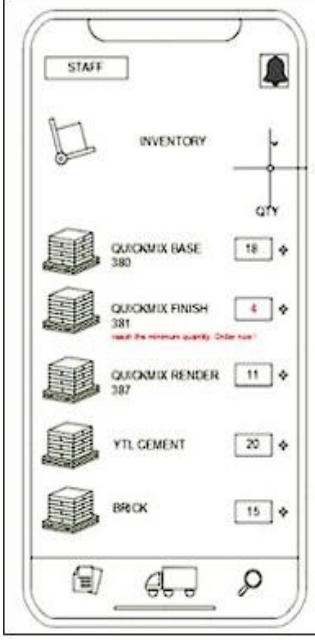


Figure 3.6: Step 2



Step 3

- The inventory pages show the amount of material which currently on site
- When the material is at a minimum level, it will give the red notice on that material to make sure staff alert on it.
- Staff user also can update the material if material.

Figure 3.7: Step 3

Step 4

- The record pages show the area/building that user want to see a record of item usage and coordination of material.

Figure 3.8: Step 4

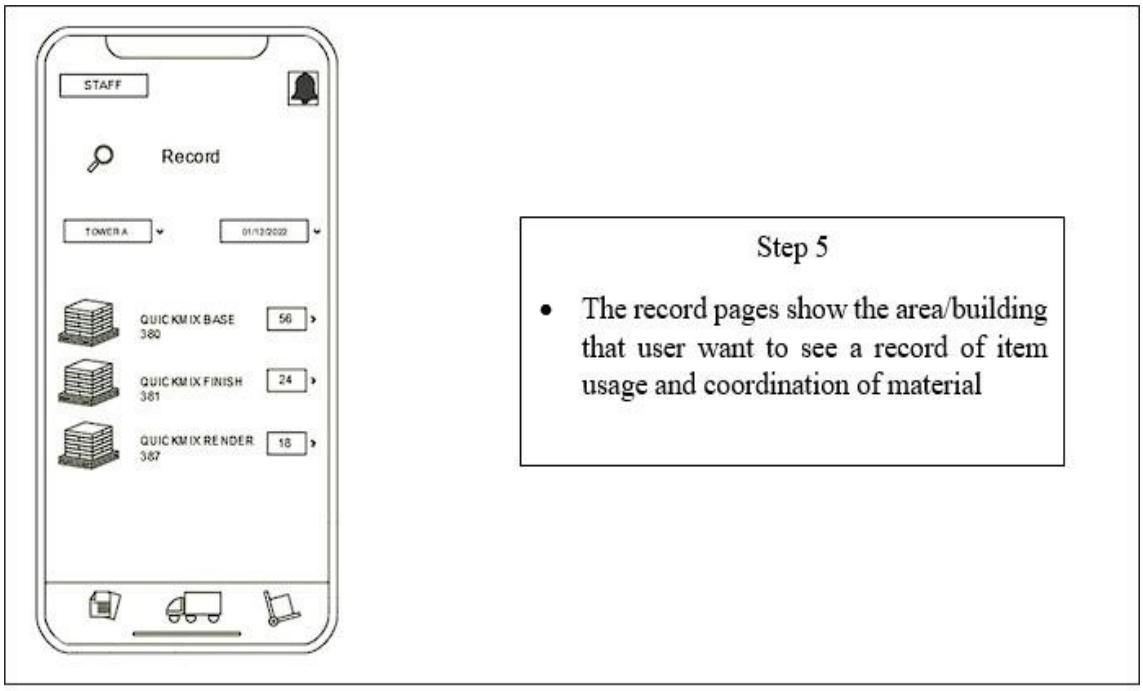


Figure 3.9: Step 5

ii. For Sub-Con/Worker User

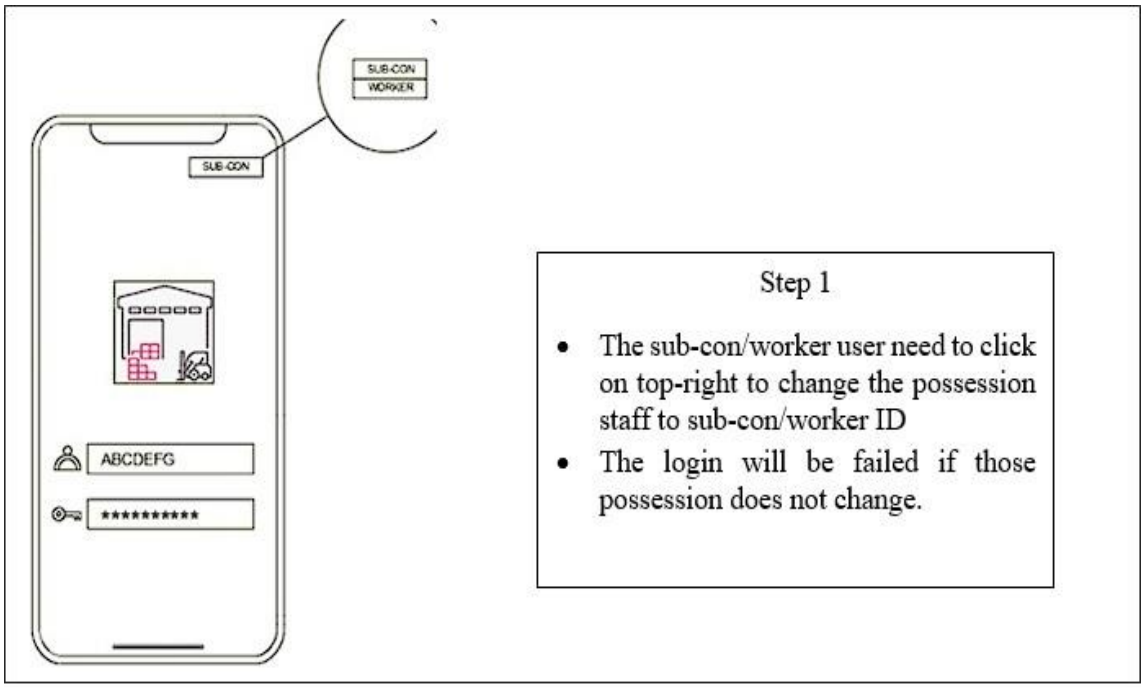


Figure 3.10: Step 1

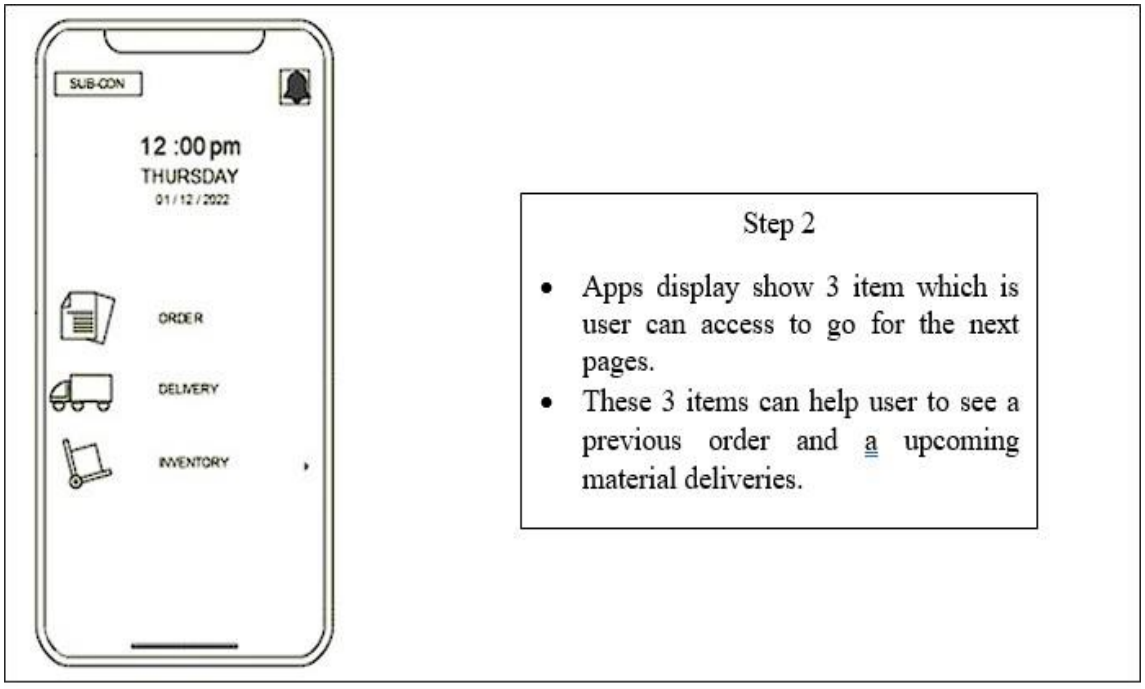


Figure 3.11: Step 2

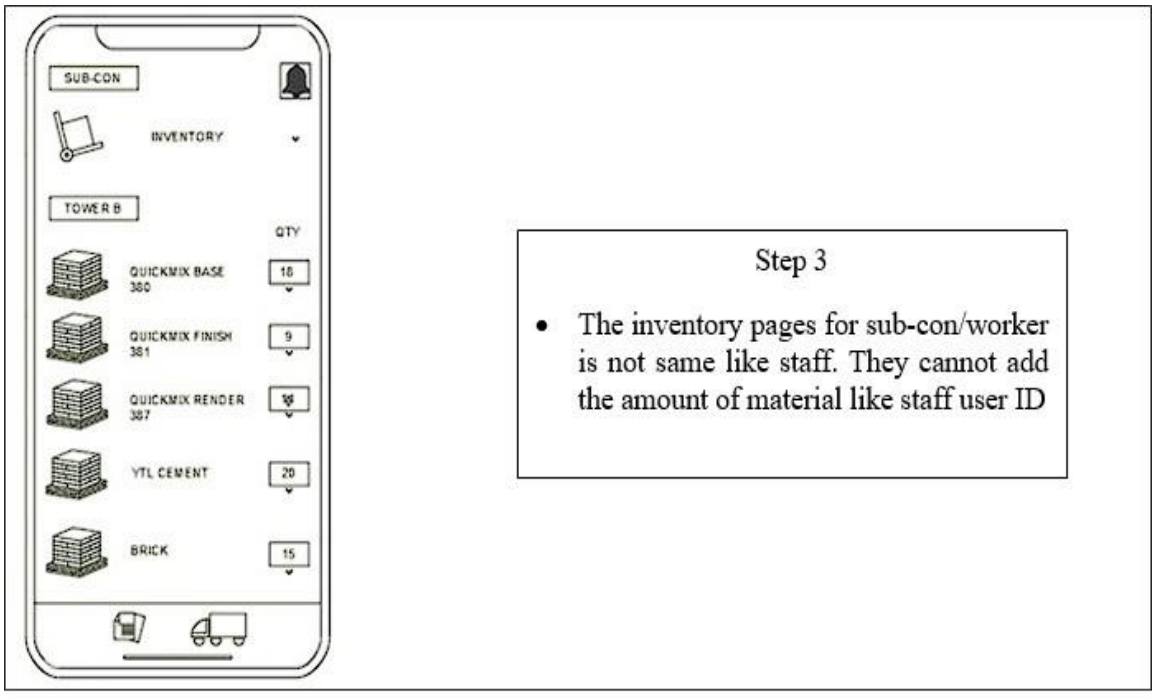


Figure 3.12: Step 3

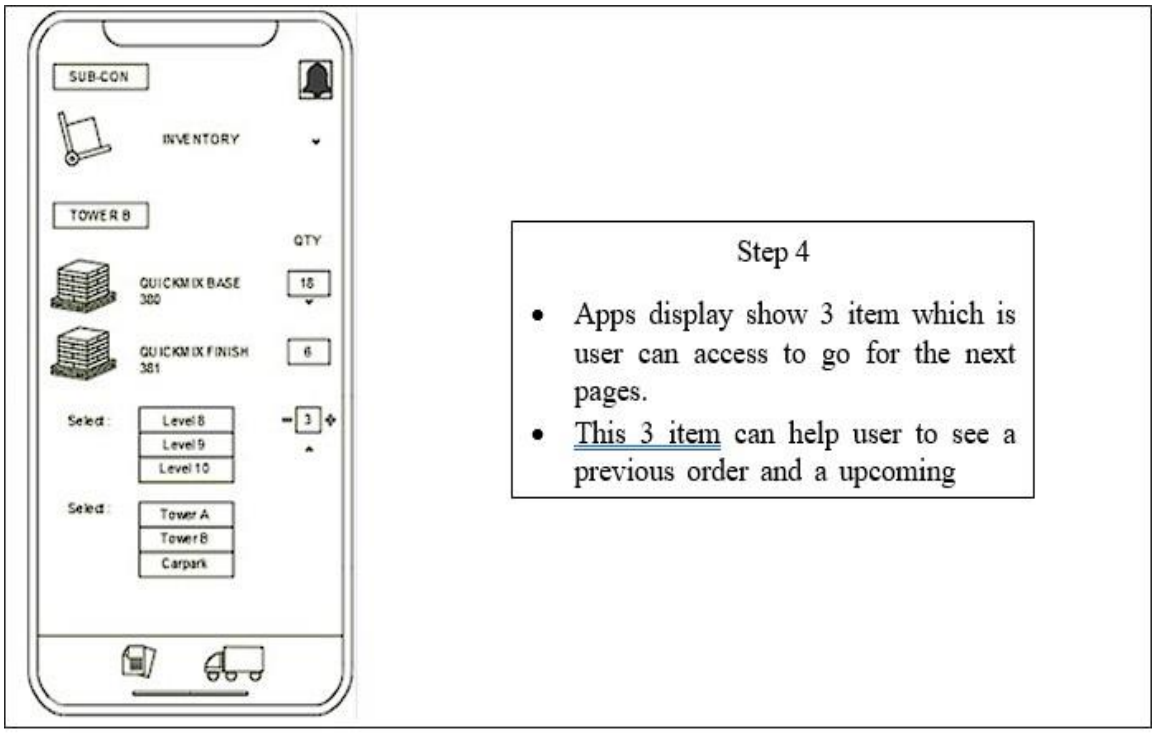


Figure 3.13: Step 4

3.6.6 Buildfire

BuildFire is the top mobile app development platform of choice for companies, groups, people, resellers, and programmers. Without knowing any code, anyone can develop sophisticated apps using BuildFire's click and edit interface and robust built-in features in only a few minutes. Additionally, using our open development site, this app's designer will be able to improve our "out of-the-box" features or add whole new bespoke functionality. The developer for Buildfire combine the strength of click-and-edit mobile app creation with the capability to go deeply and endlessly modify.

3.6.8 Questionnaire (After using the application)

A questionnaire is a research tool made up of a list of questions used to elicit information from respondents. Based on information and data obtained by another researcher from journal papers, the questionnaire's content was created. There were two sections in the questionnaire's content.

The purpose of the first segment was primarily to gather background data on whether the

firm could test the applications created and determine their viability for implementation. The study framework must be established before the questionnaire can be created in order to identify and choose the factors that will be used to build the questionnaire and interview. The literature study was used to find the variable.

