POLITEKNIK UNGKU OMAR

ORGANISATIONAL RECORD MANAGEMENT INDICATOR (ORI)

KAILASH PAL SINGH A/L BALDEV SINGH

(01BCT20F3002)

CIVIL ENGINEERING DEPARTMENT

SESSION 2 2022/2023

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KAILASH PAL SINGH A/L BALDEV SINGH

(01BCT20F3002)

A report submitted in partial fulfilment of the requirements for the award in Bachelor of Civil Engineering Technology with Honours.

CIVIL ENGINEERING DEPARTMENT

SESSION 2 2022/2023

DECLARATION OF ORIGINAL AND OWNERSHIP

ORGANISATIONAL RECORD MANAGEMENT INDICATOR (ORI)

1. KAILASH PAL SINGH A/L BALDEV SINGH (01BCT20F3002)

1. We, are the students of the final year in **Bachelor of Civil Engineering Technology, Civil Engineering Department, Politeknik Ungku Omar**

2. We acknowledge that 'The above project' and the intellectual property contained therein are the work of our original work/invention without taking or imitating any intellectual property from any other party.

3. We agree to transfer ownership of the intellectual property of the 'Project' to the Politeknik Ungku Omar to meet the requirements for the award of the Degree in Civil Engineering technology (Hons.) to us.

Made and truly acknowledged by the said.

a) KAILASH PAL SINGH A/L BALDEV SINGH
(IC No: 970905-14-6213)

.....
KAILASH PAL SINGH

In front of me, PUAN SAMIKHAH BINTI MUHAMMAD @ MUNIR As project supervisor on date .....

.....
PN SAMIKHAH BINTI MUHAMMAD @ MUNIR

APPRECIATION

Thank you, God, upon blessing me throughout the completion for my Final Year Project, Firstly, I want to offer my deepest gratitude must be towards God because of His grace and His guidance; I am able to complete this report “Organisational Record Management Indicator (ORI)”

I would like to forward my sincere gratitude and appreciation to my academic supervisor Pn. Samikhah Binti Muhammad @ Munir, without her kind direction and proper guidance this study would have been completed. In every phase of the project her supervision and guidance shaped this report to be complete perfectly.

Next, thank you to my family mostly my mother, Harjit Kaur A/P Balbant Singh and grandmother Pretum Kaur A/P Natha Singh the two most strong women I have known never missed to give me a support. They always encouraged me and prayed for me throughout the time of my research. I would also like to sincere my gratitude to my angle Daljit Kaur A/P Balbant Singh with her guidance and blessings throughout degree has given me the strength to complete my study. This thesis is heartily dedicated to them.

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Thank you.

ABSTRACT

Industry Revolution 4.0 provides quick revolution towards innovation and has delivered another model of education for the future to convert the construction industry following to the direction of further digitally developed trade. Construction delays can be seen as a risk for projects, from the aspect of inadequate planning, project complexity and documentation. To increase construction productivity, companies are investing and utilising technology. Analysis shows that insufficient data form drawings, unorganized documentation, fundings towards the project and attitude of an individual in a construction causes misinterpretation among each other which leads to the project being delayed. The aim of the study is to develop an application Organisational Record Management Indicator (ORI) to accumulate documents and drawings, setting up a base to track work progress and to avoid miscommunication. The scope of the study highlights at LRA Bukit Selambau (Zone B) located at Kuala Muda Sungai Petani. With a percentage of 61% leaning towards strongly agreeing ORI is a platform to carry out communication and store document related to the project, easy to be used for faster up project progress, with that 56.1% strongly agree on ORI is easier to track project progress with a platform set for task being easy to convey an activity being carried out in details. To test the effectiveness of the ORI, questionnaire has been distributed and with it generated an amount of 0.989 for the reliability test which profess to be accurate following by the descriptive test calculating a mean score of 4.57 which is high interpretation with a standard deviation of 0.48 using SPSS method comparing towards the T Test method. Organisational Record Management Indicator (ORI) system is user-friendly and shows its productiveness towards preventing miscommunication and speeding up the project progress.

Keywords: *Inadequate Planning, Misinterpretation, Construction Delay, Organisational Record Management Indicator, Productiveness.*

ABSTRAK

Revolusi Industri 4.0 menyediakan revolusi pantas ke arah inovasi dan telah menyampaikan satu lagi model pendidikan untuk masa hadapan untuk menukar industri pembinaan mengikut hala tuju perdagangan yang dibangunkan secara digital. Kelewatan pembinaan boleh dilihat sebagai risiko untuk projek, dari aspek perancangan yang tidak mencukupi, kerumitan projek dan dokumentasi. Untuk meningkatkan produktiviti pembinaan, syarikat melabur dan menggunakan teknologi. Analisis menunjukkan bahawa lukisan borang data yang tidak mencukupi, dokumentasi yang tidak teratur, pembiayaan terhadap projek dan sikap seseorang individu dalam sesuatu pembinaan menyebabkan salah tafsir antara satu sama lain yang menyebabkan projek tertangguh. Matlamat kajian adalah untuk membangunkan aplikasi Petunjuk Pengurusan Rekod Organisasi (ORI) untuk mengumpul dokumen dan lukisan, menyediakan pangkalan untuk mengesan kemajuan kerja dan untuk mengelakkan miskomunikasi. Skop sorotan kajian di LRA Bukit Selambau (Zon B) yang terletak di Kuala Muda Sungai Petani. Dengan peratusan sebanyak 61% cenderung ke arah sangat bersetuju ORI adalah platform untuk menjalankan komunikasi dan menyimpan dokumen yang berkaitan dengan projek, mudah digunakan untuk kemajuan projek yang lebih cepat, dengan itu 56.1% sangat bersetuju dengan ORI lebih mudah untuk mengesan kemajuan projek dengan set platform untuk tugas yang mudah untuk menyampaikan aktiviti yang dijalankan secara terperinci. Untuk menguji keberkesanan ORI, soal selidik telah diedarkan dan dengannya menghasilkan jumlah 0.989 untuk ujian kebolehpercayaan yang disifatkan sebagai tepat berikutan dengan ujian deskriptif mengira skor min 4.57 iaitu tafsiran tinggi dengan sisihan piawai 0.48. menggunakan kaedah SPSS membandingkan ke arah kaedah Ujian T. Sistem Petunjuk Pengurusan Rekod Organisasi (ORI) mesra pengguna dan menunjukkan produktivitinya ke arah mencegah miskomunikasi dan mempercepatkan kemajuan projek.

Kata Kunci: *Perancangan Yang Tidak Mencukupi, Salah Tafsir, Kelewatan Pembinaan, Petunjuk Pengurusan Rekod Organisasi, Produktiviti*

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Industry 4.0, which is the fourth industrial revolution, has been propelled forward by technological advancements and inventions. According to the literature, Industry 4.0 promotes growth and development through its efficiency capacity. Construction sector growth is a subset of the universal set of gross domestic product value; therefore, Industry 4.0 impacts the engineering and construction industry. Construction quality and productivity are likely to improve because of Industry 4.0, which is expected to attract both local and global investors. (Ali, et,al., 2019). Through continuing automation of conventional manufacturing and industrial methods, leveraging contemporary smart technologies, extensive machine-to-machine communication (M2M), and the internet of things, major changes are occurring in how the global production and supply network functions (IoT). Increasing automation, better communication and self-monitoring, and the deployment of intelligent devices that can evaluate and diagnose problems without requiring human interaction are all outcomes of this integration. (Petra, et, al., 2019).

The Internet of Things (IoT) describes the network of physical objects “things” that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. These devices range from ordinary household objects to sophisticated industrial tools. To be told with low-cost computing, the cloud, big data, analytics, and mobile technologies,

physical things can share and collect data with minimal human intervention. In this hyperconnected world, digital systems can record, monitor, and adjust each interaction between connected things. The physical world meets the digital world and then they cooperate. (Kelly., 2020). An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors, and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices -- for instance, to set them up, give them instructions or access the data. (Alexander., 2022)

Construction industry refers to the industrial branch of manufacturing and trade related to building, repairing, renovating, and maintaining infrastructures. It is a determinant of the country's technological and technical advancement, often regulating the growth of the country's infrastructural development that often directs to the country's advancement in terms of sustainability assurance. A significant concern for the public now is how to manage environmental dangers associated with development. construction industry is not by nature an environmentally friendly activity and it is a major contributor to environmental impacts, which are typically classified as air pollution, noise pollution and water pollution. While according to (Tam et al., 2006), construction industry is one of the biggest generators of pollution in Hong Kong and becoming a critical issue. Moreover, waste generated from construction industry consist of relatively huge amounts of chemical waste (Bossink., 1996). Malaysia is one of the countries that are categorized as emerging industrialized country; and of the 20 largest export nations worldwide. It is ranked 29th out of 118 countries by the “Global Enabling Trade report 2008”. This industry is an important element of Malaysia economy because it is widely linked with many other parts of the economy such as basic metal products which include the iron and steel industries and electronics. This industry also shares 3.3 % of the country’s GDP (2003) and employs over 500,000 workers in some 54,500 local companies. 80 % of these companies are small and medium sized companies. (MGCC,2009).

Documentation plays a role in a construction where the demand of quality construction requires close project monitoring and continuous efforts to improvise. The solution to meet this relevant demand is to have accountability of the work done, which can be done with construction and records. Construction records and documents are the mirrors of a project; it not only reflects the state of project but also boosts quality work and quality control. Irrespective of the usefulness of it, there are various causes and sources of errors in record keeping and benefits too, is also described. It will not be exaggerated to state that construction documents and records help in sustainable project management. (Aditya, et,al., 2017). Based on relevant literature review and pilot survey, key differences among the construction documents and records are described at the same time. Thus, it also gives the complete idea regarding documents and records and role played by them in risk mitigation. A digital document is often used by all the department to provide material product information, work progress, documentation needed, memo or details for on-site reference by workers. Websites can then be used to refer directly to the work being displayed or used for more information. and installation work on site. In addition, it can help the users to easily keep track of the documentation and drawing for an area. Since the purpose of documents is often to present information in an easy-to-navigate manner, these documents can be used to demonstrate the work of workers or others. Operations and management can also create digital documents for internal use, making it easier to access and refer to shared resources within the company (Wiesen, 2021).

Effective communication is defined as being able to successfully convey information, knowledge, and ideas in a way that is received, understood, and acted upon as originally intended. When discussing communication in the construction sector, effective communication is essential in ensuring the successful and safe operation of an organization and completion of projects. Communication takes many forms, including verbal (both face-to-face and distanced, such as over the phone), non-verbal (conveying and understanding non-verbal cues such as body language), written, and visual (such as graphs and visual signage). All these forms of communication are essential and it's important to understand their importance and know how to use them effectively. (Katie Martinelli., 2022). Communication can increase health and safety issues by induction of safety and mass toolbox significantly decrease the number of accidents and incidents.

Improving the lack of clarity around goals can be in a result where it could lessen down misunderstandings between different stakeholders. Besides that, it will help in the progress to overcome delays, decreased productivity and profitability with good communication the information is delivered on time with good surroundings of people with correct information will get the job done smoothly. Reputation with customers will also come in good stand where if the project is going as planned it will be finished on the time basics which has been given and with that if the communication is good, it will be beneficial from both parties which comes trust for the next upcoming project discussed between them. Being professional by sending a clear message, request, direct a job must be clear and concise as possible. This will help to ensure that your message is understood, and the appropriate actions are taken.

1.2 RESEARCH BACKGROUND

Digital transformation and the accompanying business model innovation have fundamentally changed consumer expectations and behaviors, putting tremendous pressure on traditional businesses, and disrupting many markets. Almost all businesses today rely on the Internet and computers to speed up their business processes. But those who really want to modernize their business are finding their way to a sort of smartphone that replaces the traditional desktop. Construction management software has been around for some time. Nearly every construction project already uses one for planning, scheduling, monitoring, and communication. It has proven to be a useful tool for making these processes more agile. However, for simplicity, the building software has already been included in the mobile app version as well.

In construction industry, the use of mobile devices at various stages of a construction project has been on the upswing It is increasingly clear that mobile devices are her to stay in the construction industry because of their ability to improve communication and productivity. Tablets and mobile phones are being used constantly amongst superintendents and project managers on constructions sites. Almost 80% of Smartphone owners check their phones way too often in a day. Over 4 hours of their

day are also spent using their phones. There's just so much information needed in a construction site every day and giving crew members an easy and quick access to it can contribute to improved productivity and consequently, profitability.

Main components in construction documentation are the building plans and specifications that are drawn up by design teams. These outline the dimensions, details, materials to be used, structural components and more. They serve the purpose of directing not only how the building should be built, but as a record of what was constructed in the form of as-built documents post-construction. Building documents are drawn by architects and engineers, with specifications that accompany the drawings to include minute details such as caulking types, grout, paint colors and more. The intent of these documents is to capture every component of the building and all associated landscaping, excavation, structural and architectural elements, and building systems like electrical, mechanical, plumbing and fire protection systems. When documents are distributed to contractors, they help review them with a different lens for constructability and to fill in any details that may be missing.

Wide source of application has been developed to solve all the construction site problem, but with only focusing on one problem at a time, such as Clock Shark the application only focused on tracking a progress, time taken for an activity from the start to the end. Other than that, Fleetio is an application that only accumulates documentation in the scope of material purchase. These applications focused on its self-problem, development of Organizational Record Indicator is expected to solve both problems, the application is also expected to be simple UI to gain access to all features in it.

1.3 PROBLEM STATEMENT

In a project, communication plays an important role in getting a job done right and smoothly. The objective leads to a team achieving a goal in completing an activity and with strong decision making and better control there will less problem in a site also

good progress throughout the project. When there are many leaders to lead an activity, it causes clashes which makes the project slow progress, and the competition of the project is stalled. Bad communication can cost a company that has over 100,000 employees to lose $62 million a year, according to communications expert David Grossman. He calculates that each employee in this environment loses about $26,000 a year in productivity. (Carol Sankar, 2020)

Another obstacle arises is documentation where it plays a major role and provides the key related to construction projects. The common documentation that are referred on site is Permit to Work (PTW), Request for Inspection (RFI), Request for Inspection (RI), Delivery Order (DO) and the most important which are the Drawing of the project which is always an essential for a work to be carried it is the main reference to conduct or construct a building, documents serve as the critical evidence to support or dispute any claims. Because of their importance, it is critical that a project has proper document control procedures (Ezelogs, 2022). With the rise in demand for more high-rise buildings or going below the ground of several miles, there has been a rise in the demand for. Revise drawing is always received when the construction is carried out with the original / old drawing and must carry out double work to rectify the mistake that has been done to follow the revise drawing. Furthermore, the revise drawing is not handled correctly for example the drawing is received by the consultant, but it doesn't reach to the main contractor hand which makes the sub con to follow the old drawing. Uncompiled documentation will also cause the work to not be carried out or to stop the work and delay the progress. The main causes of documentation errors are lack of knowledge of documentation skills, less time to maintain key documents and records, lack of willingness the employees of-on project site also influences the project progress. Poor documentation impact construction project in many ways. Without them, work cannot be done, and contractors cannot get paid. Documents serve as critical evidence to support or dispute any claims. Because of their importance, it is critical that a project has proper document control procedures (Ezelogs Construction Software, 2022). Nevertheless, speaking about documentation in today's electronic age, people are starting to consider going paperless. But there's still a long way to go before we lose our dependence on this very important human product; more than 199 tons of paper has already been produced every 15 seconds. Deforestation, states that 42% of all global

wood harvest is used to make paper and 50% of the waste of businesses is composed of paper (The World Counts, 2022). With the mass consumption of paper which is already has been going on if there are more papers that is being used when some of the documentation is incorrect or the drawings are not the latest it would be counted as wastage of paper. As said by (Hesseldahl, A, 2018), For every dollar spent on copying, companies incur another $6 in handling and distribution, and half of all documents printed are thrown away within 24 hours.

Problem, cause of the project being delayed or slow is attitude and the job scope, when there is attitude problem on site in the sense of giving instruction or agreeing on an activity it will affect the progress which can cause miscommunication and clashes always the attitude of the person in charge is important granting the work to be proceed, with a bad attitude they usually pinpoint negative in everything whether it may be people, situations or behavior. Unacceptable behavior at work, spoils the good work environment at the workplace which can hinder the productivity of the employees, besides that, Dominate the team where the power which has been given is being misused in always trying to oppose the verdict on any issues in the workplace. Shouting in a higher tone with the team also shows displeasure in the working atmosphere. Every individual employee should work helping each other to not show a negative attitude to each other. This not only helps the workplace become better, but also it helps every individual employee to grow personally (Chitra Reddy, 2019). A workforce to have a good attitude the organization through the management team must deliberately provide good working conditions, recognize effort and show employees that they are valuable assets of the organization. A good attitude in the workplace is very instrumental in enhancing productivity. People who have a positive attitude have the tendency to take more interest in everything they do and also how they deliver it. Employees who have the right attitude about work will therefore naturally think about their work and strive to give it their best. (J Kelvin Fallah, 2017). Respect towards others' opinion and attitude of willing to treat other people politely and professionally, even if they disagree with the other person's point of view shows a good attitude. Helpfulness and finding new ways by trying something new or finding a different way to do things might not work out to be the best way to do it, but the biggest failure is not at least giving new ideas a shot. (Lynda Moultry Belcher, 2019).

Regarding this study, the problem statement has been identified by handing out two sets of questionnaires which involved about 30 respondents. The first being finding out the main problem occurring at site (Miscommunication and Slow Project Progress. Once the main problem is gathered, then another questionnaire was distributed to the site to find the sub problem being (Documentation, Drawings and Attitude) which creates the main problem. These problems occur frequently as it results in slow progress.

Due to the problem statement, after all the data collection it resulted to an idea of developing an application called ORI (Organisational Record Management Indicator) towards accumulating all documents, lay out an outline accordingly to avoid miscommunication at Loji Rawatan Air Bukit Selambau. This has been a 2-part project, one being an application and the second is the support which will be a website, the application can be used at site and for the website users can used it in the office. The platform comes with integrated events will has been a problem of communication, task tab which will allow all users to track activity that will be carried out and finally the application will have a storage to store all documents and drawings related to the project. This application is to provide a better experience and improve communication and understanding between team members such as architects, engineers, consultants so that it will not affect the project progress.

1.4 OBJECTIVE OF STUDY

The aim of the study is to develop an application with accumulating documents and drawings, setting up a base to track the work progress and to avoid miscommunication between contractors on the project.

The specification objectives of this study are as follow,

i. To Identify the main problem in order to solve clients' needs on site.

ii. To develop Organisational Record Management Indicator (ORI) for LRA Bukit Selambau Zone B.

iii. To evaluate the effectiveness of Organizational Record Management Indicator in project.

1.5 SCOPE OF STUDY

The scope of study is proposed on the Water Treatment Plant (zone B) as shown in Figure 1.1 below. The shaded area from the figure below is the proposed study area for the project. This project is focused to lessen down the miscommunication on site which involves all the party to comply with the work schedule and to get the work done smoothly, it involves the process of documentation, drawings, work schedule and progress of the project. The method of questionnaire has been used to identify what is the industrial based problem and help to develop the Organisational Record Management Indicator for the Loji Rawatan Air Bukit Selambau. A questionnaire has been distributed at the beginning and also at the end of the project. Data collection in the initial stage has been identify as for the problems faced by the respondent and towards project progress for the Loji Rawatan Air Bukit Selambau. The evaluation of the effectiveness of the final product will use the questionnaire method. As for the final product, as it is tested by all the parties involved in the management of the site another questionnaire will be distributed to the management such as the Consultant, Main Contractor and also to the Sub Contractors for evaluation.

The site is divided into several buildings which consists of Sedimentation Tank, Clear Water Tank, Chemical Building, TnB Sub Station, Chlorine Building, Detention Pond, and Sand Drying Bed as shown in Figure 1.2 below all of the buildings are highlighted and it is the part of the project for zone B where the product will be tested. All the buildings that have been highlighted are included in the scope of study.