The objective of the widely disseminated questionnaire is to learn about awareness and comprehension that could be connected to our research. Besides that, to gather perspectives that may be applied to improve the implementation Next, there is one whose objective is to get specific user comments on whether they concur or disagree with our vision for the programmed.

3.6.7 Statistical Data Analysis

Statistical data analysis is a crucial tool for evaluating the effectiveness of an inventory management system (IMS) on a construction site. By analyzing relevant statistical data, organizations can gain valuable insights into inventory performance and identify areas for improvement. One key aspect of analysis is assessing the inventory turnover rate, which indicates how quickly inventory is being used and replenished. High turnover rates signify efficient inventory management, while low rates may indicate excess inventory or slow turnover.

Additionally, analyzing the frequency of stockouts helps identify patterns and take corrective actions to prevent project delays and increased costs. Lead time analysis enables organizations to identify procurement delays and make adjustments to ensure timely availability of materials. Evaluating inventory accuracy by comparing recorded levels with physical counts helps identify data entry errors or tracking issues. Cost analysis helps identify opportunities to optimize inventory levels and reduce expenses. Statistical demand forecasting enables organizations to align inventory levels with expected demand, minimizing the risk of overstocking or understocking. Lastly, supplier performance analysis helps evaluate supplier reliability and efficiency, supporting informed decision-making in supplier selection and management. Overall, statistical data analysis in inventory management provides valuable insights to optimize processes and enhance overall efficiency on construction site.