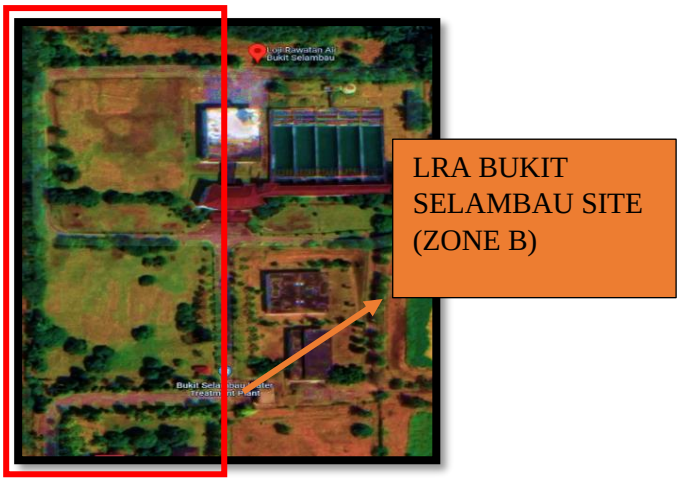


Figure 1.1: Bukit Selamabu Site (Zone B)

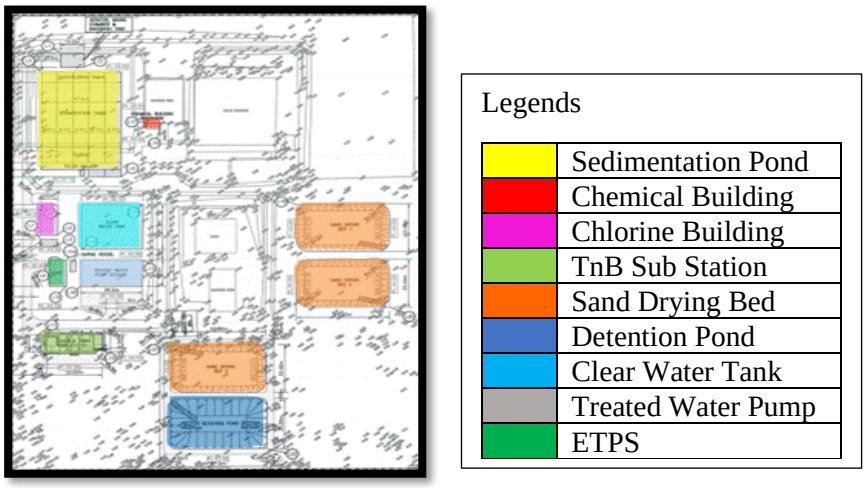


Figure 1.2: Key Plan Loji Rawatan Air Bukit Selamabu (Zone B)

1.6 SIGNIFICANT OF STUDY

With the development of Organizational Record Management Indicator, it will lessen down the usage of paper it could be access anywhere with just using a smartphone and getting the most detail out form it whereas form the traditional style with printing out papers and after a use throwing them away. It would help to save time and with just a click all the information could be recovered. With the development of the application, construction work will be done smoothly without any miscommunication, the leading of a progress comes with communication when a project is carried out on a specific date

it will require all the documents which in the old method it will have to be printed out but in the new era if the documents are all stored in a cloud based storage it will be easy to retrieve and the miscommunication will not happened if the app could also store the date of the progress to be carried out so then person in charge will communicate with all the workers by using the app and state what activity will be on going and the date will be marked with the complies of the document.

1.7 SUMMARY

The introduction, problem statement, objective, and study scope are the four main parts of this research, respectively. This is the first chapter that explains the preliminary stages of the research in detail. Based on this chapter, there are obvious explanations of the problem formulation, in particular for the industrial-based issue in project delays form documentation causes project progress to be slow and also without and proper attitude of workers at site arise miscommunication. From the industrial problem, the aim and objective has been set which are to identify the main problem in order to solve clients' needs on site; to develop Organizational Record Management Indicator (ORI) for LRA Bukit Selambau Zone B and finally to evaluate the effectiveness of Organizational Record Indicator in project. The Scope of the study which has been proposed is Loji Rawatan Air Bukit Selambau (LRA Bukit Selambau).

From the study it will benefit towards the project progress and helps to prevent miscommunication. ORI has been proposed to create event which could help in real-time project progress as users get to update the activity that is being going on, another better storage where all files, documents, drawings, test result and many more could be stored for future reference and project claim. Also, there will be a task page to inform users of the upcoming task where they could make time for that task to be carried out. It prevents miscommunication. ORI implements IR 4.0 and sustainable development goal 9, which fosters innovation, builds resilient infrastructure, and promotes equitable and sustainable industrialization.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

For this study, a literature review was produced as a summary of all relevant research papers, journal articles, books, websites, and other sources referenced in this work. This literature review examines published material on a specific topic and information published within a specific time period. The purpose of this literature review is to better understand current research and debate on a particular topic or area of research and to provide this information in the form of reports. In addition, based on this literature review, topics and gaps in existing research are highlighted, and research articles use new research to fill gaps.

This chapter will be combined with several sections such as introduction, reflection on smart goals, sustainable design, construction, and sustainable development goals, application development, green material, and conclusions. Each of these sections has its own sub-contents that are more relevant to the study. To identify current research information, the researcher will present a literature summary of the completion of an ongoing investigation in this chapter.

2.2 SMART GOALS

The objective of the research is to provide direction, inspiration, a distinct emphasis, and clarification of importance. You give yourself a target to shoot for by making goals. Setting goals is aided by using a SMART goal. SMART, or Specific, Measurable, Achievable, Realistic, and Timely, is an acronym. To help you focus your efforts and improve your chances of success, a SMART objective contains all these characteristics. (CFI Team, 2023)

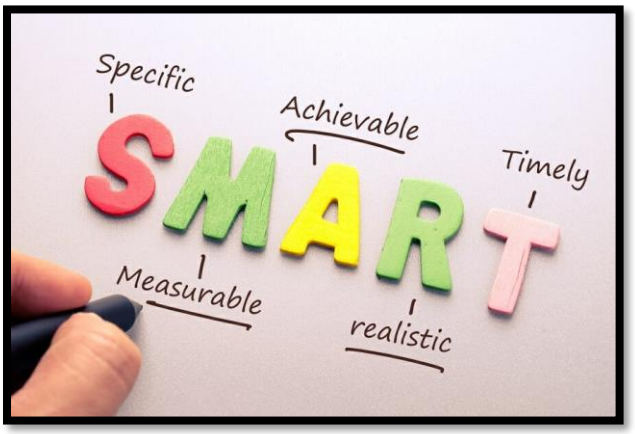


Figure 2.1: SMART Goals (CFI Team, 2023)

SMART goals are:

Specific: Well defined, clear, and unambiguous

Measurable: With specific criteria that measure your progress toward the accomplishment of the goal

Achievable: Attainable and not impossible to achieve

Realistic: Within reach, realistic, and relevant to your life purpose

Timely: With a clearly defined timeline, including a starting date and a target date. The purpose is to create urgency.

2.2.1 Specific

Specific goals have a substantially higher likelihood of being achieved. The five "W" questions must be considered in order to make a goal specific:

a) **Who**: Consider the people who must participate for the objective and the target to be met.?
b) **What**: Think carefully about the goal you want to achieve and don't be afraid to discuss it in depth with others.?
c) **Where**: Know the study area and scope of the research.
d) **When**: To manage time and move towards the target, create a timetable using a Gantt chart.
e) **Why**: Know the reason and objective and aim towards archiving the target goal

2.2.2 Measurable

Goals must be quantifiable so that concrete evidence may be provided along the way. Tracking your achievements is enjoyable! This can be done by simply designating a deadline for your accomplishment. The goals are something that can be measured and are essential SMART objective metrics for tracking progress. The selection of the criteria list allows for the measurement and tracking of the objective goals. When establishing milestones for a project that will take several months to finish, take into account specific activities to complete. A milestone are the act of tasks that, when finished all at once, will enable the achievement of the main objective. There will be a source of information that should be available to analyse or decide whether a goal has been achieved. Additionally, it is a sign of how effectively an objective will be accomplished, either directly or indirectly. Activities for gathering data to measure a target may be included in the action plan for an objective. Quantitative and qualitative measurements are also available. Examples of quantitative data include productivity gains, financial gains, etc. There are surveys, testimonies, and other available qualitative examples.

2.2.3 Achievable

A SMART objective ought to be achievable. This will assist you in determining how to achieve that objective and make progress towards it. The goal's reachability should be sufficiently specified for you to be able to accomplish it while still feeling stretched enough to feel challenging. With the objective being set and a bit of focus it is guaranteed when a task is given it is archived by the person. The path to accomplishing the objectives is to adapt a new mindset and acquire new skills, in order for us to feel to be able to accomplish with the perception of motivated the goal has to be achievable.

2.2.4 Realistic

A SMART goal must be realistic in that the goal can be realistically achieved given the available resources and time. A SMART goal is likely realistic if you believe that it can be accomplished. The objective must be relevant, realistic, worthwhile, advantageous, and able to satisfy our needs. This stage involves verifying the significance of the purpose and its consistency with other significant objectives. To be successful, it needs other people’s assistance and support. Ensure that the tactics are applied in order to accomplish everyone's objectives and advance the group as a whole.

2.2.5 Timely

A SMART goal must be time-bound in that it has a start and finish date. If the goal is not time-constrained, there will be no sense of urgency and, therefore, less motivation to achieve the goal. While everyone can make goals, without a deadline it might be challenging to reach and execute them. Setting a deadline could help you achieve your goal and finish it on time. Choosing which activities to complete when is actually very beneficial. For instance, the daily and weekly task planning may include specific directions on what must be done and finished within that time.

2.3 DESIGN THINKING

Design thinking is a process for solving problems by prioritizing the consumer's needs above all else. It relies on observing, with empathy, how people interact with their environments, and employs an iterative, hands-on approach to creating innovative solutions. Design thinking is "human-centered," which means that it uses evidence of how consumers (humans) engage with a product or service, rather than how someone else or an organization thinks they will engage with it. To be truly human-centered, designers watch how people use a product or service and continue to refine the product or service in order to improve the consumer's experience. This is the "iterative" part of design thinking. It favors moving quickly to get prototypes out to test, rather than endless research or rumination. In contrast to traditional problem-solving, which is a linear process of identifying a problem and then brainstorming solutions, design thinking only works if it is iterative. It is less of a means to get to a single solution, and more of a way to continuously evolve your thinking and respond to consumer needs. (Graham Tuttle, 2021). Design thinking will provide a better understand of the nature and process of design thinking, and the difference between a novice and an experienced design thinker, and also to apply design thinking to our educational system. The main goal of the author is to identify the characteristics and characteristics of design thinking and to discuss the importance of design thinking in improving the problem- solving skills of 21st-century students. (Razzouk & Shute, 2012).

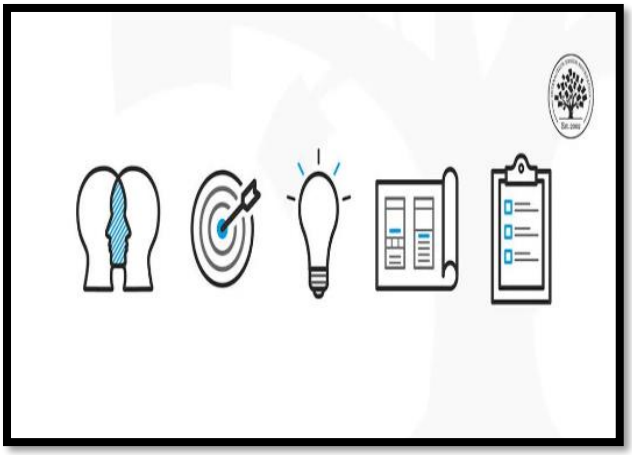


Figure 2.2: Design Thinking (Teo, 2022)

2.3.1 The Goal of Design Thinking Process

By using an observational, human-centric approach, teams can uncover main points from the consumer that they hadn't previously thought of, ones that the consumer may not even be aware of. Design thinking can provide solutions to those main points once they're identified, with design thinking it would approach complex problems from a human perspective. The design thinking process has the power to drive creativity, innovation and is user-centric to help find viable solutions that are desired by users, applicable to the business, and viable in the market. The design thinking process prioritizes user needs and requirements. The first step in the process is to create empathy with the target user and understand their needs, expectations, and behaviors. Then focus on getting ideas to quickly prototype and test with real users. The design thinking process is inseparable from initial and regular solution testing. This allows feedback to be collected and necessary changes made before the product is developed. In a nutshell, the design thinking process helps to find creative solutions to complex problems based on the needs of the target users. (Stevens et al., 2021).

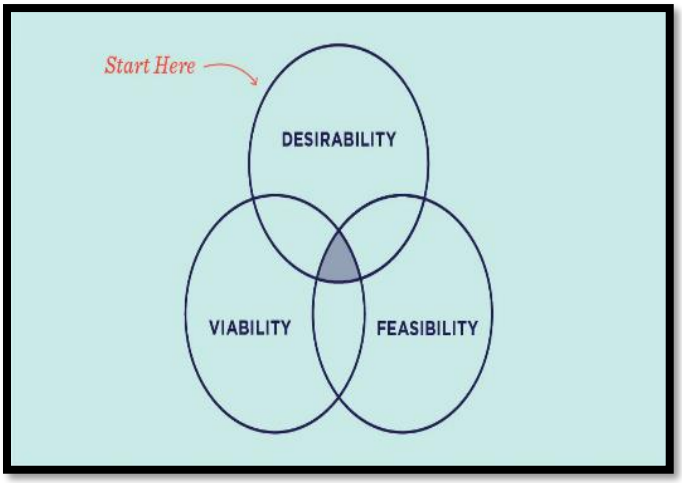


Figure 2.3: Goal of Design Thinking (IDEO U, 2022)

2.3.2 Design Thinking Process

Design thinking is an iterative process in which you seek to understand your users, challenge assumptions, redefine problems and create innovative solutions which you can prototype and test. Design thinking can be divided into 5 processes where it starts from 1. empathy, 2. define, 3. ideate, 4. prototype and 5. test. These stages can be in parallel or in repeat circle back to a previous stage at any point in the process.

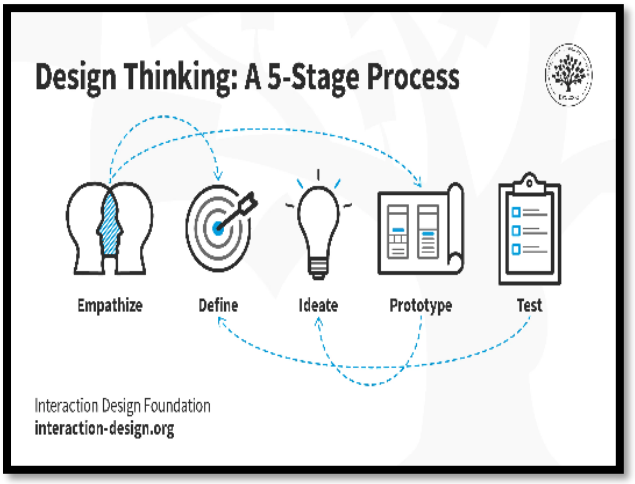


Figure 2.4: Design Thinking Process (Teo Yu Siang, 2022)

i. Empathy

Is the first process describing the ability to put yourself in someone else's shoes and understand their needs. It lets you relate to their thoughts and feelings and develop a deeper understanding of who they are as a person and also understand the perspective of the target customer/client/consumer in order to identify and solve the problem encountered. (Ildeme Mahinay Koch, 2022). Merriam-Webster defines empathy, in part, as "the action of understanding, being aware of, being sensitive to, and vicariously experiencing the feelings, thoughts, and experience of another." (Kendra Cherry, 2022)

Figure 2.5: Empathy (Teo, 2022)

ii. Define

After empathy comes define, where the process of collecting all the user center data and coming up with a problem statement. you will organize the information you have gathered during the Empathize stage. You'll analyze your observations to define the core problems you and your team have identified up to this point. Defining the problem and problem statement must be done in a human-centered manner. The Define stage will help the design team collect great ideas to establish features, functions, and other elements to solve the problem at hand or, at the very least, allow real users to resolve issues themselves with minimal difficulty. (Rikke Friis Dam, 2022)

Figure 2.6: Define (Teo, 2022)

iii. Ideate

During the third stage of the design thinking process, designers are ready to generate ideas. You've grown to understand your users and their needs in the Empathize stage, and you've analyzed your observations in the Define stage to create a user centric problem statement. With this solid background, you and your team members can start to look at the problem from different perspectives and ideate innovative solutions to your problem statement. (Emily Stevens, 2022). From this third sequence of design thinking individual can come up with several idea with pitching and present them in front to get evaluation on the content to get more detail and information towards the app/ program that is going to be delivered. This is when you can go around the room and discuss the ideas that have been presented, seeking clarity if necessary (Voltage Control, 2021).

Figure 2.7: Ideate (Emily, 2022)

iv. Prototype

After all the process of evaluation and critics developers can improve the idea to create a better app which turns the design concepts into something real that can be tested on real people. This is essential to maintaining a user-centric approach, as it allows us to gather information before continuing with full product development. This ensures that the final design solves the user's problem while remaining pleasant to use. (Simplilearn., 2021).

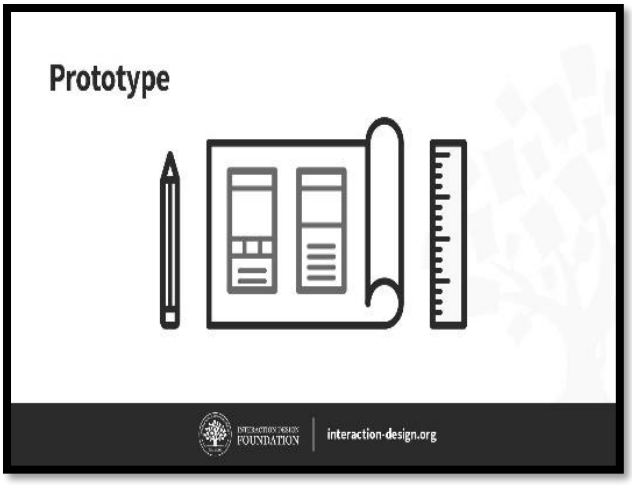


Figure 2.8: Prototype (Teo, 2022)

v. Test

Designers or reviewers correctly test the finished product using the best solutions identified at the prototype stage. This is the final step in the five-step model; however, in a constant process such as design thinking, the resulting output is often used to redefine one or more additional problems (Teo Yu Siang., 2022).

Figure 2.9: Test (Teo, 2022)

2.4 INDUSTRY REVOLUTION 4.0

The fourth Industrial Revolution (IR 4.0) has changed the landscape of educational innovation. IR 4.0 is controlled by artificial intelligence and digital physical frameworks that make human-machine interface more universal. A quick revolution in innovation has delivered another model of education for the future (Aida, et, al., 2018). The future of construction industry development is the approach of component-industrialization, the construction-breakdown, design-identical, construction-assembled, operation-data technique to maximize the life cycle value. Construction is a wide flat industry, supporting all other industries significantly, where value formation practically happens in the sense of facilities or assets development. Construction personnel allocate only around 30% of their functioning time to their main task. The residual 70% is occupied by consecutive errands, moving ingredients, arranging up, reorganizing the building site and observing resources and equipment. The construction industry is on the border of an innovative industrial era. IR 4.0 which will convert the construction industry in the direction of further digitally developed trades. The notion of creating a "digital twin" of a building or a piece of infrastructure is central to enables accurate, well-informed decisions to be made throughout the project lifecycle (Wesam et, al., 2018).

Impact or IR 4.0 in construction projects became continually further complex, budget and schedule weights are increasing while quality potentials growing. Contrasted with numerous different industries, the construction industry has usually been late in technological progress. Consequently, the industry improvements have been insufficient and remained almost flat for the previous 5 decades. Personnel in the construction businesses depend deeply on specific skills, particular practice, technology preparation, and judgment based on experience which are enormously challenging to be automated. Recent research has revealed that the construction industry has failed to keep pace with productivity improvements seen in the manufacturing sector over the last 20 years. Digital data covers the electronic gathering and processing of data to get new and current perceptions into each relation in the value chain and after that place these current perceptions to better usage. Finally, connectivity discovers the potential to link up and synchronize previously discrete tasks. For stakeholders in the

construction industry, the value chain can be broken down into the succeeding associations: Procurement and materials account for a great mass of entire budget in the construction projects (Mohd Shahir et, al., 2018).

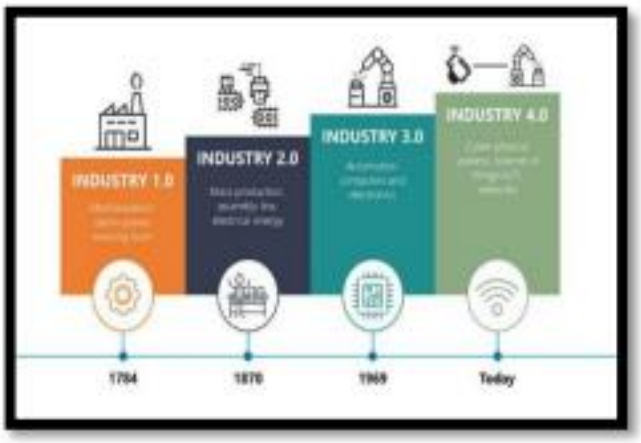


Figure 2.10: IR 4.0 (Jolene Amit, 2019)

2.5 SUSTANABLE DEVELOPMENT GOAL (SDG)

The Sustainable Development Goals (SDGs), commonly referred to as the Global Goals, were adopted by the United Nations in 2015 as a global call to action to eradicate poverty, protect the environment, and guarantee that everyone lives in peace and prosperity by the year 2030. The 17 SDGs are interrelated, recognizing that decisions made in one area can influence how other decisions are made, necessitating a balance between social, economic, and environmental sustainability in development. Infrastructure investment and innovation are key forces behind economic growth and advancement, according to sustainable development objective number nine. Mass transit, renewable energy, the development of new businesses, and information and communication technology are all growing more and more important, with more than half of the world's population now residing in cities. Other long-term solutions to economic and environmental issues, like creating new jobs and improving energy efficiency, depend on technological innovation.

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development has continued to evolve as that of protecting the world's resources while its true agenda is to control the world's resources. Environmentally sustainable economic growth refers to economic development that meets the needs of all without leaving future generations with fewer natural resources than those we enjoy today. The essence of this form of development is a stable relationship between human activities and the natural world, which does not diminish the prospects for future generations to enjoy a quality of life at least as good as our own (Puja Mondal, 2021). Goal 9 which is Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation would have a major impact if there is new innovation towards the problem discussed also by innovation it would increase economic growth and provide long-term development. Assist developing countries in strengthening their scientific and technological capacities in order to shift to more sustainable consumption and production practices (SDGs, 2021).

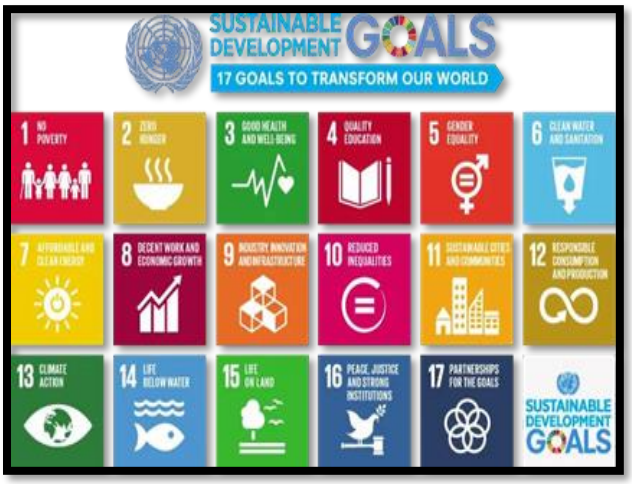


Figure 2.11: Sustainable Development Goals (the United Nation, 2016)

2.6 CONSTRUCTION INDUSTRY

Construction industry refers to the industrial branch of manufacturing and trade related to building, repairing, renovating, and maintaining infrastructures. It is a determinant of the country's technological and technical advancement, often regulating the growth of the country's infrastructural development that often directs to the country's advancement in terms of sustainability assurance. Regardless of how the building sector aids in development, it is not an environmentally friendly activity since if its growth and development are not carefully planned, many issues could arise. A significant concern for the public now is how to manage environmental dangers associated with development. construction industry is not by nature an environmentally friendly activity and it is a major contributor to environmental impacts, which are typically classified as air pollution, noise pollution and water pollution. While according to (Tam et al., 2006), construction industry is one of the biggest generators of pollution in Hong Kong and becoming a critical issue.

Construction industry contains many elements which yield high carbon footprint such as cement and aggregates production and transportation. Cement has one of the largest shares in generating carbon footprint with a production of 7% of world total CO2 emission: China is the biggest producer of cement, followed by India with nearly 2350 million metric tons (Akhtar and Sarmah, 2018). Sustainability in the construction industry is inevitable and this not only means that it must reduce carbon footprint and save the environment, but it should also contribute to conserve the natural resources which are fundamental for continuous growth (Kisku et al., 2017; Akhtar and Sarmah, 2018; Behera et al., 2014). On the other hand, waste generated from construction activity and demolition of old structures is a matter of concern all over the world. Construction of buildings often results in the production of unnecessary waste which can be due to excessively ordered supplies or mishandling of materials by unskilled laborers. Furthermore, demolition is essential for the development of mega cities where lack of space is the greatest obstacle, either the building has completed its life span or needs to be renovated. In most circumstances, demolition is a desirable option to

consider because of the economic point of view and it is less time-consuming. Finally, waste can also be generated following a natural disaster.

2.7 CONSTRUCTION TECHNOLOGY

Construction technology, according to the Construction Industry Institute, is "the collection of innovative tools, machinery, modifications, software, and other technologies used during the construction phase of a project that enables advancement in field construction methods, including semi-automated and automated construction equipment." (Jones, 2020); Construction-related new technologies are being created at a dizzying rate right now. The connected tools and equipment, telematics, smartphone apps, autonomous heavy equipment, drones, robots, augmented and virtual reality, and 3D printed buildings that appeared like future technology ten or twenty years ago are now commonplace on job sites all over the world. (Jones, 2020)

Apps are becoming used in the construction industry, and for good reasons, Because of their higher portability, tablets and smartphones enable more effective communication as well as mobile working. More specifically, data collecting apps assist building enterprises in obtaining data from the jobsite that is quicker, more precise, and of higher quality. This type of technology is straightforward to use and costs less money up front while still offering substantial advantages such as Significantly reduced data entry errors and time savings. Users of data collection apps have reported saving more than 20 field and administrative hours per week and experiencing a 50% decrease in data input errors. Enhanced workflows, it can automate workflows for data collecting such that once one form is submitted, another one is sent, and so on, until a task is finished with all required signoffs and data has been gathered. Additionally, some data gathering tools provide web forms and mobile forms apps so your staff may submit forms on their computers, desktops, cellphones, tablets, and pretty much any other type of electronic device. Improved safety compliance, data collection apps can facilitate everything from daily equipment inspections to near miss reporting to a comprehensive job safety analysis. Finally Instant reporting, depending on the company's needs, reports

can be quickly modified. (Long, 2022). Construction companies are beginning to utilise technology. Construction companies who are investing in and utilising technology are seeing increased productivity, improved teamwork, and projects finished on time and under budget, all of which has led to bigger profit margins.

2.8 CONSTRUCTION DELAYS

According to an article called delays in construction from the constructor a construction project is essentially a short-term, budgeted undertaking that is started to produce a special, usually limited-edition product, service, or outcome. To produce that one-of-a-kind development on a specific location under circumstances that will never be duplicated, the project team gets together. Construction can start despite numerous uncertainties, but they may be complex and require high levels of coordination of permissions, people, products, plant, and materials. As a result, delays are frequent. Additionally, the use of cutting-edge technologies and owner-requested alterations makes it even harder to maintain a project on schedule. Inherent uncertainties and sophistication in the physical, financial, and economic environments in which most projects are carried out go hand in hand with this state.

Such circumstances have made it challenging to complete projects on time and under budget, frequently resulting in requests for cost reimbursements and time extensions. Construction delays are defined as a time difference between the start and finish of an activity relative to the baseline timetable, or as a late start or late completion of an activity, directly affecting the stipulated cost. As a result, additional time will be needed, which will lead to fines, increased costs due to inflation, contract termination, legal proceedings, etc., or combinations of the reasons, leading to delay damages.

2.8.1 Causes of Construction Delays

Causes of construction delays result to a mismanaged event/s and can be seen as a risk for the projects, which if identified, analyzed, and managed in a systematic process at inception, could be managed, minimized, shared, mitigated, or accepted to give some good results and minimize chances of further delay. Delay in construction project has a negative effect on clients, contractors, and consultants in terms of growth in adversarial relationships, mistrust, litigation, arbitration, and cash-flow problems. the causes of each project to fall out are:

i. Change In Project Scope

The scope of work in a construction project defines the deliverables that are expected at the end of a project. Any construction project that has a poor scope definition at the beginning is likely to experience cost overruns and schedule delays. As a result, the original project scope is typically used to compute all project plans, schedules, costs, quantity estimations, procurement, and quality mechanisms.

ii. Project Complexity

For the project to be finished, a supplement to the initial proposed/allocated budget may be required due to changes in material prices, exchange rates, and inflation rates. The end effect could be higher costs and protracted negotiating processes, which ultimately lengthen the construction project's overall time. Similar to this, complex projects typically have intricate planning, schedules, and estimations.

iii. Inadequate Planning

Planning includes estimating all the facilities, different pieces of machinery, supplies, vendors, laborer, and other resources needed to accomplish the curtain phase of the construction. There are various activities/tasks that need time to settle or to execute the succeeding activity throughout the construction process, such as the time needed for the other layer of concrete to be laid, the time needed

for the prime coat to settle, and others. To ensure while preparing, a planner or responsible person should have sufficient understanding of these settling times.

iv. Impropriate Project Schedule

The work activities are organised by scheduling in a chronological, logical order in order to complete the project within the allotted time period. To effectively manage and work on a project, scheduling is a crucial component to making the most of the labor and resources at hand. The sequential order of building operations, accurate logical relationships between the activities, and the resources needed for each activity are all essential for scheduling. An improper project schedule will cause the critical activities to suffer and the delay to extend past the construction time frame because valuable project resources will be redirected to the non-critical activities.

v. Inefficient Material and Equipment Management

Managing supplies and equipment is an essential part of carrying out the project. Both are significant financial outlays for any construction project, with material costs making up between 60% and 70% of total project costs. Therefore, reducing the entire procurement/purchase or leasing cost might have a significant impact on the project's overall cost. Due to the lack of material and equipment at a crucial period, poor management can also cause significant and needless expenses during construction and a delay in the completion of the critical activities.

As a result of investigation, the researchers are interested in investigating several reasons why the construction industries are delayed. The main reasons for the delay include the contractor's financial issues, a change in order, and poor project planning or scheduling. (Odeh and Battaineh, 2018); Additionally, the main reasons for delays, their results, and strategies for minimising them for construction projects (Majid and McCaffer, 2018). There are eight reasons that contribute to building project delays, including:

i. Contractor-related delays
ii. Equipment-related delays
iii. Client-related delays
iv. Material-related delays
v. Finance-related delays
vi. Consultant-related delays
vii. External-related delays
viii. Manpower-related delay

2.8.2 Effect of Construction Delays

Construction project delays cost money every time. This is because construction projects usually contain interest-bearing loans, time-dependent management costs, and continual labour and material price increases. Delays in the construction process could also result in the project being completely abandoned. Undoubtedly, the contractor, consultant, subcontractor, supplier, and other pertinent parties are among the many contractual parties affected by a complete project abandonment. The effect may causes:

i. Overtime
ii. Over cost
iii. Disputes
iv. Negotiations
v. Abandonment

2.8.3 Types of Delays in Construction Projects

Before analysing construction delays, it's critical to comprehend the sorts or categories into which a delay can be divided. A thorough grasp of the different forms of delays is required in order to start the additional mitigation measures and turn it into a merit. There are four main categories or classifications for the delays A) Critical or non-critical delays B) Excusable or non-excusable delays C) Concurrent delays D) Compensable or non-compensable delays Prior to assessing the effects of delays on the

project, it is necessary to comprehend how the categories are assimilated. Delays can also be classified as compensable or non-compensable.

i. One must determine whether the delay is critical or non-critical.
ii. Additionally, all delays are either excusable or non-excusable.
iii. Both excusable and non-excusable delays can be defined as either concurrent or non-concurrent.
iv. Delays can be further broken down into compensable or non-compensable delays.

2.8.4 Critical and Non-Critical Delays

A delay that is responsible for extending project duration is a critical delay. Few results are such as extended field overhead, liquidated damage, idle labour & equipment cost labour and material cost escalation. For the non-critical delays, it is not the cause of extended project duration however, it will have an effect in terms of activities getting completed late than scheduled completion. these activities will also affect project cost estimates as idle labour & equipment cost, labour and material cost escalation.

2.8.5 Excusable & Non-Excusable Delay

Excusable delays occur when the contractor is entitled to a deadline extension, payment, or both under the terms and conditions of the contract. In this instance, the contractor has no control over whether the activity is delayed. There could be Clause of Force Measures, Natural disasters, Social/Political Unrest also not to forget client's Delay. A delay where the contractor is totally accountable for the operations becoming delayed and resulted in extending project duration are non-excusable delays. In this situation, the contractor is liable for any financial repercussions, including the possibility of having to pay damages not just to itself but also to third parties.

2.8.6 Compensable or Non-Compensable Delays

When delays are compensable, the contractor is responsible for Time Extension & Cost Compensation. Excusable delays encompass all compensable delays, but non-compensable delays refer to delays that are only the contractor's fault. However, depending on the circumstances it has caused and the terms of the contract, non-compensable may fall under critical, non-critical, excusable, or non-excusable categories.

2.9 MISCOMMUNICATION

Miscommunication in the workplace occurs when coworkers don't communicate effectively, so they don't understand the intent and meaning of the message conveyed to them. Unfortunately, this can potentially lead to internal conflict and employee dissatisfaction. Miscommunication happens more often than you probably think. Namely, according to the report The State of Miscommunication, a whopping 81% of employees say workplace miscommunication occurs very frequently, frequently, or occasionally. What's even more interesting is the fact that 50% of employees say that they've never, seldom, or rarely directly been involved in workplace miscommunication (Jelena Fisic, 2022). Effective communication is important in any relationship, especially in the workplace where customers and employees depend on it to be successful. When there is a breakdown between individuals, we most often assume that communication is at least part of the root cause solution. Style inventories, team-building activity programs and communication workshops are commonly used for improving communication. While these are important tools, they aren't enough to effectively move the needle for ensuring clear and effective communication. Why? Because, they are generally dealing with the symptoms of communication, not the real sources of miscommunication. (Mark Samuel, 2022).

To avoid miscommunication is it important to understand the requirements of a project communication plan, two needs should be known: the need to understand what

the project would require from its communication system and the need-to-know what communication methods and communication styles might be used to effectively address these requirements. Poor communication during projects affects the schedule, the cost, the safety of workers and the project quality. Improved communication by the project manager may lead to less failure, innovation, and technical solutions, positively influencing the quality and leading to better decision making (BG Zulch, 2014)

Miscommunication often happen when there is problem regardless of attitude it is always relate towards the documentation, documentation is the major factor which tells the progress of the project without the documentation the contractor can't make the claim because as it will state that there is no progress, another is the mishandling of the documentation which it won't reach on site by the time the progress is going on this will create the work place to unable to carry out the work. Drawings also is related to the documents because it won't be completed it will cause the contractor to repeat the job twice, sometimes there is new revision of drawing, but it is not updated to the contractor which makes the miscommunication form the contractor and consultant side to happen.

2.10 CONSTRUCTION DRAWINGS

Construction drawing is the general term used for drawings that form part of the production information that is incorporated into tender documentation and then the contract documents for the construction works. This means they have legal significance and form part of the agreement between the employer and the contractor. The main purpose of construction drawings is to provide a graphic representation of what is to be built. Construction drawings should be concise and coordinated to avoid, wherever possible, ambiguity and confusion. Delays and misunderstandings can be minimised by properly coordinating the drawings. Specifications will detail the materials, standards, techniques, and so on required to carry out the works. Construction drawings provide the graphical representation, indicating the arrangement of components, detailing, dimensions, and so on. They may sometimes contain some of the information set out in

specifications, but this should be avoided, if possible, by referring to specifications rather than duplicating information. Where there is a crossover, care must be taken to ensure proper co-ordination so there is no confusion. If there is a disparity between the two, the specifications will tend to take precedence over the drawings. A complete set of construction drawings tends to comprise floor plans, elevations, sections, and detail drawings, that together provide a complete representation of the building. On many projects, each major trade will have separate trade drawings, e.g., electrical, plumbing, and so on. Construction drawings may be prepared by hand, but it is more common for them to be prepared using computer-aided design (CAD) (or computer-aided drafting) software (Sonit Bafna., 2019).

Figure 2.12: Construction Drawings (Yashkumar Shah, 2018)

2.11 CONSTRUCTION DOCUMENTATION

Documentation plays a role in a construction where the demand of quality construction requires close project monitoring and continuous efforts to improvise. The solution to meet this relevant demand is to have accountability of the work done, which can be done with construction and records. Construction records and documents are the mirrors of a project it not only reflects the state of project but also boosts quality work and quality control. Irrespective of the usefulness of it, there are various causes and sources of errors in record keeping and benefits too, is also described. It will not be

exaggerated to state that construction documents and records help in sustainable project management. (Aditya, et,al., 2017). Based on relevant literature review and pilot survey, key differences among the construction documents and records are described at the same time. Thus, it also gives the complete idea regarding documents and records and role played by them in risk mitigation. A digital document is often used by all the department to provide material product information, work progress, documentation needed, memo or details for on-site reference by workers. Websites can then be used to refer directly to the work being displayed or used for more information. and installation work on site. In addition, it can help the users to easily keep track of the documentation and drawing for an area. Since the purpose of documents is often to present information in an easy-to-navigate manner, these documents can be used to demonstrate the work of workers or others. Operations and management can also create digital documents for internal use, making it easier to access and refer to shared resources within the company (Wiesen, 2021).

2.12 PAPER IMPACT TOWARDS ENVIROMENT

It’s no surprise to hear that pollution from manufacturing and waste has a direct and negative impact on the environment. Everything from paper clips to fax machines are contributors to the problem. Many businesses are stuck between a rock and a hard place, they’re trying to minimize their effect on the environment, while providing maximum productivity for both their consumers and employees. Paper alone accounts for 40% of all waste in the United States. That adds up to about 71.6 million tons per year. What many hope to reduce, reuse, and recycle, unfortunately and overwhelmingly ends up being dumped into a landfill. Waste from paper is a big issue. It’s easy to forget that production of paper also has a devastating impact on the world we live in. Deforestation has increased at an alarming rate. Paper manufacturing used up to 40% of all global wood. The process of manufacturing paper releases nitrogen dioxide, sulfur dioxide, and carbon dioxide into the air, contributing to pollution such as acid rain and greenhouse gases. Furthermore, the US consumes more than 30% of all paper products globally, despite being only 5% of the world’s population. (Dennis Kempner., 2016).

2.13 ANDROID DEVELOPMENT

Android development is a form of software engineering dedicated specifically to creating applications for devices that run on the Android platform. (Anthony Corbo, 2023). Android offers a unified approach to application development for mobile devices which means developers need only develop for Android, and their applications should be able to run on different devices powered by Android. There are four key components of an Android app that allow apps to function, and Android development may use numerous programming languages which are:

i. Activities

The activity is the single-screen user interface that serves as the user's first point of contact with app. independent activities are in charge of supporting crucial interactions between the system and the app, such as keeping track of what is on the screen, to guarantee that the system keeps executing the process hosting the activity. Independent activities cooperate to create a seamless user experience.

ii. Services

When another app is open or the user is not actively using the device, services operate as a general-purpose entry point to keep an app running in the background.

iii. Content Providers

An app can access shared sets of data that are managed by a content provider and kept in the file system. Approved apps are permitted to query or modify data by content providers.

iv. Broadcast Receivers

A broadcast receiver enables the system to send events, like system-wide broadcast announcements, to an app outside of the normal user flow.