CHAPTER 4
RESULT: DATA ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

This chapter included explanations of the anticipated outcomes of the project's execution. All the data and interface of application will be provided with explanation

4.2 EXISTING METHOD USING ON SITE

The existing old method of inventory management on site typically involves manual record-keeping and physical tracking of inventory items. Here's a description of the existing process that are used in Ava Residence site project:

1. Manual Documentation: Inventory managers maintain handwritten or printed documents such as inventory ledgers, stock cards, or logbooks to record details about incoming and outgoing items. These documents usually include item descriptions, quantities, and dates.
2. Physical Counting: Periodically, physical counts of inventory are conducted to reconcile the recorded quantities with the actual stock on hand. This involves manually inspecting and counting items in storage areas, warehouses, or shelves.
3. Manual Updates: Any changes in inventory, such as additions, sales, or returns, are manually updated in the inventory records. This could involve writing new entries, crossing out or amending existing ones, and calculating updated quantities
4. Human Error Prone: With manual processes, the likelihood of human errors, such as miscalculations, misplaced records, or illegible handwriting, is higher, which can lead to inaccuracies in inventory tracking

It's important to note that this description represents the traditional approach, and many organizations have now transitioned to more efficient computerized inventory management systems, which offer automation, real-time tracking, and advanced analytics capabilities.

4.3 FLOW CHART FOR INVENTORY MANAGEMENT SYSTEM

The flow chart below shows the flow for current practices of using Inventory management application on site in Figure 4.1. This flow will help users to easily understand well the flow on how to operate the application

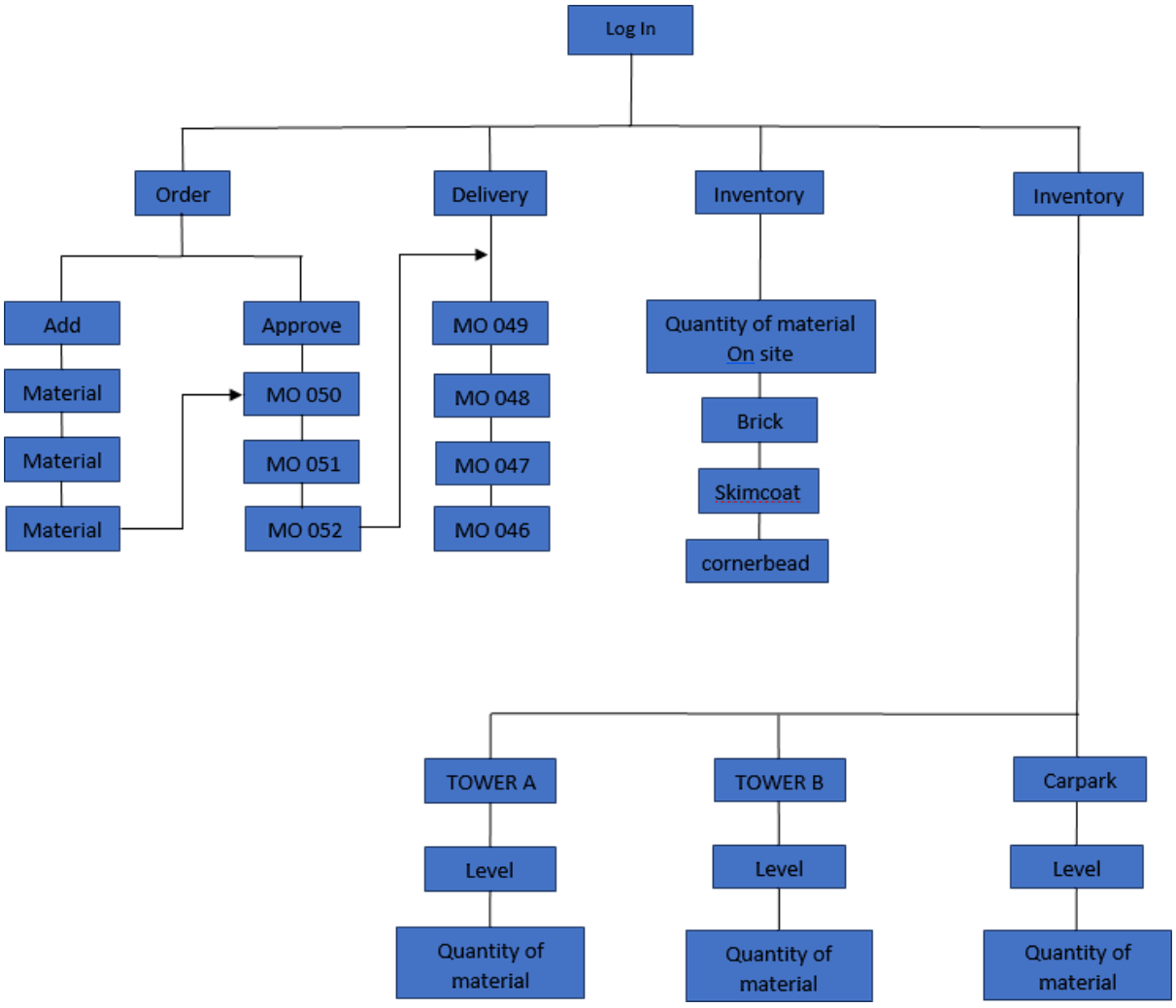
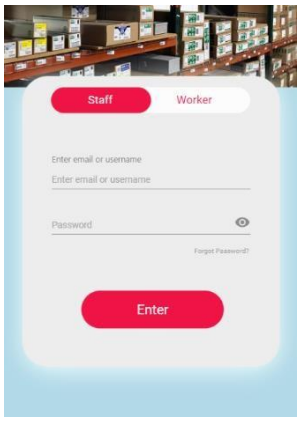
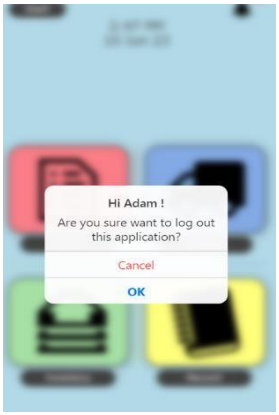
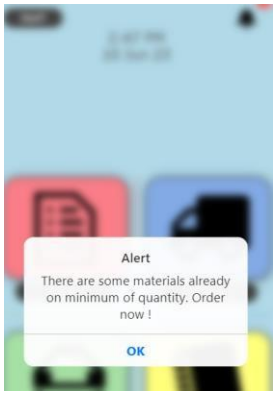


Figure 4.1: Flow chart of using the application

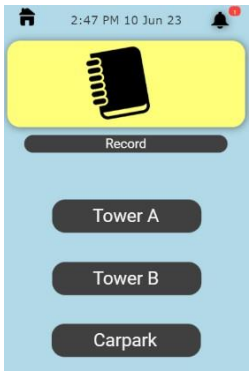
4.3.1 Interface of application

Table 4.1: Step using the application for users.

Interface	Description
	First thing user can see after open the application is log in menu. This page required user to put their worker id and password to access the apps. For the main contractor, they will sign in on staff page while sub-contractor are needed to select the worker page because the interface of staff and worker are not same.
	After user already log in, this layout will come out and user can see on main menu got four item which is order, delivery inventory and also record. The notification icon and staff icon also included on main menu. Time and date also were provided at main menu interface.
	For the staff icon, when the user click on it will show the notification on screen and ask the user to log out this application or keep stay

	For the notification icon, when user click on it will show the info such as if the material on site already at minimum quantity, it will give the notification/alert about shortage of material and staff can aware with the current situation.
	This is the interface for order page. At this order page, user can see the button approve and add. The MO is the short form for "material order". This MO will notice the staff about what item that already been order.
	When the user clicks the MO number, it will show what the item and when it was been order. If the item already arrived, user can click the deliver icon then it will transfer this MO to the delivery pages as record.

	When the user clicks the add icon, it will auto generate new MO number. User can select what material they want to add order and proceed the order by clicking done icon.
	This is the interface for delivery page. At this delivery page, user can see the history about what materials that already been delivered.
	This is the interface for inventory page. On this inventory page, user can see the amount of materials on site. So, it will make the monitoring process become easier.

	This is an example for the function in inventory page, user can choose any material that they want to see the amount of material on site. If the material is under limits, the amount of materials on display will turn red and its will ask the user to place the order. So its can give a impact on material delay that caused by late order
	This is the interface for Record page. On this record page, they got three item that can be access which is Tower A, Tower B and Carpark.
	After user choose which tower want to se the record, this page will come out and user can see the amount of materials on each level. This will easier the user to detect and control the wastage of material. User also can switch either to see the record on Tower A, Tower B or Carpark.

4.4 EVALUATION OF THE EFFECTIVENESS OF INVENTORY MANAGEMENT SYSTEM

This study summarises the results of a questionnaire that was given to respondents, including project managers, site engineers, QA/QC engineers, engineer planners, project engineers, and others, to ascertain the viability of applying an inventory management system.

4.4.1 Data Collection

A, B, C, and D are the four sections that make up the questionnaire. Age, gender, job, and work experience are only a few examples of the demographic data in Section A. The perception of usefulness is discussed in Section B. It refers to how employees and workers feel about using a system method to improve their material circumstances. The user's approval of the system's methodology is discussed in Section C's section on perceived usability. The term "User Satisfaction" relates to the degree of satisfaction that staff and employees have with the system method system's impact on their daily job progress, and it is found in Section D. The team site for Orangebeam Construction Sdn Bhd, which is the AVA Residence project site, issued this questionnaire to 20 responders by way of links on a Google Form.

4.4.2 Demographic Data

There are four questions on the respondent's backgrounds in Section A, which collects demographic information. The following are the items:

a) Gender
b) Gender
c) Position
d) Work experience

a) Age

The age distributions of the study's respondents are shown in Table 4.2. The age groups were split up by the researchers into four groups. This section was established to help with data processing and locating responders on the construction site. The age range of 25 to 34 has the most replies in this survey, with 10 more than 50 percent (55.6%), followed by the

age range of 35 to 44, with 4 respondents (22.2%), which is different from the age range of 24 and below, which has 2 respondents (11.1%). Only 2 respondents which is less than 20 percent (11.1%) were available for the 45–54 age range.

Table 4.2: The percentage of respondents by age

Age	No. of Respondent	Percentage (%)
<24 years old	2	11.1
25-34 years old	10	55.6
35-44 years old	6	22.2
45–54 years old	2	11.1
Total	20	100

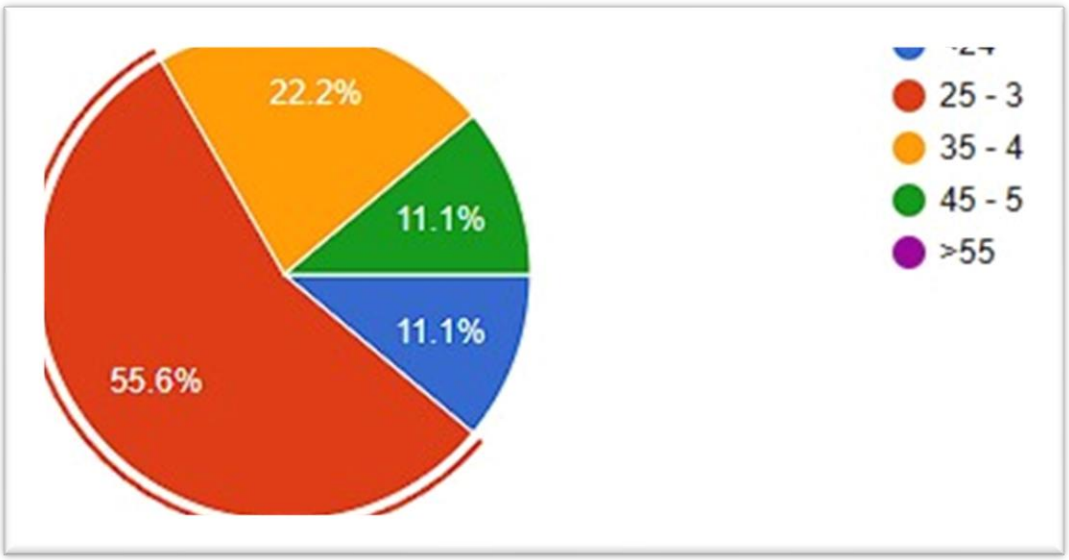


Figure 4.2: The percentage of respondents by age

b) Gender

In this study, there were 14 (70%) men and 6 (30%) women responders. As seen by the percentage, men respondents outnumber female respondents by a significant margin. This is because men, not women, predominated the site's answers. Table 4.3 below lists the respondents' numbers by gender.

Table 4.3: The percentages of respondents by gender

Gender	No. of Respondent	Percentage (%)
Male	14	70
Female	6	30
Total	20	100

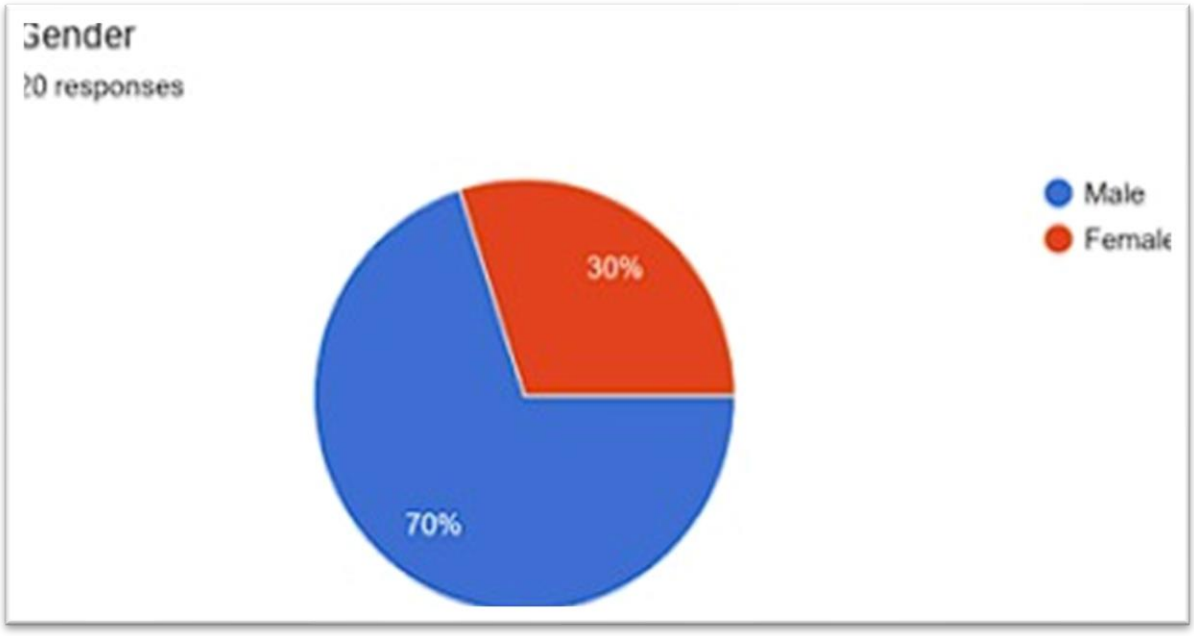


Figure 4.3: The percentages of respondents by gender

c) Position

The titles of the jobs at a construction site, including Project Manager, Planner Engineer, QA/QC Engineer, Site Supervisor, Project Engineer, and others. According to Table 4.4, there were 8 respondents (40%) for the Project Engineer position. With 3 responses (15%), the Safety Department placed second. Only two people, or 10%, responded to the question about the site supervisor, followed by two people, or 10%, who answered about the QA/QC engineer and two people, or 10%, who answered about the logistic department. Site admins come in next with only 1 respondent (5%) followed by planner engineers with only 1 respondent (5%) and, last but not least, Project Managers with exactly one respondent (5%).

Table 4.4: The percentages of respondents by position

Position	No. of Respondents	Percentages (%)
Project Engineer	8	40
Safety Department	3	15
Logistic Department	2	10
Engineer QA/QC	2	10
Site Supervisor	2	10
Site Admin	1	5
Project Manager	1	5
Planner Engineer	1	5
Total	20	100

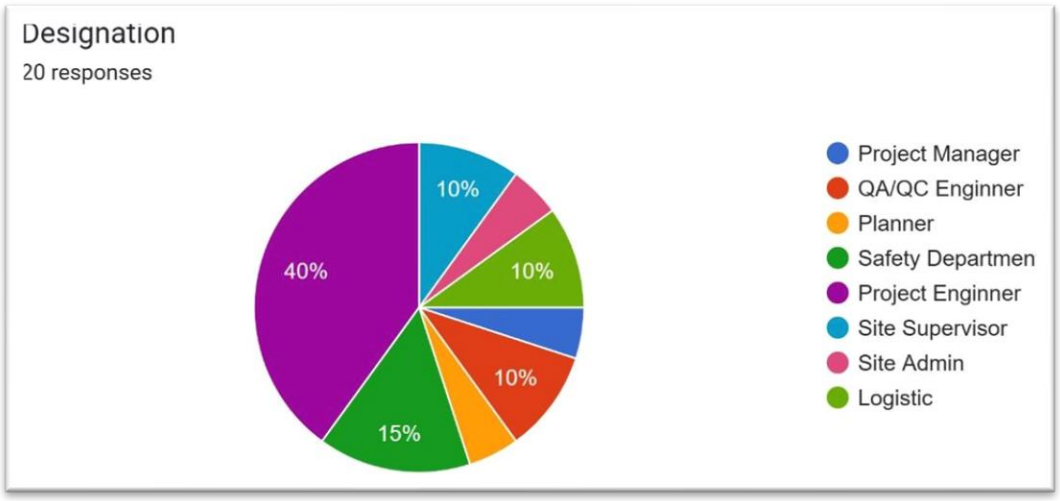


Figure 4.4: The percentages of respondents by position

d) Working experience

Majority respondents in this survey (40%) had more than 2 years of work experience, with 6 respondents that having from 6 until 10 years work experience (30%), only 3 respondents work experience below than 2 years which is (15%) and other 3 respondents got the working experience more than 10 years is also (15%). The number of responses by work experience is shown in Table 4.5 below.