Figure 2.13: Android Development (Anthony Corbo, 2023)

2.14 WEB DESIGN

The planning and development of websites is known as web design. This encompasses a variety of unique abilities that are all grouped together as web design. Information architecture, user interface, site structure, navigation, layout, colours, fonts, and overall imagery are a few examples of these skills. To construct a website that fits the objectives of the business or person from whom that site is being created, all of these abilities are blended with design principles.

2.14.1 Key Part of Web Design

Design encompasses both the design elements lines, forms, textures, colours, and direction following the design principles which are balance, contrast, emphasis, rhythm, and unity. A web designer builds websites, but a skilled web designer is also familiar with the limitations of the Web in addition to design principles. (Jennifer Kyrinn, 2020).

2.14.2 Different Roles of Software

To create an entire sites or just individual pages a web designer should know all the roles of the software that will be in used of it such as:

i. **HTML** — This is the structure of web pages, creating the foundation of all websites.

ii. **CSS** — This is how web pages are visually styled. CSS (Cascading Style Sheets) handles the entire look of sites, including layout, typography, colors, and more.

iii. **JavaScript** — This governs certain behaviours on websites and can be used for a variety of interactions and features.

iv. **Server management** — All websites need to be hosted. The management of the servers that host those sites is an important web design skill.

v. **Design** — Creating the visual look and feel of websites has always been an important aspect of the industry.

vi. **Speed** — A successful site is one that loads quickly on a wide variety of devices, regardless of a visitor's connection speed. Being able to tune the performance of sites is a very valuable skill.

vii. **Content** — People come to websites for the content that those sites contain. Being able to create that content is a critically important component in the world of website design.

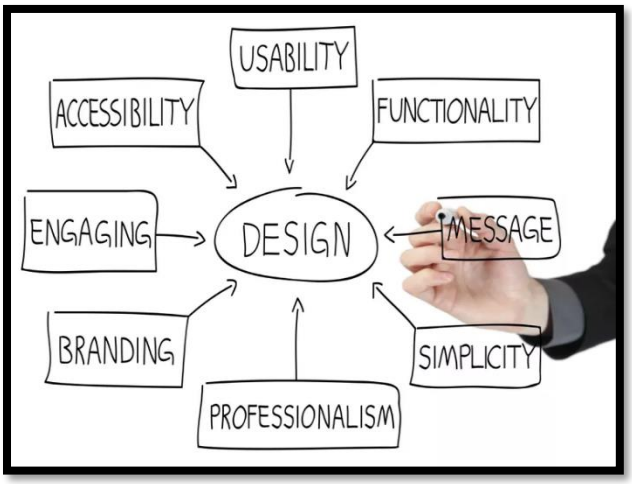


Figure 2.14: Web Design (Jennifer Kyrinn, 2020)

2.15 DATABASE

A database is a planned grouping of material that has been organised and is often kept electronically in a computer system. A database management system (DBMS) typically has control over a database. The term "database system," which is frequently abbreviated to "database," refers to the combination of the data, the DBMS, and the applications that are connected to it. To facilitate processing and data querying, the most popular types of databases currently in use typically model their data as rows and columns in a set of tables. The data may then be handled, updated, regulated, and organised with ease. For writing and querying data, most databases employ structured query language (SQL). (Oracle, 2022)

2.15.1 Database Software

Database software is used to build, modify, and maintain database files and records, making it simpler to create, enter, edit, update, and report on files and records. Data storage, backup, reporting, multi-access control, and security are other functions handled by the software. Strong database security is crucial nowadays since data theft

is becoming increasingly common. A "database management system" (DBMS) is another name for database software.

2.15.2 Database Management System (DBMS)

A database management system (DBMS), which is a comprehensive database software programme, is normally needed. A DBMS acts as a conduit between the database and the applications that will use it, enabling users to access, modify, and control how the data is arranged and optimised. A DBMS also makes it easier to monitor and manage databases, enabling a number of administrative tasks like performance tweaking, backup, and recovery.

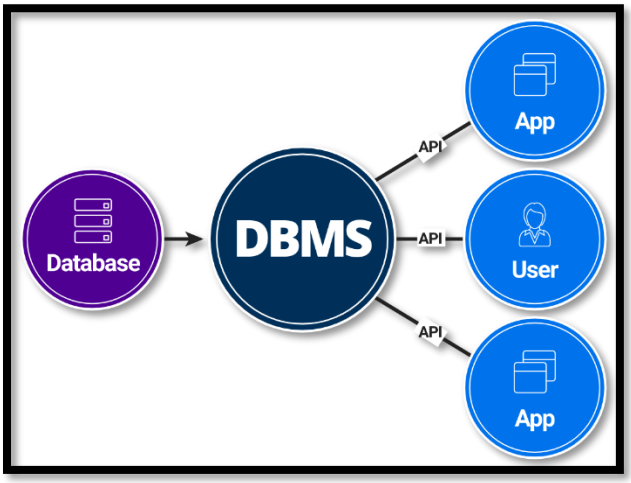


Figure 2.15: Database (Andy Marker, 2021)

2.16 SOFTWARE USED

Software is a set of instructions, data or programs used to operate computers and execute specific tasks. It is the opposite of hardware, which describes the physical aspects of a computer. Software is a generic term used to refer to applications, scripts and programs that run on a device. Application software and system software are the two main subcategories of software. Applications are pieces of software that carry out

tasks or address certain needs. Middleware, which lies between system software and applications, driver software, which controls computer peripherals and devices, and programming software, which offers the programming tools needed by software developers. Early software was created for certain machines and sold alongside the hardware those computers used. Software started to be marketed on floppy discs in the 1980s, and then on CDs and DVDs. Most software is now bought and downloaded simply from the internet. Websites for vendors or application service providers may contain software. (Linda Rosencrance, 2021).

i. Application Software

Application software, the most prevalent kind of software, is a set of computer programs that carry out a particular task for a user or, in some situations, for another application. Applications can be standalone or comprise a collection of programs that operate them on the user's behalf.

ii. System Software

These software packages are made to run the hardware and application software on a computer. The actions and features of the hardware and software are coordinated by the system software. Additionally, it manages how the computer hardware functions and offers a setting or platform in which all other software can operate.

2.16.1 Software Used for Application Design

To create an application for the study the software used are Android Studio alongside Flutter Framework for open android source with the data storage of MySQL to secure and gather data from API, to top it all of Json Web Token is used for the security for the application and the Data Storage of all files. To create an application approximately 1 month is taken into consideration of coming out with the storyboard, meeting with the developer and then creating the application finally testing and

finalizing the application to be published onto the App Store, Google Play Store and App Gallery. The software being used will be explained in detail below.

i. Android Studio

From the Developers page, Android Studio is built on JetBrains' IntelliJ IDEA software and created exclusively for Android development, Android Studio is the recognised integrated development environment (IDE) for Google's Android platform. On Windows, macOS, and Linux-based operating systems, it can be downloaded. As the main IDE for creating native Android applications, it takes the position of the Eclipse Android Development Tools (E-ADT). At the Google I/O conference on May 16, 2013, Android Studio was unveiled. Beginning with version 0.1 in May 2013, it was in the early access preview stage. From version 0.8, which was released in June 2014, it moved into the beta stage. Starting with version 1.0, the first stable build was released in December 2014. Google stopped supporting Eclipse ADT at the end of 2015, leaving just Android Studio as an officially approved IDE for Android development. As of May 7, 2019, Google's recommended language for creating Android apps is Kotlin, not Java. C++ and Java are still supported. Android Studio offers even more features that enhance your productivity when building Android apps, such as:

i. A flexible Gradle-based build system
ii. A fast and feature-rich emulator
iii. A unified environment where you can develop for all Android devices.
iv. Apply Changes to push code and resource changes to your running app without restarting your app.
v. Code templates and GitHub integration to help you build common app features and import sample code.
vi. Extensive testing tools and frameworks
vii. Lint tools to catch performance, usability, version compatibility, and other problems.
viii. C++ and NDK support

ix. Built-in support for Google Cloud Platform, making it easy to integrate Google Cloud Messaging and App Engine

With Android Studio, users are able to do multiple APK support. Efficiently create multiple APKs based on screen density or ABI. For example, you can create separate APKs of an app for the hdpi and mdpi screen densities, while still considering them a single variant and letting them share test APK, javac, dx, and ProGuard settings.

Figure 2.16: Android Studio (Developers, 2023)

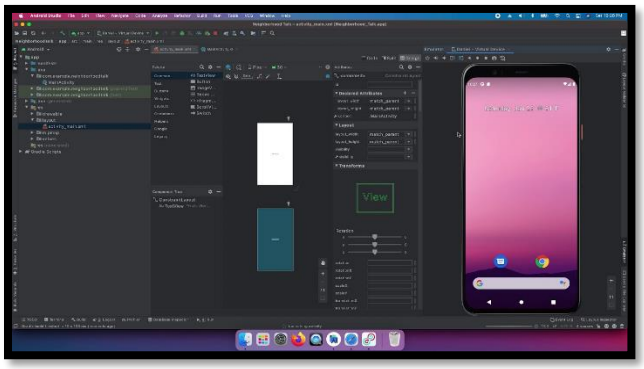


Figure 2.17: Android Studio Interface (Developers, 2023)

ii. Flutter Framework

Google's portable UI toolkit, Flutter, allows developers to create stunning, natively built applications from a single codebase for desktop, mobile, and the web. Flutter is free and open source, integrates with existing code, and is utilised by developers and businesses all over the world. Flutter lowers the barrier to entry for developers while creating apps. It expedites app development and lessens the expense and difficulty of creating apps across platforms.

Flutter offers a blank canvas for premium user experiences for designers. Flutter was named one of the best design ideas of the decade by Fast Company for its capacity to translate ideas into working code without the limitations imposed by conventional frameworks. With CodePen integration, it also serves as an effective prototype tool for communicating your ideas to others.

By combining app developers into a single mobile, web, and desktop app team with Flutter, branded apps for many platforms can be created from a single codebase. Release timelines are synchronised throughout the entire client base via Flutter, which accelerates feature development. (Flutter, 2023)

Figure 2.18: Flutter Framework (Flutter Website, 2023)

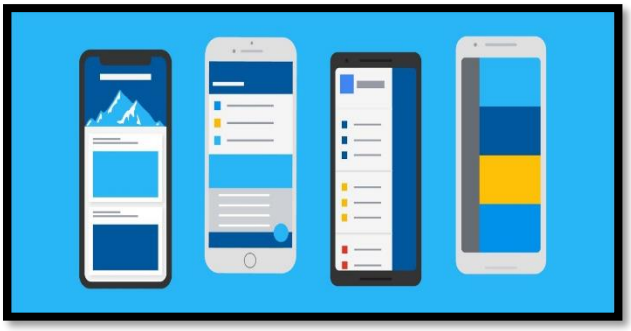


Figure 2.19: Flutter Framework Interface (Flutter Website, 2023)

2.16.2 Software Used for Website Design

PHP API

The classes, methods, functions, and variables that your application will need to call in order to do its intended task are defined by an application programming interface, or API. The required APIs for PHP applications that

need to interface with databases are typically made available through PHP extensions.

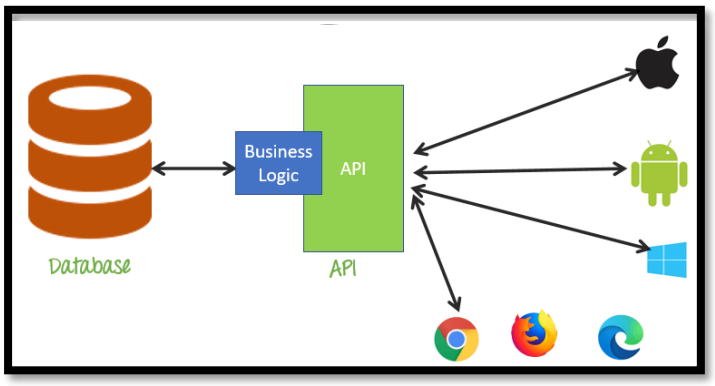


Figure 2.20: API (Alyssa Walker, 2023)

2.16.3 Database Used for Application and Website

As for the database, for the development of the application and website it will use MySQL to store all the files pictures and activities with the security of the documents of PHP API to make all the documents accessible to the users involved. Data could not be breached without any authority.

MySQL

A database is a systematic collection of data. It may be anything from a basic grocery list to a picture gallery or the massive volumes of information in a business network. A database management system, such as MySQL Server, is required to add, access, and process data contained in a computer database. Database management systems, whether used as stand-alone programs or as a component of other programs, are essential to computing because computers are excellent at processing vast volumes of data. Anyone can use and modify the software because it is open source. The MySQL software is available for free download and usage online by anyone. You are free to examine the source code and modify it as necessary. In addition to your other apps, web servers, and other software, MySQL Server can function smoothly on a desktop or

laptop while requiring little to no maintenance. You can modify the settings to utilise all the RAM, CPU power, and I/O capacity if you dedicate a whole machine to MySQL. Additionally, MySQL can scale networked clusters of machines. (MySQL, 2023)

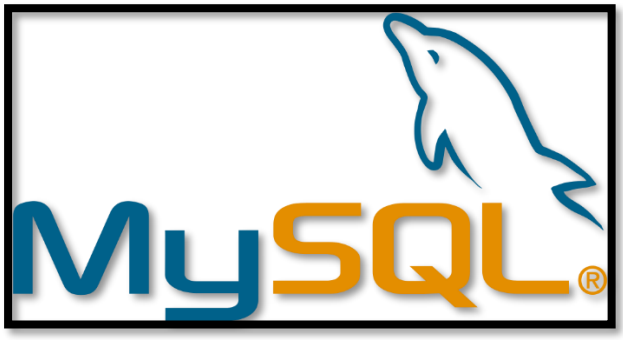


Figure 2.21: MySQL Database (MySQL Website, 2023)

2.16.4 Security Used for Application and Website

JWT, or JSON Web Token, is an open standard that allows two parties, a client and a server, to exchange security information. Each JWT includes encoded JSON objects as well as a set of claims. JSON stands for JavaScript Object Notation and is a text-based format for transmitting data across web applications. It stores information in an easy-to-access manner, both for developers and computers. It can be used as a data format by any programming language and is quickly becoming the preferred syntax for APIs, surpassing XML. (Akana, 2020); A token is a discrete or self-contained secure communication and transfer mechanism for passing sensitive information between two parties. Whether on a website or in an application, tokens are typically employed to bolster the authentication procedure. A secondary service authenticates a server request when using token-based authentication. The server responds to the request and returns a token after the verification is complete. (Alisha Chhabra, 2023).

2.17 QUESTIONNAIRE

Written questionnaires are well-liked and useful in the study and evaluation of projects for performance development. They are tools that allow the respondent to submit information to them in writing or by using the images; in response, they must write something down, such as a check, a circle, a word, a sentence, or a few sentences. Data may be gathered via questionnaires by asking questions or handing questions to concur with or disagree with remarks that express various points of view. It is simple and inexpensive to give questionnaires, and they can yield a wealth of data in a reasonable amount of time. (Roopa S, Rani M, 2012); It is very important that questionnaires are properly well prepared, designed and provides straight to the point questions to the respondent. The targeted goals as where questionnaire items must have a high level of applicability, accountability, and technical quality in order to be utilised as an analysis and evaluation instrument to gauge participants' attitudes or feelings regarding performance development.

2.17.1 Questionnaire Design

It is crucial that considerable thought be given to the design of your questionnaire in order to collect relevant and usable information. A well-designed questionnaire demands consideration and work, and it must be planned out and developed in stages.

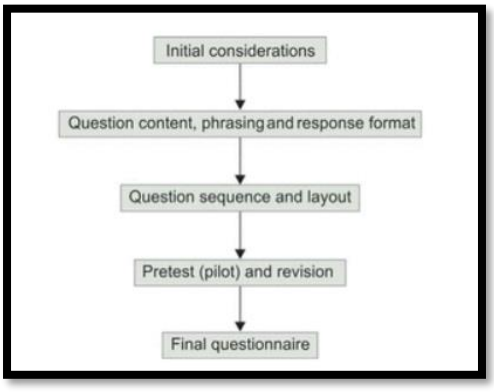


Figure 2.22: Development Stages (S Roopa & MS Rani, 2012)

2.17.2 Type of Survey Question

There are about four basic types of survey questionnaires. They are used in accordance with the survey's objectives.

i. Closed-ended Question.
Respondents' answers are limited to a fixed set of responses. Most scales are closed ended. Types of closed-ended questions include:

a. Yes/No question the respondent answers the questions with a 'yes' or a 'no'.
Example: Have you ever visited a dentist?

b. Multiple choice the respondent has several options from which to choose. Example: How would you rate this product
(i) Excellent (ii) Good (iii) Fair (iv) Poor

c. Scaled questions responses are graded on a continuum (example: Rate the appearance of the product on a scale from 1 to 10, with 10 being the most preferred appearance). Examples of types of scales include the Likert scale and Semantic differential scale. Likert scale is a psychometric scale commonly involved in research that employs questionnaires to measure social attitudes. Example: Are you happy with your child's teeth arrangement?
(1) Strongly disagree (2) Disagree (3) Don't know (4) Agree (5) Strongly agree

ii. Open-ended questions.
There are no suggested options or predefined categories. The respondent responds in their own words, rather than being limited by a fixed set of possible responses. The following are examples of open-ended questions:

a) Completely unstructured—For example, ‘What is your opinion on questionnaires?’

b) Word association—Words are presented, and the respondent mentions the first word that comes to mind. Example: If interviewer says cold, the respondent may say hot and the like ones.

c) Sentence completion—Respondents complete an incomplete sentence. For example, ‘The most important consideration in my decision to buy a new house is.

d) Story completion—Respondents complete an incomplete story.

e) Picture completion—Respondents fill in an empty conversation balloon.

f) Thematic apperception test—Respondents explain a picture or make up a story about what they think is happening in the picture.

2.17.3 Method to Reach Target Respondent

i. Face-to-face interview

Personal interviews are surveys conducted in person by an interviewer who usually goes to the person being surveyed.

Merits: High response rates can clarify questions, if necessary, control over respondent selection, can use longer, more complex questionnaire and easier to motivate respondents.

Demerits: High costs, time-consuming, more administrative requirements selecting and training interviewers, traveling and contacting respondents.

ii. Internet Questions Internet surveys are a form of a written survey. Respondents are invited to participate in the survey through e-mail when they visit a particular web page.

Merits: Fast to conduct and tabulate, some software products allow questionnaires to be customized depending on respondents' answers, avoids interviewer bias and distortion, answers unlikely to be socially influenced, easy to administer and relatively low cost.

Demerits: Information transferred via the internet may not be confidential, poor control over respondent selection, follow up difficult to conduct, difficult to obtain probability sample and like the mail surveys, this is the most difficult type of questionnaire to design.

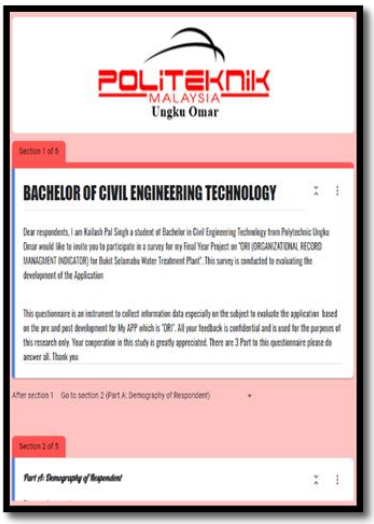


Figure 2.23: Example of Questionnaire

2.18 T-TEST

A t test is a statistical test that is used to compare the means of two groups. It is often used in hypothesis testing to determine whether a process or treatment actually has an effect on the population of interest, or whether two groups are different from one another. A t test can only be used when comparing the means of two groups. (Rebecca

Bevans, 2022); If you want to compare more than two groups, or if you want to do multiple pairwise comparisons, use an ANOVA test or a post-hoc test. The t test is a parametric test of difference, meaning that it makes the same assumptions about your data as other parametric tests. The t test assumes your data:

i. are independent.
ii. are (approximately) normally distributed.
iii. have a similar amount of variance within each group being.