Table 4.5: The percentages of respondents by work experience

Work Experience	No. of Respondents	Percentages (%)
<2 years	3	15
2-5 years	8	40
6-10 Years	6	30
>10 years	3	15
Total	20	100

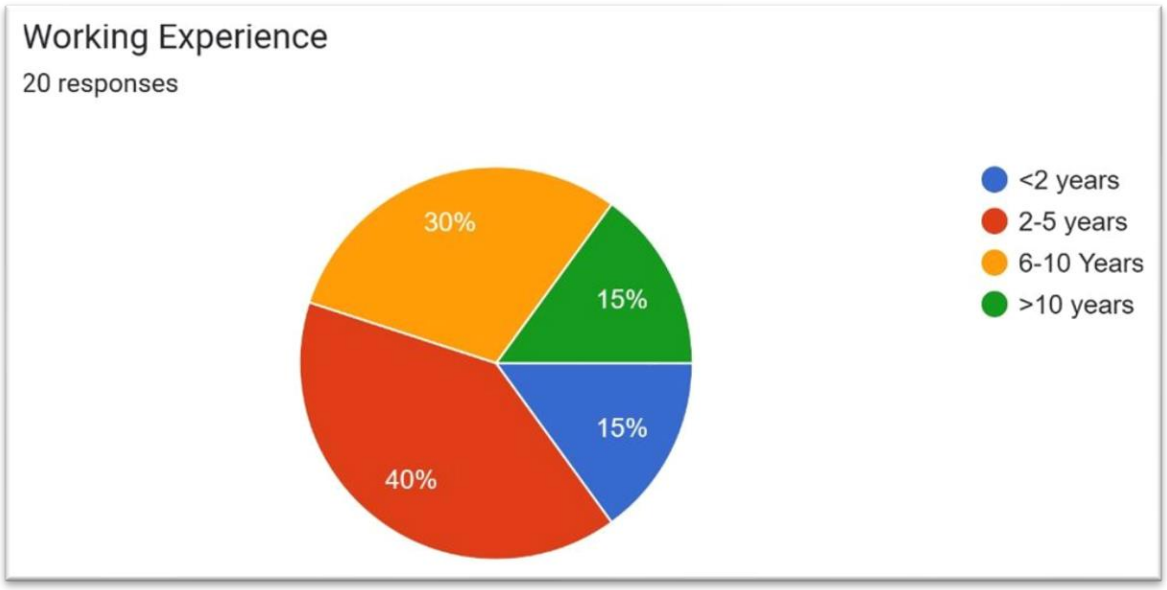


Figure 4.5: The percentages of respondents by working experience

4.4.3 Perceived of usefulness

In Section B, C and D, the respondent's opinions on the current approach with the new application are presented. To select their level of agreement with each choice, respondents were asked.

a) Strongly Disagree (Scale 1)
b) Disagree (Scale 2)
c) Neutral (Scale 3)
d) Agree (Scale 4)
e) Strongly Agree (Scale 5)

Table 4. 6: Question for Perceived of Usefulness (PU)

Perceived of usefulness items		
Construct	**Operational definitions**	**Measured items**
Perceived of usefulness (PU)	Perceived usefulness is a positive attitude that employees and workers have toward improving material application through the system approach.	**PU1**: Using the Inventory Management Apps in my job would enable me to accomplish tasks more quickly **PU2**: Using the Inventory Management Apps would improve my job performance **PU3**: Using the Inventory Management System would enhance my effectiveness on the job. **PU4**: Using the Inventory Management Apps in my job would increase my productivity.

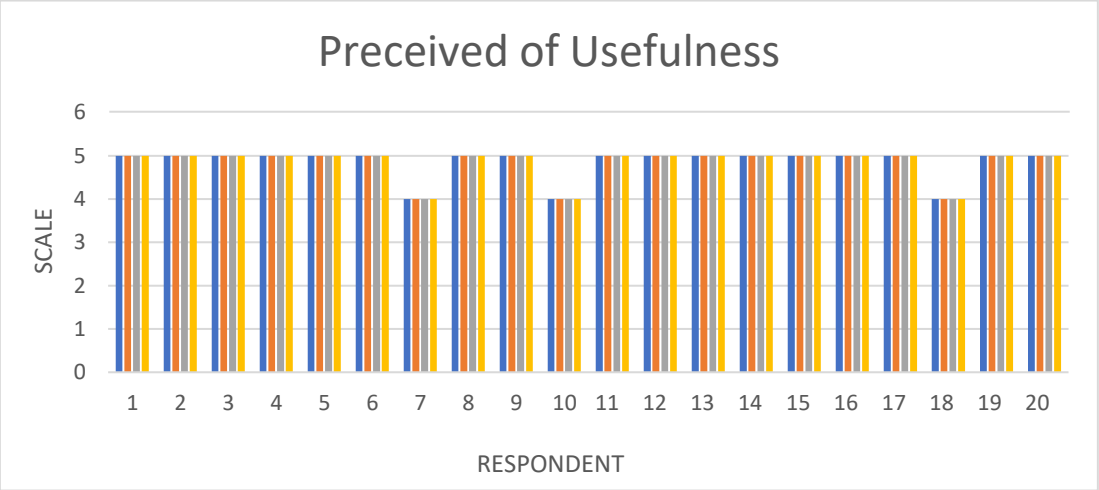


Figure 4.6: Analysis result for Perceived of Usefulness (PU) questions.

Users' perceptions of the utility of the improving material application made possible by the system method. The bar graph in Figure 4.5 above depicts the analytical findings for the question about perceived usefulness (PU). This graph's 'X' axis represents the responder count, while the 'Y' axis represents scale. The scale for this question ranges from 1 to 5, with 1 denoting significant disagreement and 5 denoting strong agreement. With a scale rating of 4 or 5, the majority of respondents stated that they agree and strongly agree with the usefulness of IMS. However, the three respondents who only selected "agree" note that they still feel comfortable using the outdated approach and that they are too elderly to use smartphones excessively.

4.4.4 Perceived ease of use items

Table 4. 7: Question for Perceived Ease of Use (PEOU)

User Satisfaction items		
Construct	**Operational definitions**	**Measured items**
Perceived ease of use (PEOU)	Perceived ease of use refers to User's acceptance of the inventory management system method.	**EU1**: Learning to operate the Inventory Management System would be easy for me **EU2**: I would find it easy to get the Inventory Management System to do what I want it to do **EU3**: My interaction with the Inventory Management System would be clear and understandable. **EU4**: I would find the Inventory Management System information to be flexible to interact with.

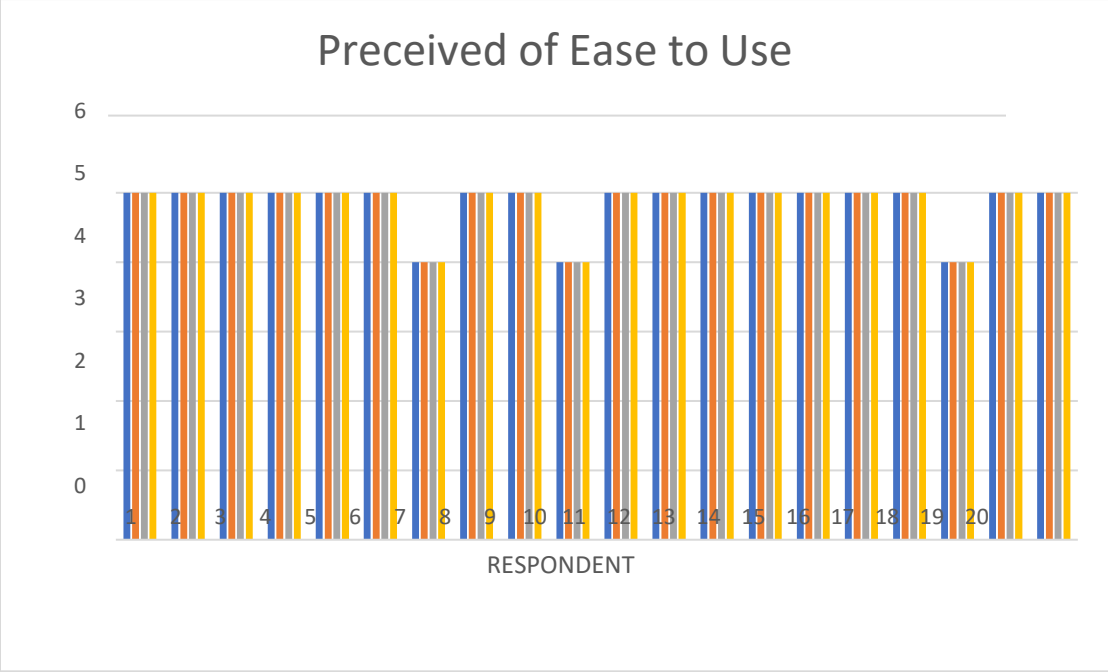


Figure 4. 7: Analysis result for Perceived Ease of Use (PEOU)

Users' perceptions of how simple it is to use e-PCI are referred to as perceived ease of use. Figure 4.11's bar graph shows the analytical findings for the Perceived Usefulness (PU) question. The vertical axis ('Y' axis) indicates the scale, while the horizontal axis ('X' axis) reflects the number of responses. The scale used for this question ranges from 1 to 5, with 1 denoting strongly disagree and 5 denoting strongly agree. 17 respondents gave a scale score of 5 (Strongly Agree) in response to all of the questions, while the remaining 3 respondents gave a score of 4 (Agree).

4.4.5 User Satisfaction

Table 4. 8: Question for User Satisfaction

User Satisfaction items		
Construct	**Operational definitions**	**Measured items**
User satisfaction	Users' satisfaction refers to the level of satisfaction that staff and workers with using the system method system on their daily work progress	**EU1**: I agree the information (such as purchase order, inventory record, and other delivery) provided with this Inventory Management System is clear. **EU2**: I satisfy with data stored on the inventory management system is accurate and updated. **EU3**: I believe information provided for the Inventory Management System is easy to understand. **EU4**: I believe using that from using Inventory Management System will decrease the wastage materials on site.

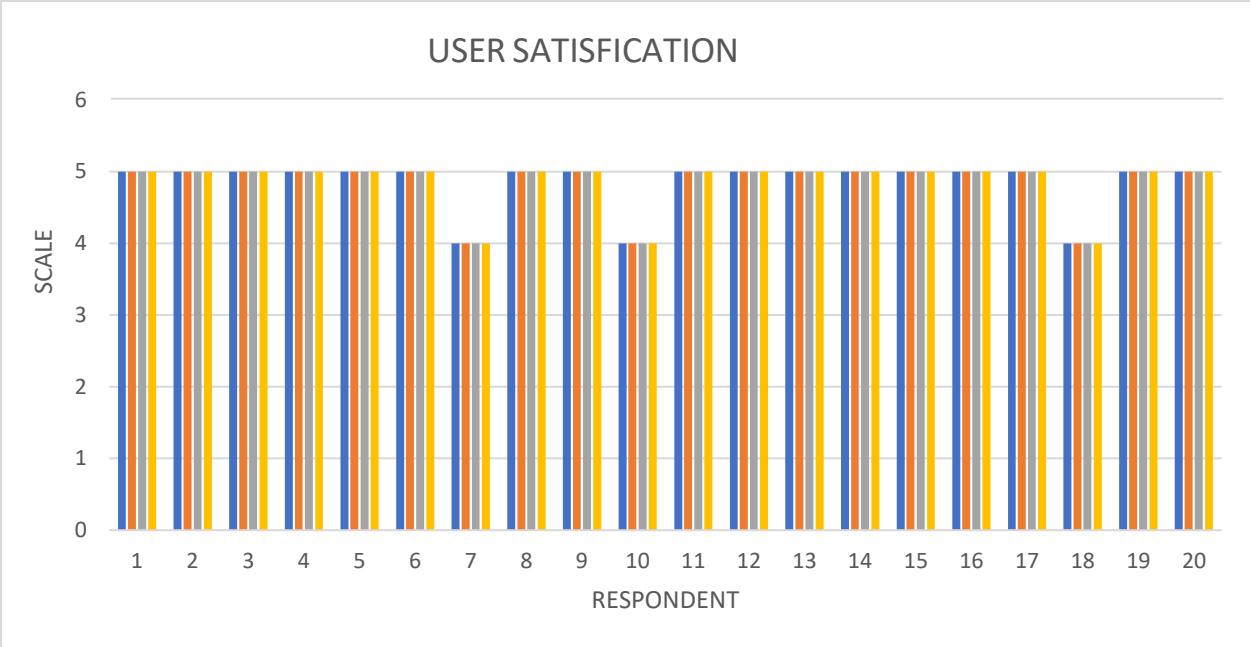


Figure 4.8: Analysis result for User Satisfaction

Users' satisfaction refers to the level of satisfaction that staff and workers with using the system method system on their daily work progress. The vertical axis ('Y' axis) indicates the scale, while the horizontal axis ('X' axis) reflects the number of responses. The scale used for this question ranges from 1 to 5, with 1 denoting strongly disagree and 5 denoting strongly agree. Based on figure 4.7, 17 respondents gave a scale score of 5 (Strongly Agree) in response to all of the questions, while the remaining 3 respondents gave a score of 4 (Agree).

4.4.5 The Interpretation of Mean and Standard Deviation for The Data Analysis

Figure 4.8 provides a summary of the analysis conducted on the effectiveness of Inventory Management System. The summary includes the mean and standard deviations for all the collected data. The mean value for all the questions is 4.80 or higher, indicating that the respondents' ratings on the questionnaire were predominantly "strongly agree" (scale 5) for almost all the questions.

Figure 4.9: Summarize of Analysis on Effectiveness IMS

	Gender	Age	Designation	Working Experience	Using the Inventory Management Apps in my job would enable me to accomplish tasks more quickly.	Using the Inventory Management Apps would improve my job performance.	Using the Inventory Management System would enhance my effectiveness on the job.	Using the Inventory Management Apps in my job would increase my productivity.	Learning to operate the Inventory Management System would be easy for me.	I would find it easy to get the Inventory Management System to do what I want it to do.	My interaction with the Inventory Management System would be clear and understandable.	I would find the Inventory Management System information to be flexible to interact with.	I agree the information (such as purchase order, inventory record, and other delivery) provided with this Inventory Management	I satisfy with data stored on the inventory management system is accurate and updated.	I believe information provided for the Inventory Management System is easy to understand.	I believe using that from using Inventory Management System will decrease the wastage materials on site.
	Male	35 - 44	Project Enginn	6-10 Years	5	5	5	5	4	4	4	4	5	5	5	5
	Female	25 - 34	Project Enginn	6-10 Years	5	5	5	5	5	5	5	5	5	5	5	5
	Female	25 - 34	QA/QC Enginn	2-5 years	5	5	5	5	5	5	5	5	5	5	5	5
	Male	25 - 34	Project Enginn	2-5 years	5	5	5	5	5	5	5	5	5	5	5	5
	Male	25 - 34	Safety Departn	<2 years	5	5	5	5	5	5	5	5	5	5	5	5
	Male		Safety Departn	2-5 years	5	5	5	5	5	5	5	5	5	5	5	5
	Male	45 - 54	Site Superviso	>10 years	4	4	4	4	4	4	4	4	4	4	4	4
	Male	25 - 34	Project Enginn	2-5 years	5	5	5	5	5	5	5	5	5	5	5	5
	Female	25 - 34	Site Admin	2-5 years	5	5	5	5	5	5	5	5	5	5	5	5
	Male	45 - 54	Logistic	>10 years	4	4	4	4	4	4	4	4	4	4	4	4
	Male	<24	Planner	<2 years	5	5	5	5	5	5	5	5	5	5	5	5
	Female	25 - 34	QA/QC Enginn	2-5 years	5	5	5	5	5	5	5	5	5	5	5	5
	Male	25 - 34	Project Enginn	2-5 years	5	5	5	5	5	5	5	5	5	5	5	5
	Male	25 - 34	Project Enginn	6-10 Years	5	5	5	5	5	5	5	5	5	5	5	5
	Male	25 - 34	Safety Departn	2-5 years	5	5	5	5	5	5	5	5	5	5	5	5
	Female	35 - 44	Project Enginn	6-10 Years	5	5	5	5	5	5	5	5	5	5	5	5
	Female	35 - 44	Project Enginn	6-10 Years	5	5	5	5	5	5	5	5	5	5	5	5
	Male		Project Manag	>10 years	4	4	4	4	4	4	4	4	4	4	4	4
	Male	35 - 44	Logistic	6-10 Years	5	5	5	5	5	5	5	5	5	5	5	5
	Male	<24	Site Superviso	<2 years	5	5	5	5	5	5	5	5	5	5	5	5
N					20	20	20	20	20	20	20	20	20	20	20	20
Mean					4.85	4.85	4.85	4.85	4.80	4.80	4.80	4.80	4.85	4.85	4.85	4.85
Standard Deviation					0.37	0.37	0.37	0.37	0.41	0.41	0.41	0.41	0.37	0.37	0.37	0.37