2.18.1 Type of T Test

choosing a t test, you will need to consider two things: whether the groups being compared come from a single population or two different populations, and whether you want to test the difference in a specific direction.

i. One-sample, two-sample, or paired t test
   a) If the groups come from a single population (e.g., measuring before and after an experimental treatment), perform a paired t test. This is a within-subjects design.
   b) If the groups come from two different populations (e.g., two different species, or people from two separate cities), perform a two-sample t test (a.k.a. independent t test). This is a between-subjects design.
   c) If there is one group being compared against a standard value (e.g., comparing the acidity of a liquid to a neutral pH of 7), perform a one-sample t test.

ii. One-tailed or two-tailed t test
   a) If you only care whether the two populations are different from one another, perform a two-tailed t test.
   b) If you want to know whether one population mean is greater than or less than the other, perform a one-tailed t test.

2.18.2 T Test Formula

The ratio of the difference in group means over the combined standard errors of both groups is used by the t test to evaluate the genuine difference between two group means. Statistical analysis software can be used to calculate it automatically or manually using a formula.

$$t = \frac{\dot{x}1 - \dot{x}2}{\sqrt{\left(s^2\left(\frac{1}{n1} + \frac{1}{n2}\right)\right)}}$$

In this formula, t is the t value, x1 and x2 are the means of the two groups being compared, s2 is the pooled standard error of the two groups, and n1 and n2 are the number of observations in each of the groups.

A larger t value shows that the difference between group means is greater than the pooled standard error, indicating a more significant difference between the groups. (Rebecca Bevans, 2022).

2.19 STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES (SPSS)

It is a set of computer programmers that examines social science-related scientific data. A quick-visual modelling environment that supports the simplest to the most complicated models is provided by SPSS. Surveys, data mining, market research, and other purposes use the information obtained through SPSS. SPSS is popular because of its simplicity, easy-to-follow command language, and well-documented user manual. Government entities, educational institutions, survey companies, market researchers, marketing organizations, health researchers, data miners, and many others use it for analyzing survey data. (Kate William, 2022)

2.19.1 Core Features of SPSS

The core functionalities offered in SPSS are:

i. Statistical program for quantitative data analysis – It includes frequencies, cross-tabulation, and bivariate statistics.
ii. Modeling program that allows for predictive modeling. It enables researchers to build and validate predictive models using advanced statistical procedures.
iii. Text analysis helps you derive insights from qualitative inputs through open-ended questionnaires.
iv. Visualization Designer allows researchers to use their data for a variety of visual representations.

Apart from the above four functionalities, SPSS also provides data management solutions. Its data management solutions like FHIR enable researchers to perform case selection, create derived data, and perform file reshaping.

2.19.2 Statistical methods that can be leveraged in SPSS

i. Descriptive Statistics – It includes methodologies such as cross-tabulation, frequencies, and descriptive ratio statistics.
ii. Bivariate Statistics – It includes methodologies such as means, nonparametric tests, correlation, and Analysis of Variance (ANOVA)
iii. Predicting numeral outcomes such as linear regression
iv. Methodologies such as cluster analysis and factor analysis which are great for predicting for identifying groups.

2.20 SUMMARY

In the construction industry, there are many challenges to be faced, that is why in this chapter 2 Literature review. In this literature review smart goals, design thinking is used a lot to gain the main problem that is causing the site to be delayed, challengers like delays in project, the cause of delay and the effect of delays will prevent the project to proceed with ace, also Industry Revolution 4.0 has given a major impact towards the construction industry where technology has been introduced but yet still most of the companies are still using the traditional method to get a job done. With most of the company will lead to miscommunication involving all the people in charge. Companiesion drawings and documents plays a big role in a construction which it is the backbone of a construction, without them construction could not be carried out as they are the core but still most of the companies still uses traditional method such as always printing and most of the time if the documents and drawings go missing they print them again, the current situation leads to more trees being chopped off and causing impact towards the environment.

To increase productivity at site the creation of an application is important to get people to communicate and to act as a digital calendar to save a date for the task. With this the software is being used are Android Studio, Flutter Framework. For the website it uses PHP API. Above all of that, MySQL will act as the storage and with the help of API to give the files some security. For the main security of the application, it will be using Json Web Token (JWT) to secure the application and all the document so that other users who don't have the access could breach through.

For the development of the application questionnaire is being used to generate all the perspectives from the users whether it is good comments or bad comments. With the use of T-Test and SPSS it could generate the means, standard deviations and percentage of the users acknowledge the application.

CHAPTER 3

METHDOLOGY

3.1 INTRODUCTION

The system's development process and approach will be covered in this chapter. This chapter will also describe the methods used to pinpoint the issue as well as the system that will be used throughout the entire project, from start to finish. This approach is used to accomplish the project's goals and deliver a perfect result. It will outline the research approach that was employed. Additionally, every part of the research will be covered in this chapter, including the methodology used with the interview sample population and population frame. In-depth discussion of the selected mode of analysis and data gathering method is provided in this chapter. Research is a process for acquiring new knowledge in a systematic approach involving diligent planning and interventions for discovery or interpretation of the newly gained information. The outcome reliability and validity of a study would depend on well-designed study with objective, reliable, repeatable methodology with appropriate conduct, data collection and its analysis with logical interpretation. Inappropriate or faulty methodology would make study unacceptable and may even provide clinicians with faulty information. Hence, understanding the basic aspects of methodology is essential (Indian J Anaesth, 2016).

While working on the accomplishing the effectiveness of the Application and Website, the observation has been made by implementations of many resources. In this chapter Design thinking process can in hand with its 4 staged helped acknowledge the

main problem, coming up with a solution by ideating, creating a prototype and finally evaluating it to help to solve the problem. Design modelling is also covered in this chapter. To add value to the project, studies were done using both primary and secondary sources. Along with the primary source, surveys and fieldwork were used. It results from the gathering and analysis of data for the secondary source. This chapter will include a process path that will be implemented for this project and applied to the work environment on site. Alongside, the material used to produce the application and website will be clarified in detail to help the users enhance the product as it is.

As from the process of empathy which data is collected by surveys and fieldwork, defining the Main problem with the support of the sub problem, ideating all the possible solution and coming up in a major idea to help the with the problem, then comes the prototype where in this chapter will be defined and elaborated in depth and finally determining the effectiveness on the application with the help of consumers.

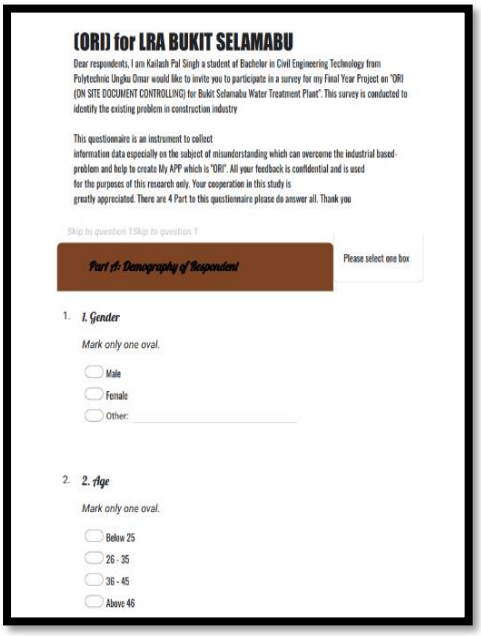
This stage involves testing the prototype with consultants and construction workers to see how they react and gauge their level of satisfaction with the outcome. Any available upgrade or addition can be made to the prototype. As the usage continues a source of questionnaire would be distributed to all site office employees as well as the clerk, consultants, project manager, site engineer, project coordinator, and the others. In order to determine the system's efficacy, observation will be made throughout task completion. The feasibility of the project was investigated utiliing primary sources and secondary sources in order to increase its value. For the primary source, a questionnaire and an observation were used in the research process. While the secondary source is archive from the data collected and analysis. The purpose of the disseminated questionnaire is to learn about perceptions and knowledge that may be relevant to the study topic. Additionally, to gather feedback that can be utilised to enhance the application. The second goal of this questionnaire is to determine whether the intended audience agrees or disagrees with the researcher's decision to create the application and website.

3.2 DESIGN THINKING PROCESS

3.2.1 Phase 1: Empathy

The first process of design thinking is empathy which helps in understand or feel what another person is experiencing. Basically, collecting data to understand client's needs. To gain the data, a questionnaire (Figure 3.1) has been prepared with the purpose of finding out the main problem that is occurring at site. A total of 20 respondents from the site have been picked and requested to fill up the form to understand the problem, which as the result the main problem has been identified.

After that, to make the main points which is the main problem another questionnaire has been prepared and channel out to all clients which includes JKR, SADA, Main Contractor, Sub Contractor, Consultant, Project Manager, Site Engineers, Document Controller, Site Clerk and no to forget Architect, and as the data of respondent around 34 people has responded with the supporting points.



(ORI) for LRA BUKIT SELAMABU

Dear respondents, I am Kailash Pal Singh a student of Bachelor in Civil Engineering Technology from Polytechnic Ungku Omar would like to invite you to participate in a survey for my Final Year Project on "ORI (ON SITE DOCUMENT CONTROLLING) for Bukit Selamabu Water Treatment Plant". This survey is conducted to identify the existing problem in construction industry

This questionnaire is an instrument to collect information data especially on the subject of misunderstanding which can overcome the industrial based-problem and help to create My APP which is "ORI". All your feedback is confidential and is used for the purposes of this research only. Your cooperation in this study is greatly appreciated. There are 4 Part to this questionnaire please do answer all. Thank you

Skip to question 1Skip to question 1

Part 1: Demography of Respondent

Please select one box

1. *1. Gender*

Mark only one oval.

- Male
- Female
- Other:

2. *2. Age*

Mark only one oval.

- Below 25
- 26 - 35
- 36 - 45
- Above 46

Figure 3.1: Distribution of Questionnaire

3.2.2 Phase 2: Define

After the first phase empathy, next will de define from the questionnaire distribution the data has gained and the process of interpreting the data has begun, from the first questionnaire it is about the major problem occurring at site and then form the second questionnaire that is the supporting point from how the main problem occurs (Figure 3.2) below, then after that the Problem Statement is develop using the points.

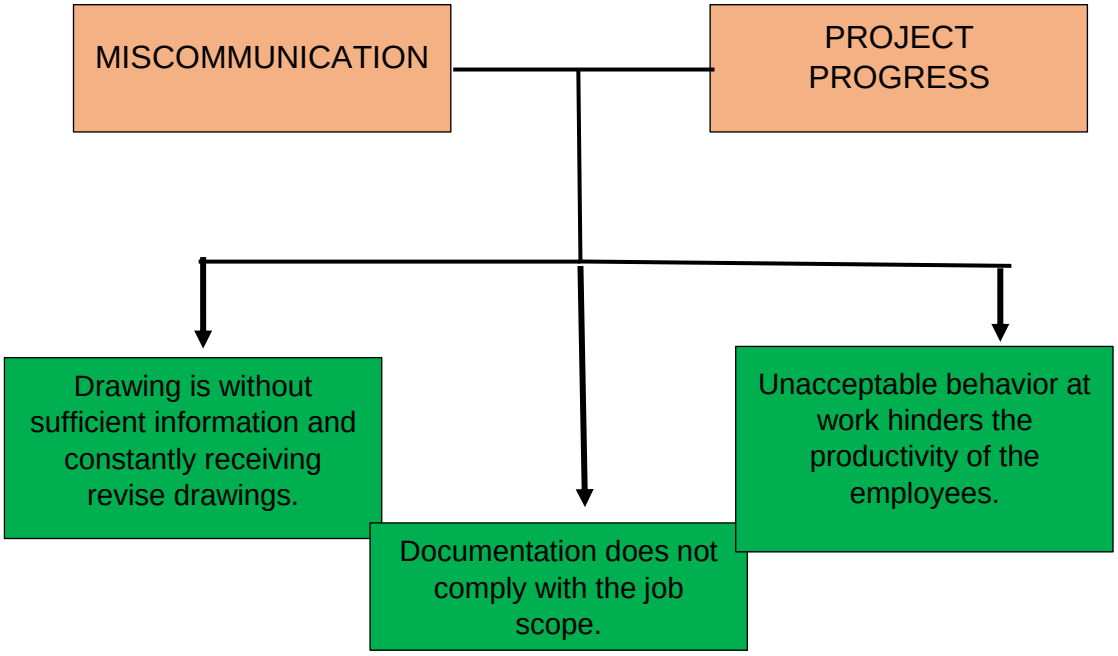


Figure 3.2: Problem Equip from questionnaire.

PROBLEM STATEMENT

Miscommunication occurs when common documentation does not comply with the job scope for example wrong documentation for activity carried out or it is prepared late, drawing without sufficient information causes project to be delayed incomplete drawings without much information is always given and when there is question it will always arise to deliver revise drawings and causes the activity carried out to be on hold. unacceptable behavior at work, spoils the good work environment at the workplace which can hinder the productivity of the employees, when problems occur the team will have discussion on alternate solution but if a person in charge decline the alternative root it will cause the environment to work to be bad.

3.2.3 Phase 3: Ideate

From the problem statement created at the first phase, then comes the second phase where the process of ideation is occurs, in this phase many ideas has develop to solve the problem but there has always been an interference with would the company use it. After much thought given to it the process of brainstorming occurs between site engineers and me with a long and thoughtful discussion it is fair that an application and website are developed to solve the problem statement. Another survey conducted is to obtain the features that will be used. An idea for the application development has arrived (Figure 3.3) below. Besides that, the solution also has been made up to solve the problem statement.

SOLUTION:

Documentation + Drawings + Communication

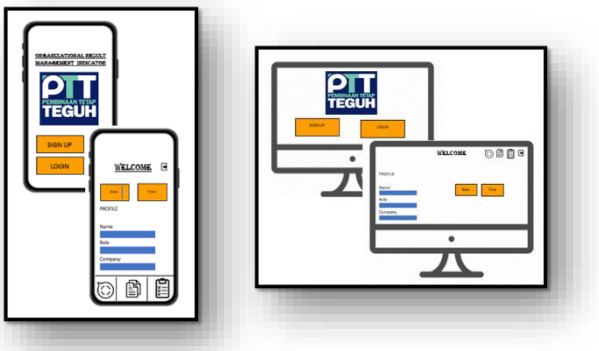


Figure 3.3: Purposed Solution (App + Website)

- Drawings and Documentation will be integrated into the application with the storage
- To Direct project planning
- Help to lessen Miscommunication
- Speed up project progress

3.2.4 Phase 4: Prototype

Then it comes to the phase of prototype, in this phase the prototype has been develop. For the development of the application and website many software (Figure 3.4) has been proposed to be integrated towards the development of the application name ORGANIZATIONAL RECORD MANAGMENT INDICATOR (ORI) which shown in Figure 3.5 and Figure 3.6 below:

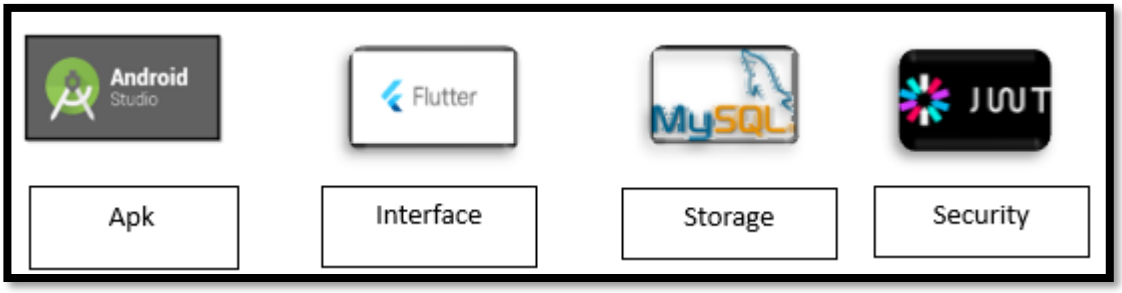


Figure 3.4: Software Used for Organisational Record Management Indicator (ORI)

DESIGN OF APPLICATION & WEBSITE

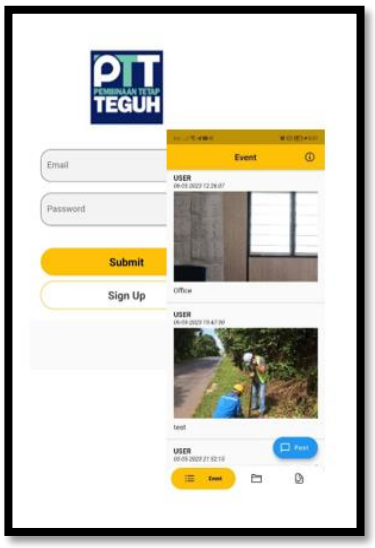


Figure 3.5: ORI Application Design

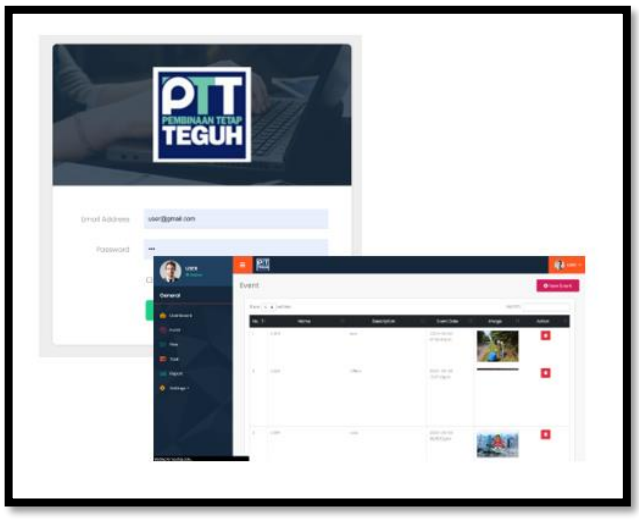


Figure 3.6: ORI Website Design

3.2.5 Phase 5: Testing

Once the prototype has been completed the phase of evaluating comes in play with it testing. The product testing will be done at the Water Treatment Plant Bukit Selambau (Zone B). After a handful of usage, the effectiveness will be tested as well so there is where another set of pre and post questionnaire (Figure 3.7) will be handed out to gain the data for how the product in is general. For the post is where questions will be asked by referring towards existing method and for the post is by using and evaluating the app. For the questionnaire preparation it is one questionnaire in the sub 3 section and questions of 6 for the pre and post questions.

i. Demography
ii. App Capability
iii. User Evaluation towards Prototype

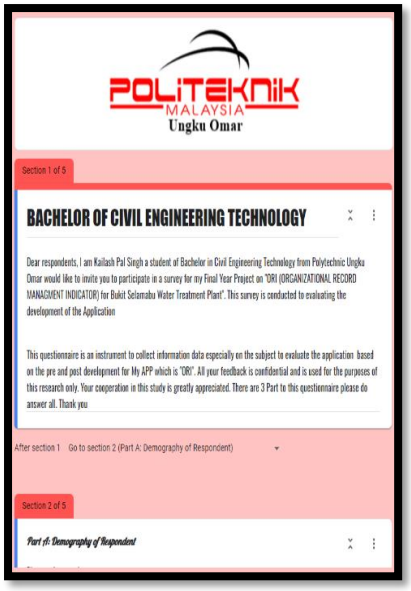


Figure 3.7: Testing Questionnaire

3.3 DESIGN RESEARCH

Research design is the framework of research methods and techniques chosen by a researcher to conduct a study. The design allows researchers to sharpen the research methods suitable for the subject matter and set up their studies for success.

The structure of research can be thought of as the glue that ties all of the pieces of a research project together; in other words, it is a blueprint for the proposed study endeavour. Different social scientists describe research design in different ways; for example, Johoda et al. (2017) define it as "the arranging of conditions for the gathering and analysis of data in a manner that tries to combine relevance to the study purpose with economy and process. According to Manheim (2010), research design not only predicts and describes the seemingly innumerable decisions associated with data collection, processing, and analysis, but it also provides a logical foundation for these judgments. A master plan, according to Zikmund (2019), specifies the methods and procedures for gathering and analysing the required data.

Effective research typically reduces data bias and fosters greater confidence in the veracity of the information gathered. In experimental research, the goal is typically to construct a design with the smallest possible margin of error. The essential elements are:

i. Accurate purpose statement
ii. Techniques to be implemented for collecting and analyzing research.
iii. The method applied for analyzing collected details.
iv. Type of research methodology
v. Probable objections and setting for research study.
vi. Timeline
vii. Measurement of analysis

Therefore, the goal of design research is to describe and clarify the procedure followed by the researcher in order to provide a plan of study that enables accurate evaluation in carrying out the usability using the application and website to track job progress and document storage while referring to it as ORI. The process for creating an organisational record management indicator is illustrated in figure 3.8 below.

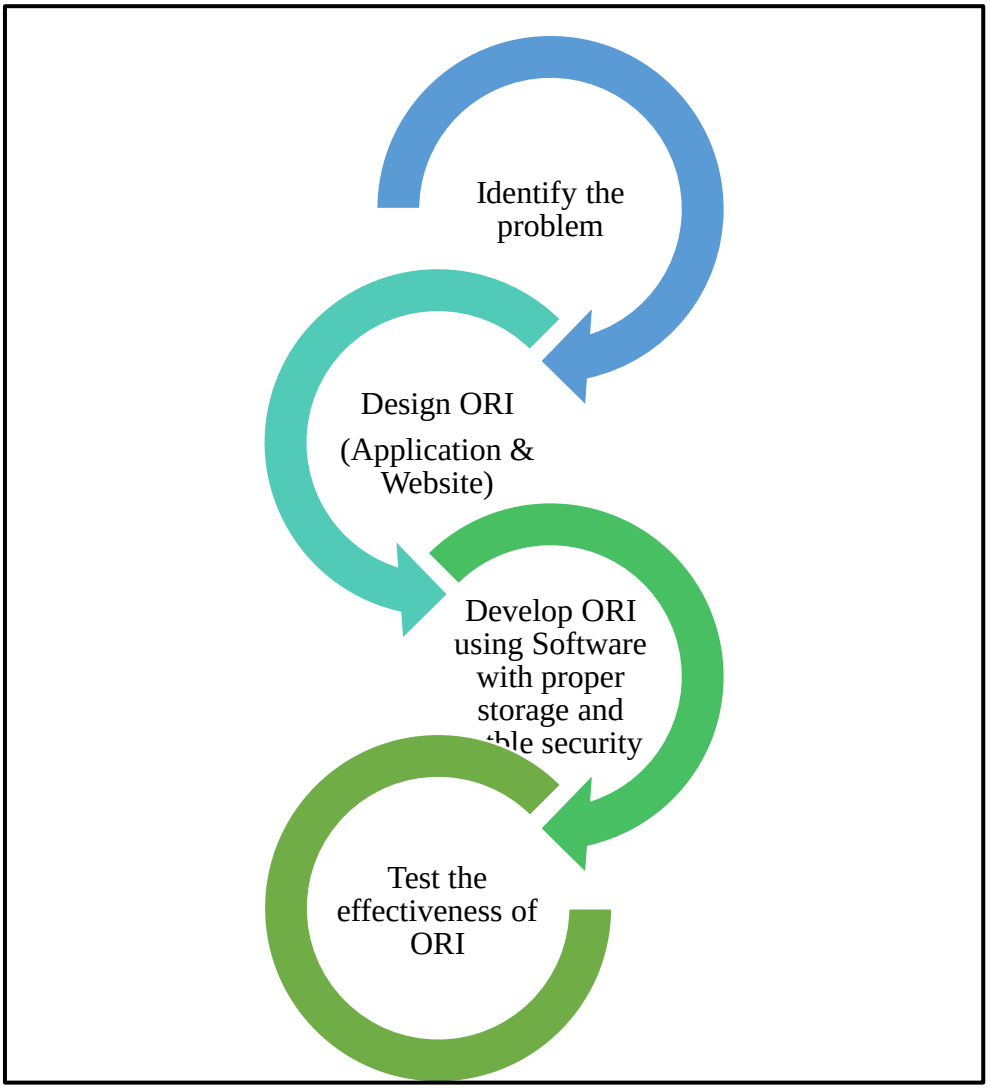


Figure 3.8: Illustrated method on creating Orginasational Record Management Indicator (ORI)

Table 3.1: Design Research

Objective	Method	Instrument	Analysis	Expected Outcome
1.To identify the client needs in order to solve problem occurs at site.	Survey	i. Quantitative ii. Respondents iii. Questionnaire iv. Google Form	Microsoft Words (SEM 7) i. Frequency Analysis	To identify the Industrial Based Problem Main Problem with its supporting
2. To develop Organizational Record Indicator (ORI) for LRA Bukit Selambau Zone B.	Develop	**Application / Website** i. Android Studio (App) ii. API PHP (Website) iii. Flutter iv. MySQL v. JWT	- Event Management for staff to daily activity upload - Storage for documentation and drawings for future use -Task Management for to prepare staff for the specific duty future plan on an activity	Development of Organisational Record Management Indicator (ORI) for determining Work Progress and for Document Storage
3. To evaluate the effectiveness of Organizational Record Indicator in project	Survey	i. Quantitative ii. Respondents iii. Questionnaire iv. Google Form	SPSS Software i.Reliability test i.Frequency Analysis i.Descriptive Analysis • Excel-Average mean • Paired T- Test (Compare)	Effective test for ORI app and website

3.4 DEVELOPMENT OF RESEARCH

A series of proactive, strategic, catalytic, and capacity-building actions known as research development described as helping faculty members, research teams, and central research administrations towards partnerships, create and put into action plans that will increase institutional competitiveness. In this section, the researcher thoroughly described how the application worked from the very beginning up till the very end of the final result. Building a flowchart design before starting the application was crucial to make understanding it easier.

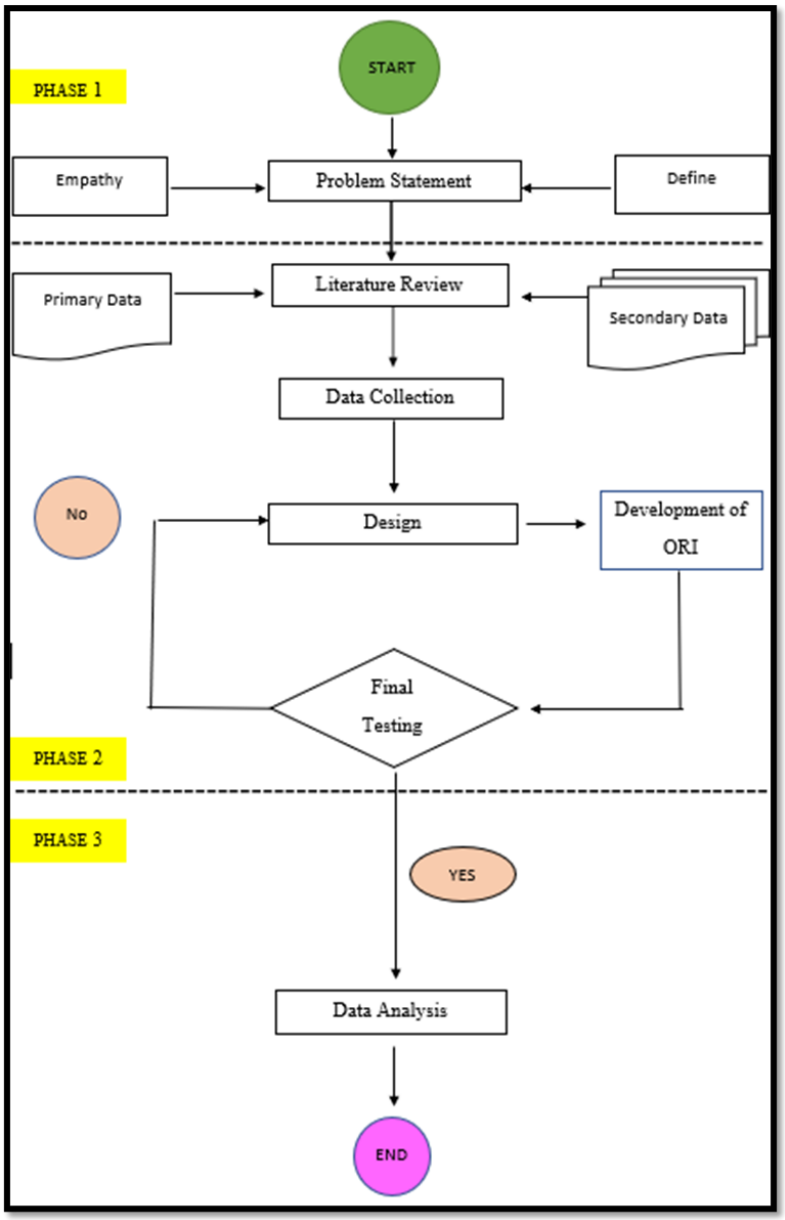


Figure 3.9: Flow of Research Framework

The project was carried out using a proposed framework as reference. The process of the purposed study is divided into multiple parts, as shown in figure 3.10 detail of research development, takes a process-based approach throughout from the start of it until the end. The establishment of a flowchart of procedures has been drawn up to make sure the project is completed as planned and smoothly as possible.

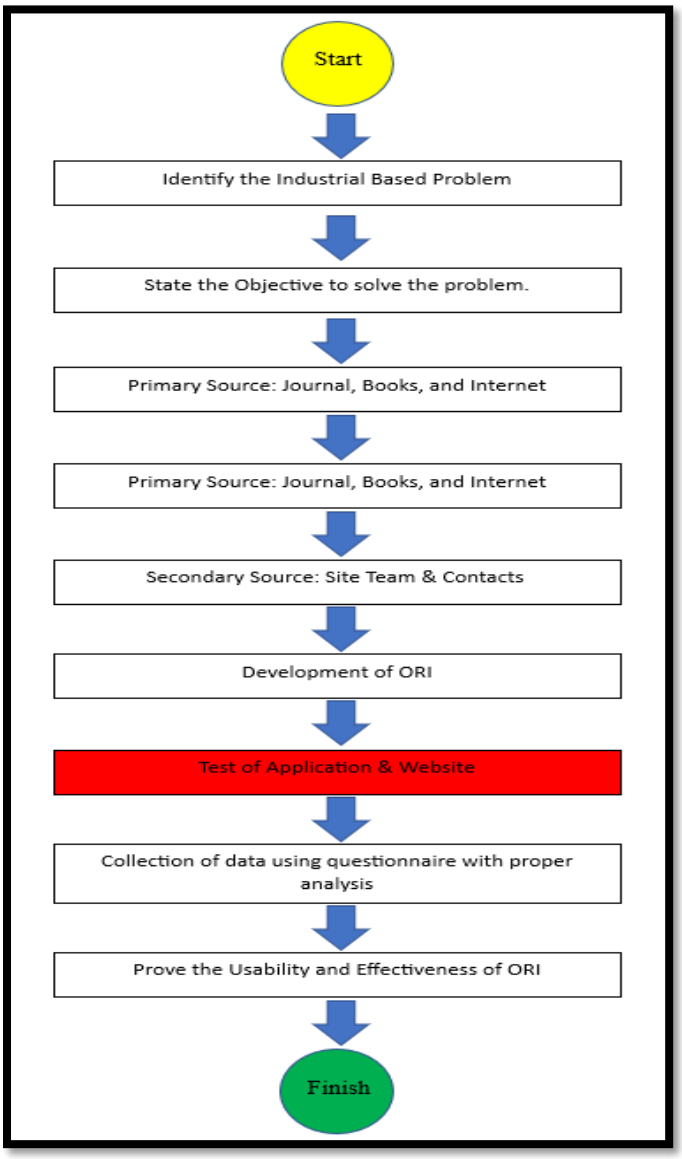


Figure 3.10: Detail of research development

3.5 ORAGANISATIONAL RECORD MANAGEMENT INDICATOR (ORI) DEVELOPMENT

Systems development life cycle phases include planning, system analysis, system design, development, implementation, integration and testing, and operations and maintenance. The process of creating or altering systems, as well as the steps, methods, models, and strategies required to do so, are all referred to as system development. The system process and creation of the organisational record management indicator are therefore essential to ensuring that the process is established and carried out properly.

As the result of this study is to achieve all goals that can solve the problems that have arisen in the industry. To detect the problem a form has been distributed to gain the quantitative sum of 41 respondent by using google form as questionnaire. Once when the problem has been clarified a problem statement will be written with that thoughts will be put in to come out with the aim to solve the problem following the objectives. Further in the discussion the requirement for an application and website has is needed to speed up the process of work in LRA Bukit Selambau. In the remaining 6 months development started and at the end of April the application and website has been develop and in May the process of testing the prototype was started. For the testing questionnaire of pre usage of app and post usage of app has been carried out to determine the effectiveness of the application and website.

Organisational Record Management Indicator (ORI) application uses android studio to create the APK to be downloaded into the phone for users to use with that the main component that is used to build the application from scratch are Flutter acts as Google's portable UI toolkit, Coding, Interface with the help of MySQL acts as the database for the application all data will be stored in the server with unlimited storage provided by the server and finally to secure the data Json Web Token (JWT) has been chosen to be used as the security to protect all the files.

For the website, the software used to create the interface are firstly the usage oh PHP API for the user experience with the help of MySQL for the database same as the application and finally Json Web Token (JWT) for the security to secure all the documents and information.

3.5.1 Purpose of ORAGNISATIONAL RECORD MANAGEMENT INDICATOR (ORI)

The purpose of the system created named ORI is to solve the industrial based problem which has arisen with the help of the quantitative respondent by using google form as the questionnaire. The respondent feedback gave the project an overview of the major problem and that must be solved which the development of ORI has been done.

Based on the data collection at the initial stage the outcome of it is where ORI application can be designed. Then, all Drawings and Documentation will be collected from the IR that comply to the project progress with newest spec.

Once when the app is created, all the Drawings and Documentation will be integrated into the application with the storage all the important documents will be stored. Then with the section of project planning and communication it allows to have a activity plan on a specific date with notifying every person in charge to be ready with all the equipment with complete documentation and specific drawing to carry out the process.

This application is expected to lessen miscommunication with all correct specifications and project planning. Everyone will be informed, and everyone will comply with the activity. In the application also will have the section to store all documentation, such as RFI, PTW, drawings, memo and other individually with this it will lessen up the miscommunication about all the incomplete details for the job scope. Following with all the stored documents could also make claim or workers payment to be done easily with the UI, person in charge could just key in the data in and the project progress and payment could be done. All above that, this application is expected to get the project progress to increase in speed.

3.5.2 Design for ORAGNISATIONAL RECORD MANAGEMENT INDICATOR (ORI) Application and Website

The design of the application has been done followed by the users requestion form a questionnaire that has been provided on the design of the application and website the requirement are all from the users to be implemented into the site for proper use to track progress and also to store all documents that involve at the LRB Bukit Selambau Zone B, the design of the application and website for the Organisational Record Management Indicator is show below

i. ORI Application
ii. ORI Website

i. Organisational Record Management Indicator (ORI) Application

In this interface users would be able to create their own account with all the information needed then users can login using their own account to get started to able to post their activity and store their documentation and plan their future activity. Users are also able to view their profile at the user profile interface to make sure that they are using their own account.

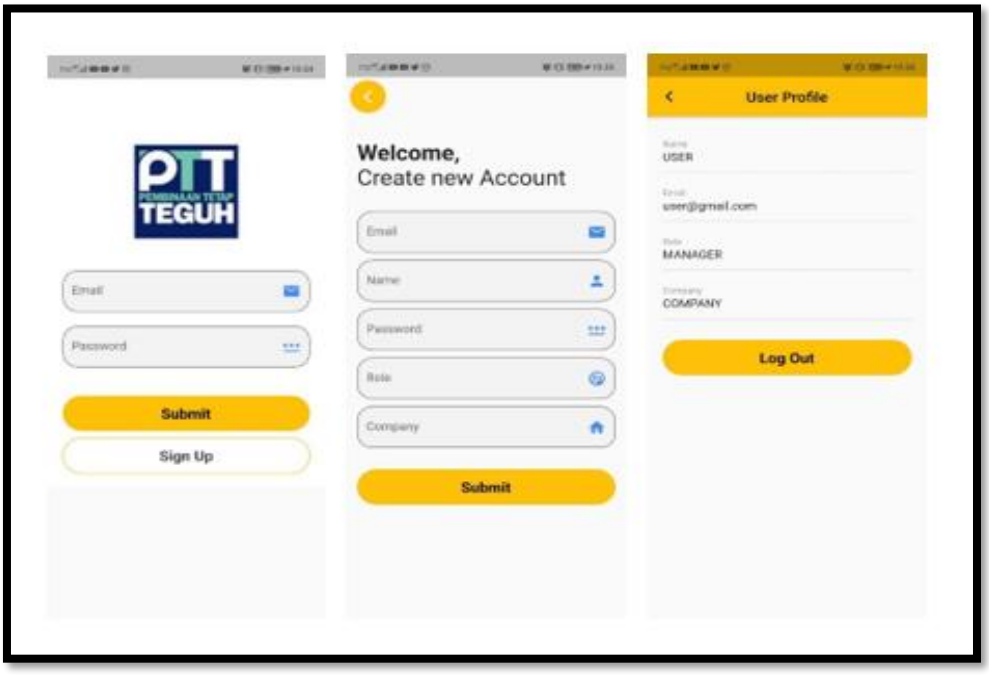


Figure 3.11: User login, Signup and Profile Interface for Application

As for this interface it will be the start page of the application where in this interface users could post their daily activity using their own account to be view by other users to ensure the current users are carrying out their duty in their respective site, current users could post a pic of the activity that is being carried out on that day form the start of the morning until the end of the evening with their respective description of what activity is being carried out. The concept of this interface came from Instagram where users can post stories claiming on what are they doing throughout the day of work.

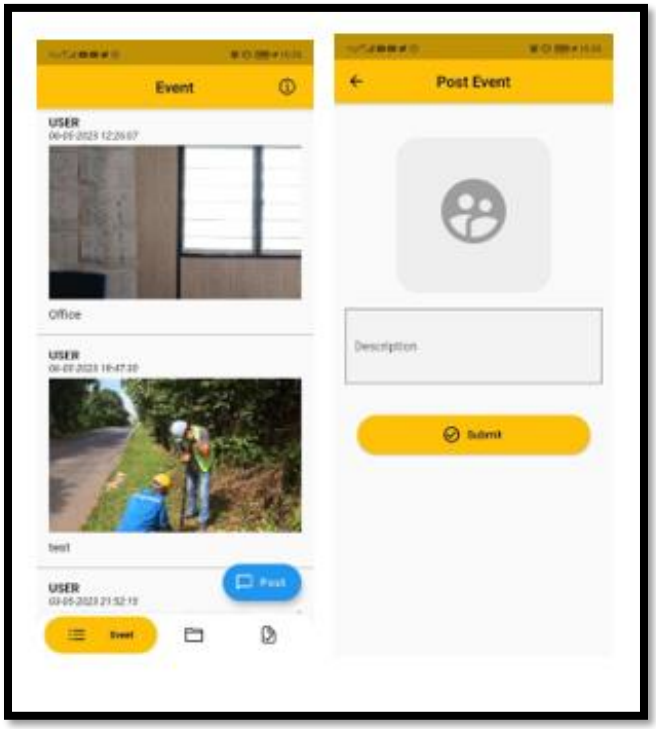


Figure 3.12: Event Interface for Application

Towards the storage interface where users could store their documents in a folder specific towards the building development that is being carried out for an example for the Chlorine building there is a dedicated folder for the building documentation where for now is it just focused on the RFI, PTW, Cube Test and Drawing for Architectural and Structural.

Therefore, users do not need to be worried of documentation going missing or receiving a revise drawing from the consultant all could be digitalised and would receive online so that users could download the documentation and drawings to be review or

make it as a hard copy. The storage also acts as a future reference for the project where all black and white are available when it is needed.