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 INRODUCTION

Inventory management systems are crucial in the construction industry, ensuring timely material availability, efficient resource allocation, and accurate project planning. By tracking inventory levels and lead times, these systems enable construction companies to maintain optimal stock levels, preventing delays caused by material shortages and improving project efficiency. They also aid in resource allocation by providing real-time visibility into material availability, ensuring optimal use of resources and minimizing unnecessary expenses. Additionally, inventory management systems contribute to reducing material loss and theft through robust control mechanisms and tracking material movements, enhancing security and promoting regulatory compliance. Moreover, these systems foster effective communication and collaboration among project stakeholders by centralizing information and providing real-time updates, leading to better decision-making and proactive issue resolution.

In summary, inventory management systems play a vital role in the construction industry, facilitating timely material availability, efficient resource allocation, and effective project planning. They contribute to improved project efficiency, minimized delays, and optimized resource utilization, ultimately enhancing the overall success and profitability of construction projects. Incorporating these systems into construction practices is a wise investment that yields significant benefits in today's competitive construction landscape.

5.2 DISCUSSION

Inventory management plays a critical role in the successful completion of construction projects. Effective management of materials is essential to ensure timely availability and efficient utilization, both of which directly impact project timelines and overall productivity. This discussion explores the importance of inventory management in the construction industry and highlights key considerations for implementing an effective inventory management system.

Firstly, based on objective one the study analyzed the current inventory management practices in the construction area and identified areas for improvement. The existing methods, primarily manual or spreadsheet-based systems, exhibited limitations in terms of accuracy, real-time tracking, and integration. To address these challenges, the study recommended the implementation of an advanced inventory management system that offers real-time tracking, automation, and integration features. Such a system would enhance accuracy, efficiency, and communication among stakeholders, optimizing inventory control and ultimately improving project outcomes in the construction area.

The study identified the shortcomings of the existing inventory management practices in the construction area and emphasized the need for a more advanced system. By adopting a modern inventory management system, construction companies can overcome the limitations of manual processes, streamline inventory tracking, and improve coordination among project stakeholders. This would lead to better inventory control, reduced delays, and increased efficiency in the construction industry.

Next, the discussion continues with second objective which is to develop the application of inventory management system (IMS). Developing an inventory management system (IMS) application involves gathering data requirements, designing the system, developing the application, testing it, and deploying it to the production environment. During the development process, it is essential to focus on simplicity, scalability and user-friendly application. Thorough testing helps identify and fix any issues before deployment. User training and documentation support smooth adoption of the application. Ongoing maintenance and support ensure the application's optimal performance and address user feedback for continuous improvement.

Third objective is about to evaluate the effectiveness of the application of inventory management system (IMS). Evaluating the effectiveness of an inventory management system (IMS) application involves assessing its accuracy, efficiency, integration capabilities, user satisfaction, and cost-effectiveness. The accuracy and reliability of the IMS application need to be evaluated by comparing actual inventory status with the data provided by the system. Assess the efficiency and productivity enhancements achieved through the application, such as reduction in stockouts, improved order fulfillment rates, and decreased inventory materials delay. Additionally, evaluate the integration capabilities of the system by assessing its ability to seamlessly integrate with other relevant systems. Gather user feedback to evaluate the user experience and satisfaction with the application. By conducting a thorough evaluation, organizations can determine the effectiveness of the IMS application and make informed decisions for further improvements or optimization.

Furthermore, the discussion highlights the user-friendly nature and portability of the developed inventory management application. User-friendliness and ease of use are essential factors in the successful implementation and adoption of any technology in the construction industry. The simplicity and accessibility of the application make it a valuable tool for construction personnel, enabling them to effectively coordinate materials and monitor inventory levels in real-time

In conclusion, the discussion reinforces the significance of inventory management in the construction industry. Effective inventory management systems contribute to timely material availability, efficient resource allocation, cost control, and improved project planning. They also address challenges related to material loss and theft, enhance communication and collaboration, and ensure regulatory compliance.

5.3 RECOMMENDATION

Based on the importance of inventory management systems in the construction industry, here are some recommendations for selecting and implementing an effective inventory management system:

1. User-friendly interface: Choose an inventory management system with a simple and intuitive interface to ensure easy adoption by construction personnel.
2. Implementation support and training: Choose a vendor that offers support during system setup, data migration, and integration, along with thorough training for your construction team.
3. Add-on other brand of material: the brand of material on current application is limited and need to add another brand for backup if the current brand cannot be supply.
4. Regular evaluation and improvement: Continuously assess the system's effectiveness, gather feedback from users, and consider updates or enhancements to optimize its performance.

5.4 CONCLUSION

This project has successfully achieved its objective of assessing the effectiveness of the application of an Inventory Management System (IMS) in the study area and highlighting the potential of technology in improving inventory management in the construction industry. By implementing the IMS, the study area experienced notable improvements in inventory control, resource allocation, and overall project efficiency.

The application of the IMS allowed for real-time tracking and visibility of inventory levels, ensuring timely material availability and reducing the risk of stockouts or excess inventory. The system's automation and barcode scanning features streamlined data entry processes, minimizing manual errors and saving valuable time. Additionally, the integration of the IMS with other business systems facilitated seamless information flow, eliminating duplicate data entry and improving coordination among stakeholders.

By implementing the IMS, the study area demonstrated enhanced inventory control, reduced project delays, and improved overall operational efficiency. The project's success underscores the significant potential of technology in revolutionizing inventory management practices within the construction industry.

Based on the findings and outcomes of this project, it is evident that the adoption of an effective inventory management system can bring tangible benefits to construction projects. It is recommended that other construction firms consider implementing similar systems to optimize their inventory control, improve project performance, and achieve cost savings. Embracing technology-driven solutions in inventory management will contribute to the continued advancement and competitiveness of the construction industry as a whole.

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APPENDIX

APPENDIX A **POST SURVEY**

APPENDIX B **GANTT CHART**

APPENDIX A

Final Year Project

Dear respondents, I am Muhammad Adam Bin Nor Azman, a final year student of Bachelor in Civil Engineering Technology (BCT) from Politeknik Ungku Omar (PUO) would like to invite you to participate in a survey on evaluation of "Inventory Management System" after experienced on it. I'd appreciate it if you could take the time to complete this survey. Your assistance with this survey is highly appreciated. Thank you.

Gender

- Male
- Female

Age

- <24
- 25 - 34
- 35 - 44
- 45 - 54
- >55

Designation

- ○ Project Manager
- ○ QA/QC Enginner
- ○ Planner
- ○ Safety Department
- ○ Project Enginner
- ○ Site Supervisor
- ○ Site Admin
- ○ Logistic

Working Experience

- ○ <2 years
- ○ 2-5 years
- ○ 6-10 Years
- ○ >10 years

Part B: Perceived of Usefulness (PU)

Read each statement and choose.

Using the Inventory Management Apps in my job would enable me to accomplish tasks more quickly.

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly agree

Using the Inventory Management Apps would improve my job performance.

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly agree

Using the Inventory Management System would enhance my effectiveness on the job.