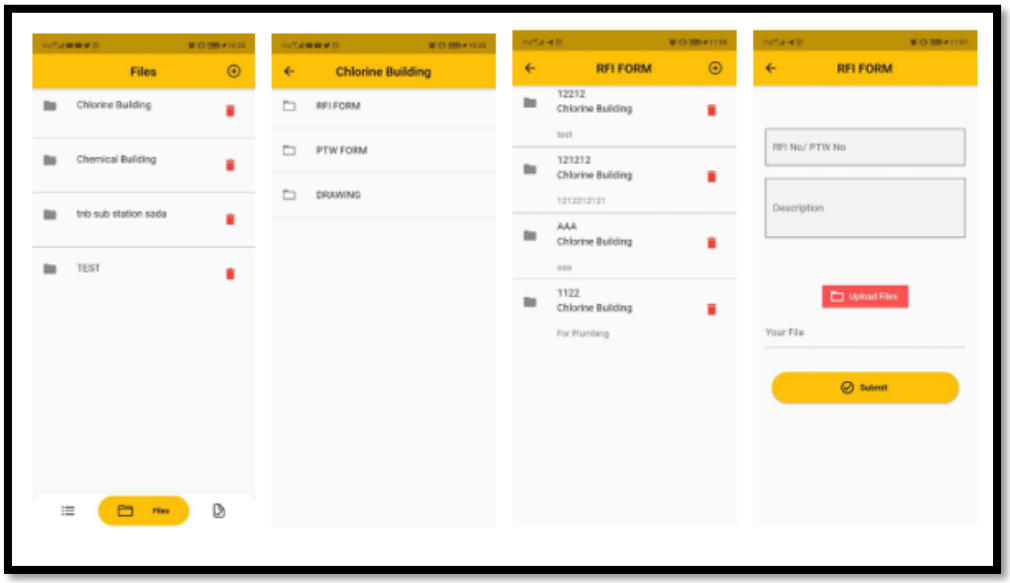


Figure 3.13: Document and Drawings Storage Interface for Application

The final interface, which is the Task interface, as stated it is to plan the future task. Users with their own account could set the task for the upcoming project with the specific stated in the task form by specifying the task name, where would the location of the task to be carried out, some description of the task for better understanding of the task to be precise, when would the task start and when would it completed, with the person in charge towards the task mentioning them will be helpful for them to get notified that the specific users are in charge to carry out the task and finally to post a picture of the task that will be carried out with its documents such as drawing, RFI and PTW in need so that the specific user would not be worried about the task and the paperwork.

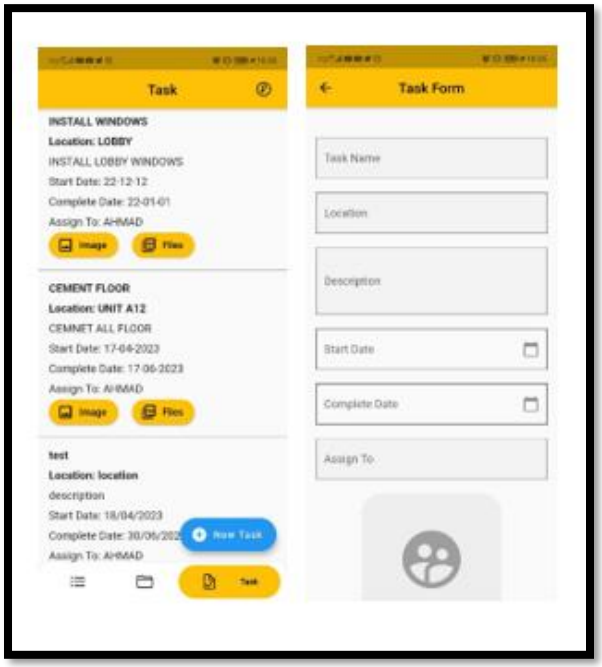


Figure 3.14: Upcoming Task Interface for Application

ii. Organisational Record Management Indicator (ORI) Website

In this interface for the website users would be able to login using their own account to get started to able to post their activity and store their documentation and plan their future activity. Users are also able to view their profile at the user profile interface to make sure that they are using their own account.

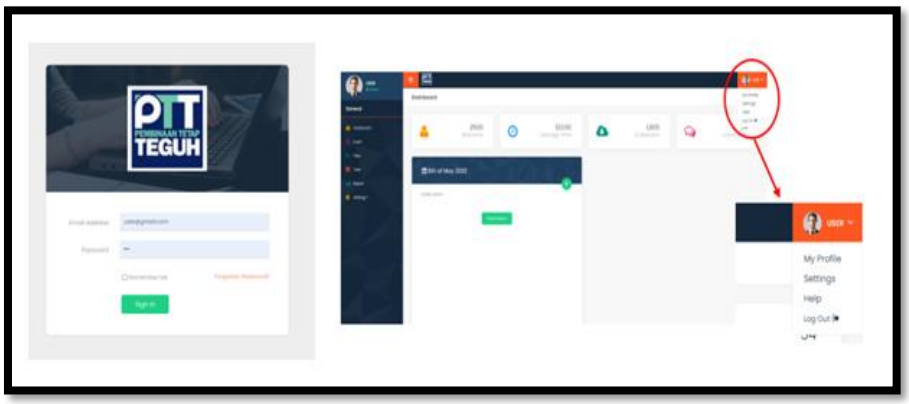


Figure 3.15: User login, Signup and Profile Interface for Website

As for this interface it will be the start page of the application where in this interface users could post their daily activity using their own account to be view by other users to ensure the current users are carrying out their duty in their respective site, current users could post a pic of the activity that is being carried out on that day form the start of the morning until the end of the evening with their respective description of what activity is being carried out. The concept of this interface came from Instagram where users can post stories claiming on what are they doing throughout the day of work.

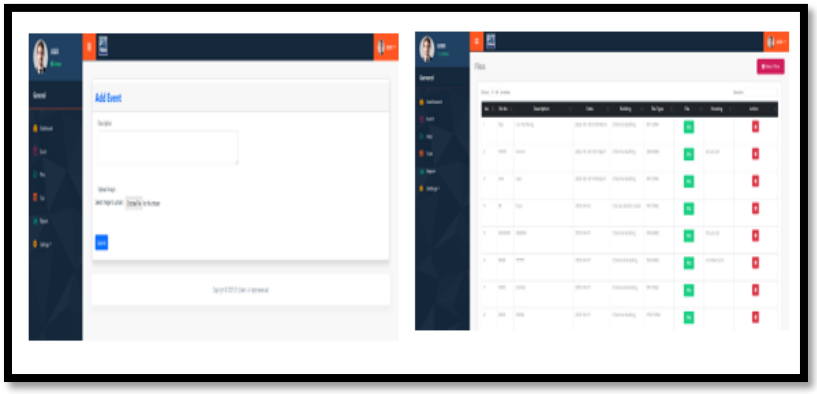


Figure 3.16: Event Interface for Website

Towards the storage interface where users could store their documents following the specific building development that is being carried out for an example for the Chlorine building for now is it just focused on the RFI, PTW, Cube Test and Drawing for Architectural and Structural. Towards the gathering of the documentation there is a search button to get the information whether it is the documentation or drawing for the specific building.

Therefore, users do not need to be worried of documentation going missing or receiving a revise drawing from the consultant all could be digitalized and would receive online so that users could download the documentation and drawings to be review or make it as a hard copy. The storage also acts as a future reference for the project where all black and white are available when it is needed.

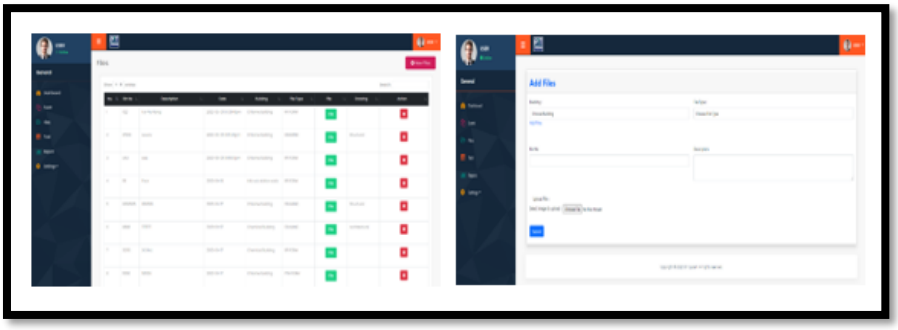


Figure 3.17: Document and Drawings Storage Interface for Website

The final interface, which is the Task interface, as stated it is to plan the future task. Users with their own account could set the task for the upcoming project with the specific stated in the task form by specifying the task name, where would the location of the task to be carried out, some description of the task for better understanding of the task to be precise, when would the task start and when would it completed, with the person in charge towards the task mentioning them will be helpful for them to get notified that the specific users are in charge to carry out the task and finally to post a picture of the task that will be carried out with its documents such as drawing, RFI and PTW in need so that the specific user would not be worried about the task and the paperwork.

Figure 3.18: Upcoming Task Interface for Website

3.5.3 Development for ORAGNISATIONAL RECORD MANAGEMENT INDICATOR (ORI) Application and Website

The development of ORI application and website based on (Appendix 1 and 2) went throughout a process of drafting and using all the software below and the end result are showed based on (Appendix 5 and 6).

i. Documentation and Drawings Storage Process

Organizational Record Management Indicator flow is where all the documentation and drawings has been accumulated and converted to PDF for more clear references.

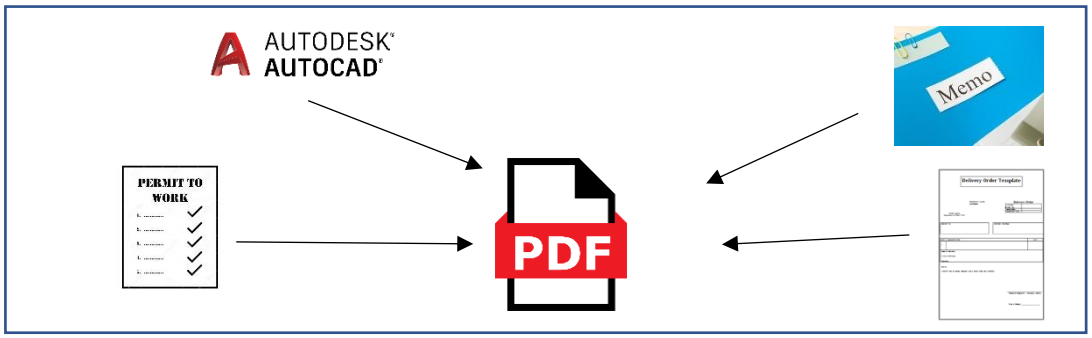


Figure 3.19: Document Asset Creation

Secondly, PDF will be uploaded into the software that will be used to develop the app and website and it will be stored in the storage of MySQL.

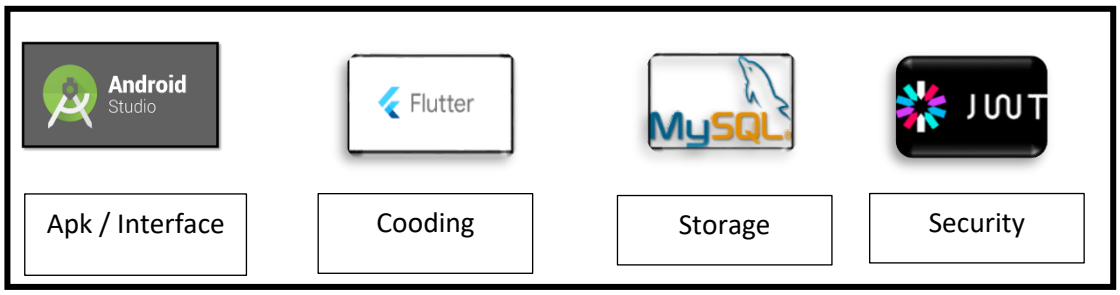


Figure 3.20: Product Develop

Finally, all the documents and drawings will be shown in the app to follow progress and users are able to communicate and set up tasks to the calendar to determine when and what activity will be carried out.

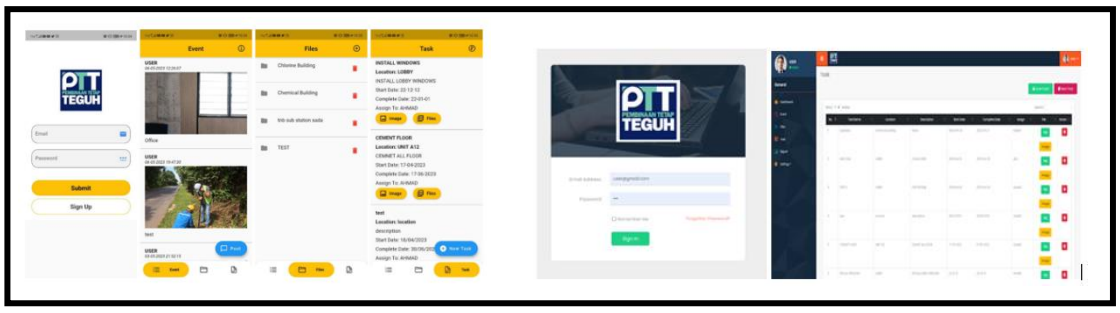


Figure 3.21: Final Product for Application and Website

ii. Material Used

a) Laptops

The purpose of laptop / desktop is to create the application and website itself, with the combination of coding plus data storage and inserting the security to secure the system.

Figure 3.22: Desktop & Laptop

b) Digital Devices

Testing of the product is done by using digital devices such as smartphone, tablet and also Laptop and computer.

Figure 3.23: Digital Devices

c) Internet

To link the computer and internet connect to develop an application and website with that also uses to upload data to the system.

Figure 3.24: Internet

d) Android Studio
Android is a software to create APK for the application that has been developed to be used in Android Devices or IOS Devices

Figure 3.25: Android Studio Software

e) Flutter
Flutter is used for coding and binary to produce the interface of the elements for the application and implement all the elements to make it as function.

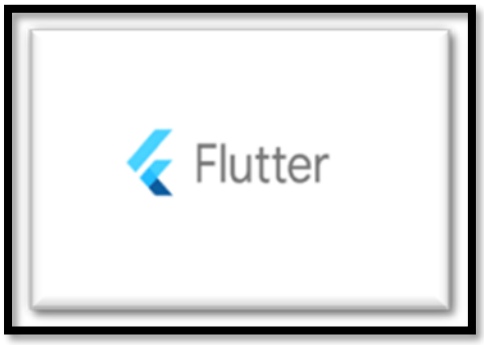


Figure 3.26: Flutter Software

f) PHP API
PHP API integrates the application towards website friendly and all system data is enabled to make website friendly.

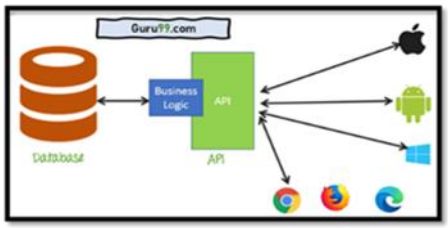


Figure 3.27: PHP API

g) MySQL
MySQL plays a role as a Database to store all files and documents to be review future safely.

Figure 3.28: MySQL

h) JWT
JWT acts as the Security for both Application and Website to secure all data that is in the database.

Figure 3.29: Json Web Security (JWT)

i) PDF Converter
PDF converter plays a role in converting all drawings and words file into PDF to be stored into the application and website

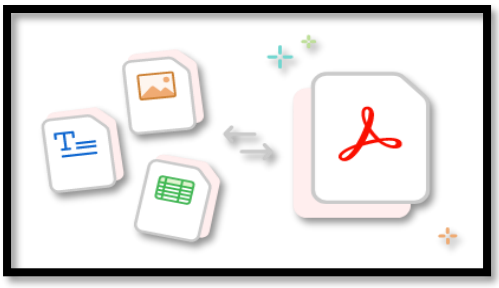


Figure 3.30: PDF converter

j) Documentation
All-important Document regarding the construction on specific building will be stored in the application and website.

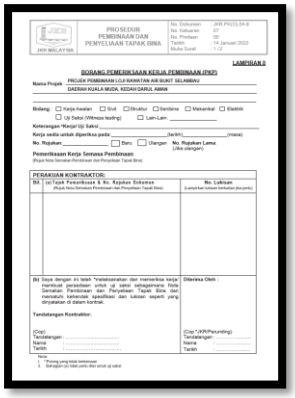


Figure 3.31: Documentation

k) JPG
Images can be uploaded into the system following the required format to make it as references towards the job / activity scope.

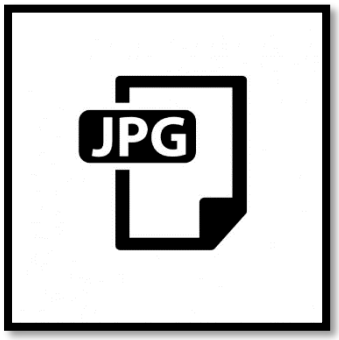


Figure 3.32: JPG Format

3.6 TESTING OF PRODUCT

The Organisational Record Management Indicator (ORI) is a simplify method on carrying out an activity swiftly producing less miscommunication on site and faster up project progress of the site. Previously with the existing method engineers, consultant and workers at the site will always have miscommunication when there are to many persons in charge for the task involve with all their opinion towards carrying out the task. ORI will lessen down the miscommunication providing a base to set up each person work base on their scope. Besides that, documentation and drawings are another factor where lack of information and uncomplying data is presented towards the work, with this platform it will lessen down the hectic of uncomply document and provides a

storage to store all important files to be used in the future in needed. All site staff and departments which are involved in the project could have access and communicate in the app to prevent slow project progress. For the Design for Organisational Record Management Indicator (ORI) is based on (Appendix 4 and Appendix 5).

Application and website that has been developed will undergo a testing phase where users or customers would respond on their satisfaction of the product which would solve the problems on site. Therefore, another set of questions would be asked if the users have any changes in the application or website need be to alter or they are happy with the features provided. All the testing is done by handing in the software to be used and the questionnaire will be handed in to fill up the requirements as for the respondents all are based on the project of LRA Bukit Selambau.

The questionnaire is created to learn more about the respondent perceptions of and system developed. In addition, gathering potential feedback is used to enhance this system. After that, the purpose of this questionnaire is to gather input from the targeted users regarding their agreement or disagreement with the basic idea behind this system.

3.7 DATA COLLECTION

Data collection is done with google with comprehensive instructions to collect data from a questionnaire are included in the collection procedures. A quantitative methodology was applied in this study. Rapid data collecting, reliable data capture, and a wider range of data analysis are all made possible by this method. The study methodology, respondents, and other site features will be covered. These details ensure that the project's objectives can all be achieved.

3.7.1 Location

The location of study is carried out at Water Treatment Plant Bukit Selambau (Zone B) LRA Bukit selambau site office based on problem of miscommunication, progress project and unethical attitude of workers. All respondents are workers that are involved at LRA Bukit Selambau.

3.7.2 Respondent

Respondents are those who take part in surveys, conduct interviews, or provide information that is utilised to evaluate study findings. According to the study's criteria, respondents are requested to fill up their demography. The respondent consists of site clerk, site supervisor, environmental officer, site safety supervisor, safety and health officer, traffic management officer, structural site engineer and mechanical site engineer, with that a total of 41 respondent have received the questionnaire and completed the survey with their honest review towards the development of the system to help solve the site base problem. Based on an article Central Limit Theorem (CLT) form (Akhilesh Ganti, 2023) sample sizes equal to or greater than 30 are often considered sufficient for the CLT to hold as the aspect of CLT is that the average of the sample means and standard deviations will equal the population mean and standard deviation. A sufficiently large sample size can predict the characteristics of a population more accurately.

3.7.3 Survey – Questionnaire

Distribution of questionnaire was done to collect information for this study. To gather information, google form has been utilised. The effectiveness of a questionnaire towards gathering data plays a huge role when researchers are aware of the needs of the study. The questionnaire will be sent to the respondents by email or WhatsApp, the link to them that will direct lead them to the survey form.

As for the questionnaire, it is divided into 3 sections which are Section A, Section B and Section C. in Section A the questions are towards the demography of the respondent such as gender, age, designation, and work experience, for section B is it towards the criteria of ORI. The questions determine the product of existing method to the new method. Section C asks the respondent for their feedback on the application and website.

Additionally, respondents will be asked in all sections of the questionnaire on how they view the implementation, employee awareness, and employee participation of site monitoring applications in construction site practice. A summary of questions as per section from the questionnaire is shown in the list below.