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly agree

Using the Inventory Management Apps in my job would increase my productivity.

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly agree

Part C: Perceived ease of use (PEU)

Read each statement and choose.

Learning to operate the Inventory Management System would be easy for me.

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly agree

I would find it easy to get the Inventory Management System to do what I want it to do.

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly agree

My interaction with the Inventory Management System would be clear and understandable.

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly agree

I would find the Inventory Management System information to be flexible to interact with.

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly agree

Part D: User Satisfaction

Read each statement and choose

I agree the information (such as purchase order, inventory record, and other delivery) provided with this Inventory Management System is clear.

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly Agree

I satisfy with data stored on the inventory management system is accurate and updated.

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly Agree

I believe information provided for the Inventory Management System is easy to understand.

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly Agree

I believe using that from using Inventory Management System will decrease the wastage materials on site.

- [ ] Strongly disagree
- [ ] Disagree
- [ ] Neutral
- [ ] Agree
- [ ] Strongly Agree

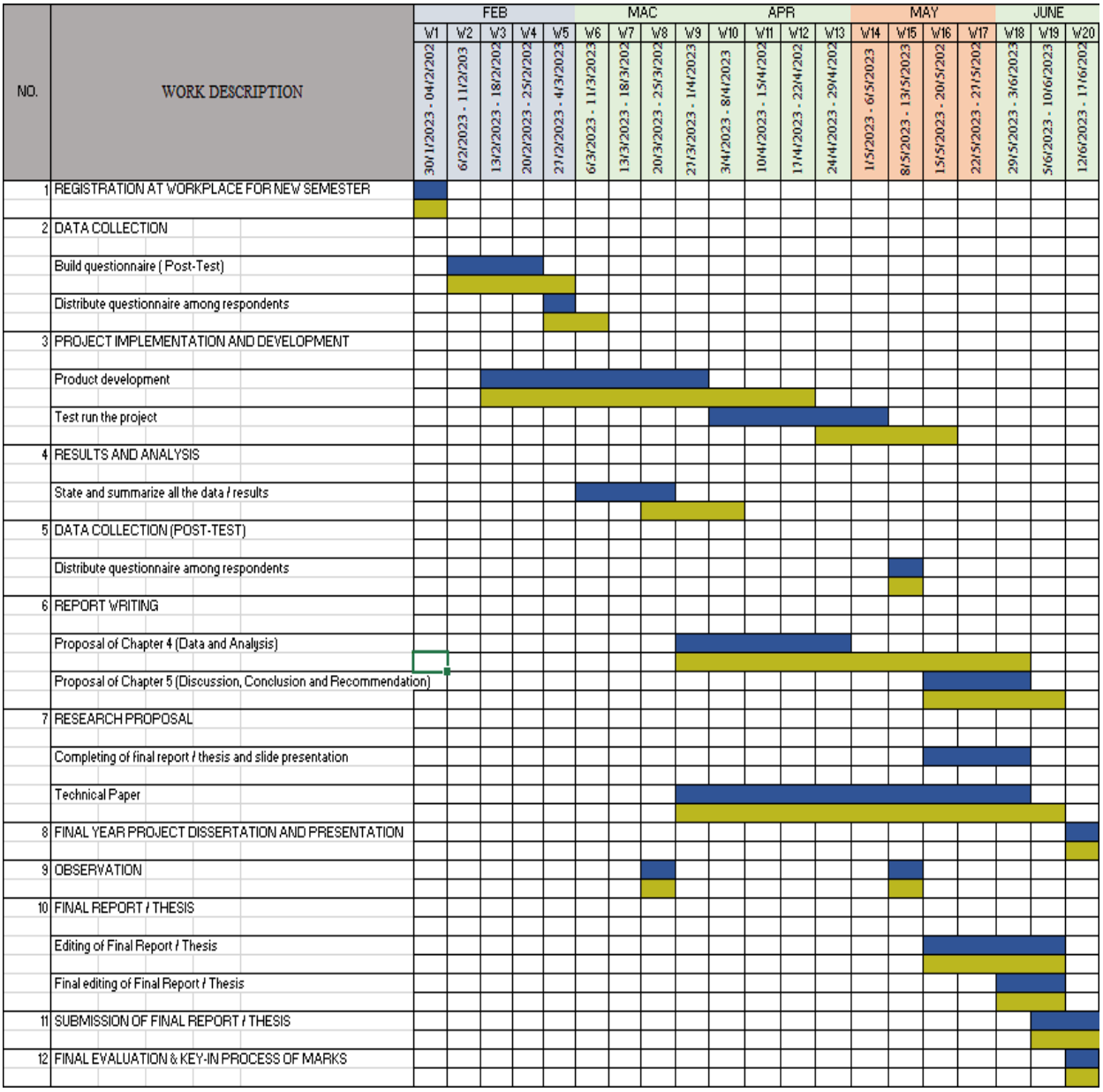
Thank you for completing this survey. Your feedback is highly appreciated and will help us to improve our Inventory Management System in the future.

APPENDIX B

SEMESTER 7

NO.	ITEM	SEP			OCT				NOV					DEC				JAN			
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20
		12/09/22-17/9/22	19/9/22-24/9/22	26/9/22-1/10/22	3/10/22-8/10/22	10/10/22-15/10/22	17/10/22-22/10/22	24/10/22-29/10/22	31/10/22-5/11/22	7/11/22-12/11/22	14/11/22-19/11/22	21/11/22-26/11/22	28/11/22-3/12/22	5/12/22-10/12/22	12/12/22-17/12/22	19/12/22-24/12/22	26/12/22-31/12/22	2/1/23-7/1/23	9/1/23-14/1/23	16/1/23-21/1/23	23/1/23-28/1/23
1	**REVIEW OF LITERATURE REVIEW**																				
2	**CHAPTER 1: INTRODUCTION**																				
	Problem Statement																				
	Objectives																				
	Scope of Study																				
	Significance of Study																				
	Expected Outcome																				
3	**CHAPTER 2: LITERATURE REVIEW**																				
	Knowledges/Information/Theory of the Study																				
	Gap of Study																				
	Method Used for the Study																				
4	**CHAPTER 3: METHODOLOGY**																				
	Flowchart																				
	Research Study																				
	Questionnaire																				
	Principles Development																				
	Validate of Method																				
5	**WRITING PROPOSAL**																				
	Submission Draf																				
	Chapter 1																				
	Chapter 2																				
	Chapter 3																				
6	**PROPOSAL PRESENTATION**																				
7	**SUBMISSION OF FINAL PROPOSAL**																				
14	**FINAL EVALUATION & KEY-IN PROCESS OF MARKS**																				

SEMESTER 8


NO.
WORK DESCRIPTION
FEB
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30/1/2023 - 04/2/202
6/2/2023 - 11/2/203
13/2/2023 - 18/2/202
20/2/2023 - 25/2/202
27/2/2023 - 4/3/2023
6/3/2023 - 11/3/2023
13/3/2023 - 18/3/202
20/3/2023 - 25/3/202
27/3/2023 - 1/4/2023
3/4/2023 - 8/4/2023
10/4/2023 - 15/4/202
17/4/2023 - 22/4/202
24/4/2023 - 29/4/202
1/5/2023 - 6/5/2023
8/5/2023 - 13/5/2023
15/5/2023 - 20/5/202
22/5/2023 - 27/5/202
29/5/2023 - 3/6/2023
5/6/2023 - 10/6/2023
12/6/2023 - 17/6/202
1 REGISTRATION AT WORKPLACE FOR NEW SEMESTER
2 DATA COLLECTION
Build questionnaire (Post-Test)
Distribute questionnaire among respondents
3 PROJECT IMPLEMENTATION AND DEVELOPMENT
Product development
Test run the project
4 RESULTS AND ANALYSIS
State and summarize all the data / results
5 DATA COLLECTION (POST-TEST)
Distribute questionnaire among respondents
6 REPORT WRITING
Proposal of Chapter 4 (Data and Analysis)
Proposal of Chapter 5 (Discussion, Conclusion and Recommendation)
7 RESEARCH PROPOSAL
Completing of final report / thesis and slide presentation
Technical Paper
8 FINAL YEAR PROJECT DISSERTATION AND PRESENTATION
9 OBSERVATION
10 FINAL REPORT / THESIS
Editing of Final Report / Thesis
Final editing of Final Report / Thesis
11 SUBMISSION OF FINAL REPORT / THESIS
12 FINAL EVALUATION & KEY-IN PROCESS OF MARKS