Table 3.2: Questionnaire Items in Google Form

Sections	Evaluation Aspect
A	Demography of Respondent
B	Criteria towards the effectiveness of Existing vs New Method
C	Feedback towards the Development of the Application and Website

Table 3.3: Likert Scale

Scale	Description
1	Strongly Disagree
2	Disagree
3	Slightly Agree
4	Agree
5	Strongly Agree

3.8 DATA ANALYSIS

Data analysis provides several methods and tactics of doing, as it depends on the field and the goal of the study. Data processing is built on the foundation of both quantitative and qualitative research techniques.

For the data gathered it will be shown using tables and a pie chart showing the response rates, as for the pre and post data form using the products it will be calculated by using the Statistical Package for the Social Sciences (SPSS) software. Additionally, that includes a few statistical techniques that can be applied, such as:

i. Descriptive statistics, including methodologies such as frequencies, cross-tabulation, and descriptive ratio statistics.

ii. Numeral outcome prediction such as linear regression.

iii. Prediction for identifying groups, including methodologies such as cluster analysis and factor analysis.

Based on the data acquired from the questionnaire the data gathered will be processd with the SPSS software and then it will be paired against T-test to evaluate the effectiveness of Organisational Record Management Indicator (ORI).

3.9 SUMMARY

This chapter discusses the method of design thinking process on the development of Organisational Record Management Indicator (ORI) where from the empathy finding out the problem based on site to define the problem statement , ideating using all the sources and coming up with an idea on how to possible help in the site problems to coming out with a prototype that is functional towards reducing the problem faced on site and finally testing the effectiveness of the prototype. Then comes the development

of research from the start on what software should be used to create the application and website throughout the journey from this subtopic planning plays a huge role on how the objective is to be archive.

ORI development, talking about the purpose of the application and website as a system it would help to lessen down the miscommunication and helps to boost the work progress at least change the attitude of the staff on acknowledge their duty as a worker and with this it helps to reduce the unwanted problem and boost the wanted project progress. The design where a survey was distributed on what is needed from their perspective and an application plus website was developed following the likings of the users at site. From the survey a storyboard for the application and website has been created with precise instruction on how to use the application and website. The material used to develop the system are obviously laptop for the coding and interaction of interface for the system, internet to link all data to the system, digital devices to run the application and website, not to forget the software used to create a system are android studio, flutter, php api, MySQL and JWT.

The final subtopic that has been discussed in this chapter are the testing of the product with the user's interaction on the application and website handing out questionnaire to evaluate the effectiveness of the system pre and post to gain the data collection and then to analyse the data using T Test method comparing to SPSS method to determine the Reliability and Descriptive of the Organisational Record Management Indicator (ORI) system.

CHAPTER 4

DATA AND ANALYSIS

4.1 INTRODUCTION

The information generated from, the results' interpretation, and debate are covered in this topic's data and analysis. The process of gathering, modelling, and analysing data using various statistical and logical methodologies is known as data analysis. In this phase, researchers should have a precise idea of what the outcome of the project will be. The goal of this initiative was to help construction professionals with project progress by integrating innovation and technology into their daily tasks, particularly in building. Information is gathered to gain data for helping the researcher archive its objective in study. All the data gained has been discussed and explained comprehensively. All information is gained through google form and then downloaded produced an excel sheet to be explained in depth for all the objectives. The quantitative method is used with the help of T Test analysing the data using 2 dependent means and SPSS to gain precise data on the reliability test and descriptive Test of average mean. Below were the following objectives that had been accomplished by using the Organisational Record Management Indicator (ORI):

i. To identify the main problem in order to solve client’s needs on site.
ii. To develop Organizational Record Management Indicator (ORI) for LRA Bukit Selambau Zone B.
iii. To evaluate the effectiveness of Organizational Record Management Indicator in project.

4.2 DATA RECEIVED

3 questionnaires been distributed to gain information towards the study 2 question being at the early stage of empathy, getting responders thoughts on the problem faced by them in the project and the other 1 being after the development stage. To collect the data on the main problem which is ten used to generate ideas on the development of the application are divided into 2 questionnaires, the first being getting the main problem occurring towards the study.

After the Development of the application and website in the design and prototype phase then comes the evaluation phase where (3rd Questionnaire) has been distributed with both the predevelopment and post development question being asked together to get the respondent's insight on before using the application and after using the application and penning their thoughts on the effectiveness of the development on to the google form and describing their feeling on the progress project. In this questionnaire 3 sections have been proposed where section A will be demographic, section B pre & post questions and section C being suggestion and comments towards the application and website development.

4.3 IDENTIFY THE MAIN PROBLEM

To collect the data on the main problem which is ten used to generate ideas on the development of the application are divided into 2 questionnaires, the first being getting the main problem occurring towards the study. The 1st questionnaire presents the main problem.

4.3.1 1st Questionnaire

First questionnaire being given to get information of the main problem roughly around 20 randomly chosen respondent had replied to the questionnaire with the question being directly approached regarding the main problem caused towards project progress being slow.

(a). Question 1 - What is the problem faced at site?

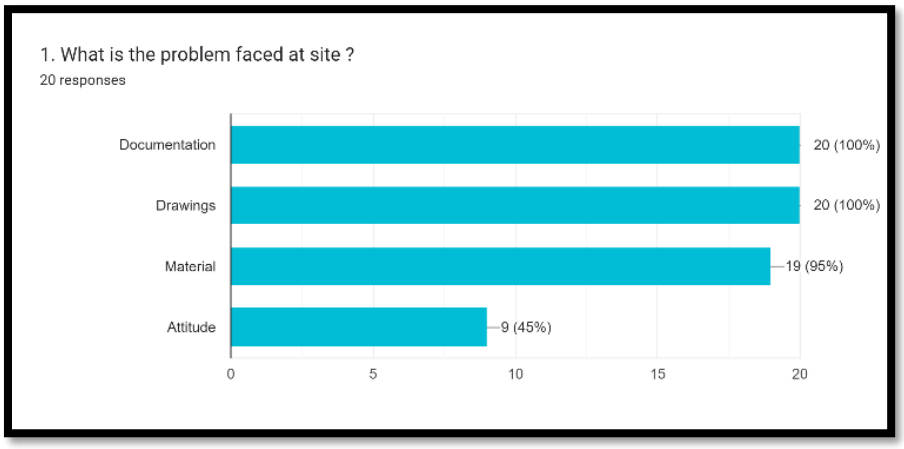


Figure 4.1: Problem Faced

As shown above in Figure 4.1 the problem faced on site are mostly on 2 major topic which are Documentation and Drawing with 20 respondent and 100% rating following by Material with 19 respondents at 95% lastly attitude being low with 9 respondent and 45%. Therefore, the most problem faced at site are for the Documentation and Drawings, following by materials and then lastly attitude.

(b). Question 2 - How is the project progress?

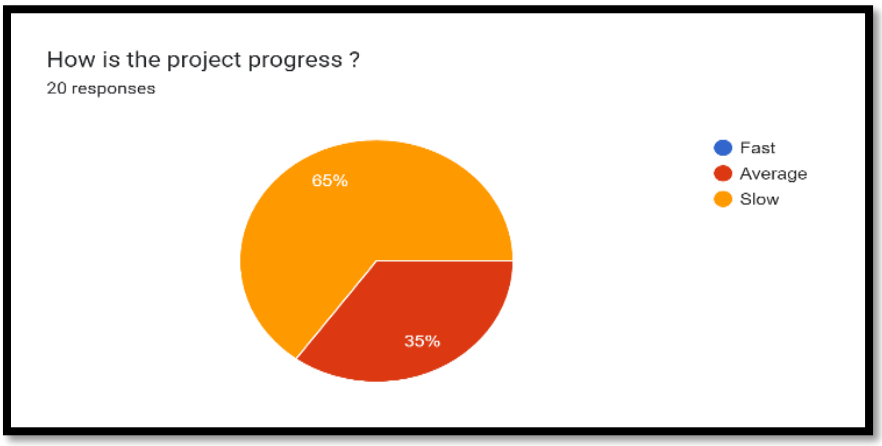


Figure 4.2: Project Progress

From the respondent towards the project are in fast is 0 respondent as 0% then followed by Average at 7 person 35% and following at slow is 13 respondents at 65%. As can be relate the progress of the project is at a phase of slow.

(c). Question 3 - How is the Communication on site?

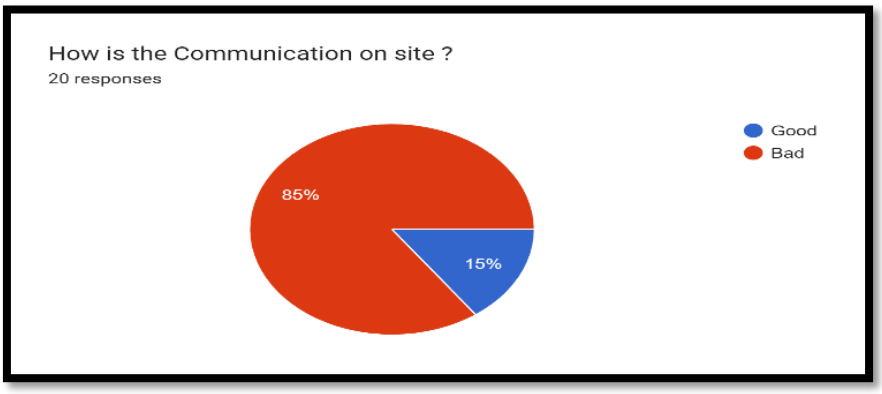


Figure 4.3: Communication at Site

The figure 4.3 shows how is the communication on site which around 3 respondents voted good with the percentage of 15% and a whooping of 17 respondents with the percentage of 85% with the saying of bad. In context the communication on site is bad without any sync.

(d) Question 4 - What is the Main Problem on site?

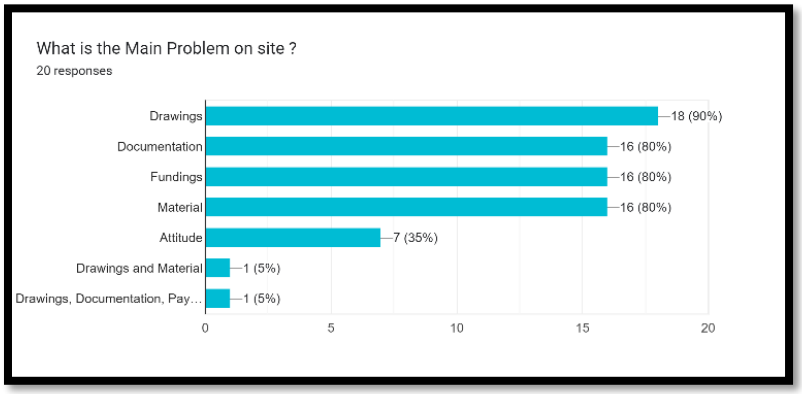


Figure 4.4: Main Problem at Site

From the figure of 4.4 it stated the main problem faced by the site is from the documentation with 18 respondent and 90% following by Drawings, Fundings and material with 16 respondents with a 80% the second in the rank, then comes attitude with 7 respondent 35% and finally the category of others gets 2 respondent with 10%. Form this we got to know that Documentation is the problem following by the second problem from the drawings, Funding of the project and Material used at the construction.

Another Questionnaire will be prepared to cover up the Main problem at the site, which is about Documentation, Drawings, Materials and how communication is carried out at site which leads to the main topic towards Miscommunication.

4.4 EVALUATE THE EFFECTIVENESS OF ORGANIZATIONAL RECORD MANAGEMENT INDICATOR (ORI) IN PROJECT

Moving towards the 3 objective which is evaluation the effectiveness of the Product has been divided into 2 part one being before the product being develop and one being after the product being develop which clarifies the users experience and feeling before and after the product. The questionnaire which has been distributed is only 1 but it covers the question on before and after the product development, the step token will be easier to the users to only answer it once and it also saves their time in answering the questions.

The questionnaire has been made using Google Forms and has been distributed via WhatsApp by link. For the questionnaire before the development of product it has only sanction 2 parts which are being Section A questions on the respondent Demographic, then comes Section B questions on the effectiveness of using Existing Method.

For the After the development of the product, there are 3 sections to this questionnaire which being Section A questions on the respondent Demographic, then at Section B questions on the effectiveness of using Organisational Record Management Indicator (ORI) and Section C being all the Comments on the usage of the product.

This questionnaire was distributed after the prototype has been used by users for them to use approximately about 1 week for the users to get to know well on how the End Product will be. After getting both data form the questionnaire, it was transferred to an Excel Sheet to create a T Test result to identify the frequency. With that SPSS is also used to compare the result between T Test to generate the reliability and Descriptive of each result.

4.4.1 Evaluate the Effectiveness of Existing Method

For the questionnaire before the development of product it has only sanction 2 parts which are being Section A questions on the respondent Demographic, then comes Section B questions on the effectiveness of using Existing Method. A total number of 41 respondent has

i. Section A: Demographic

(a) Gender

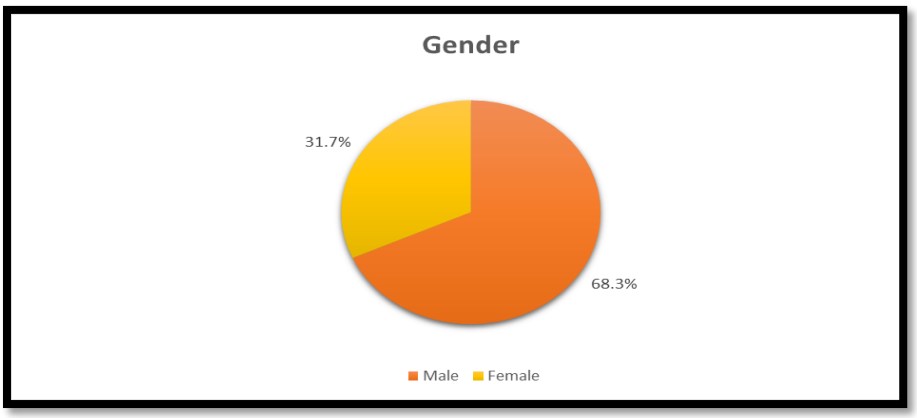


Figure 4.5: Number of Respondent by Gender

The data collected from the Google Form are as shown above figure with a total number of 41 respondents have pen the google form being 28 are male with (68.3%) and female being 13 with the percentage of (31.7%). As shown the number of males surpass the number of females this is because the questionnaire were handed out mostly at the site.

(b) Age

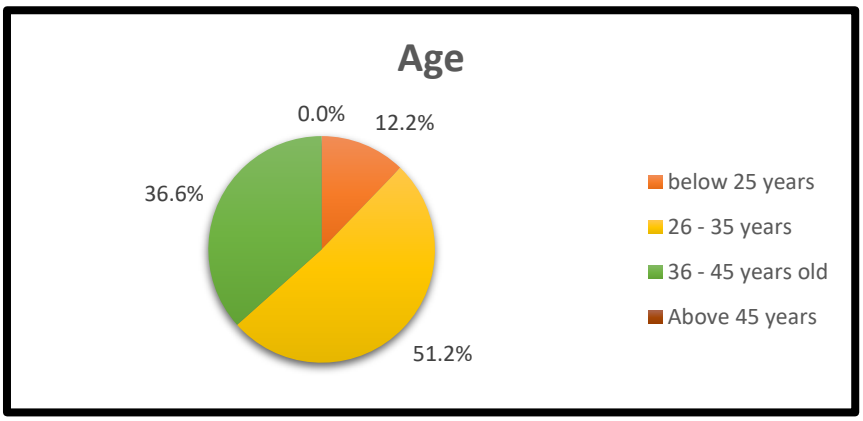


Figure 4.6: Number of Respondent by Age

Figure 4.6 above shows the number and percentage of respondents in the age category which are divided into four categories. This section was established to aid in the processing of data and the identification of respondents from various departments. The survey reveals that the age group of 26 to 35 years old has the highest percentage of respondents, with 21 people (51.2%), followed by the age group of 36 to 45 years old, with a total of 15 people (36.6%), and the age group of under 25 years old, with a total of 5 people (12.2%).There were no respondents in the group of people over 45.

(c). Designation

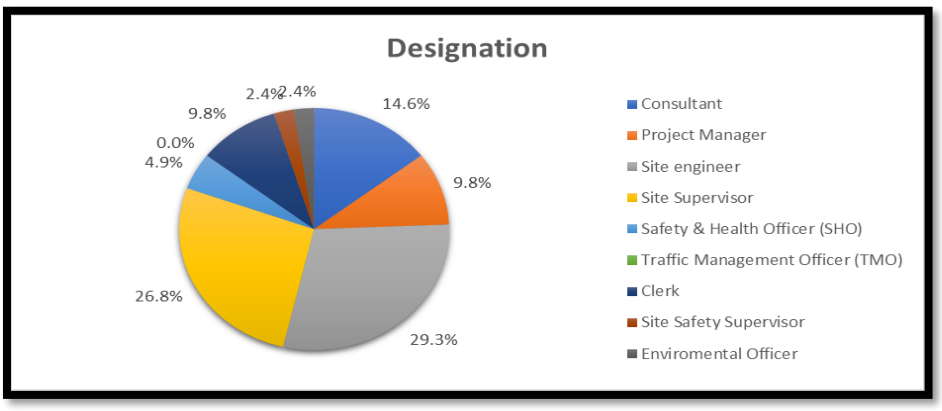


Figure 4.7: Number of Respondent by Designation

Figure 4.7 above shows the number and percentage of respondent in designation category where it is divided into nine categories. This section is to gain information on who have been involved in the survey. The survey shows the most area of designation who answered are Site Engineers which consider of 12 respondents with (29.3%), followed by the Site Supervisor with 11 respondent (26.8%), at third being the consultant with 6 respondent (14.6%), then coming with the Clerk and Project Manager sharing the same no of respondent of 4 with the percentage of (9.8%), Safety and Health Officer survey with 2 respondent percentage of (4.9%) then next categories also share the same percentage of (2.4%) with the number of respondent being 1 for each person for Site Safety Supervisor and Environmental Officer. There was no respondent for Traffic Management Officer side. The highest percentage coming from the Site Engineers and Site Engineers shows that most of the respondent are from the site itself.

(d). Work Experience

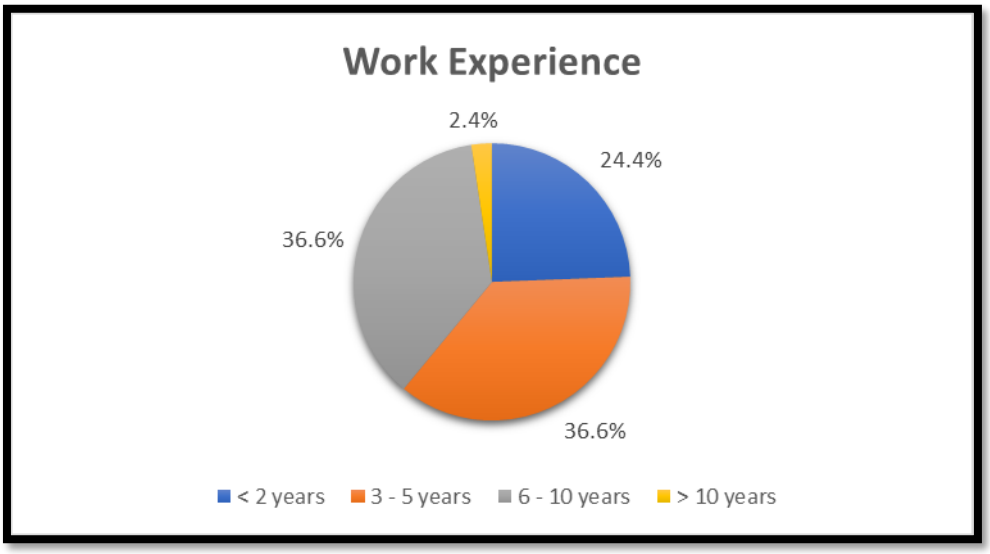


Figure 4.8: Number of Respondent by Work Experience

The result above shows the respondent through their experience in the work. The highest work experience percentage of respondent are form the range of 3 – 5 years and 6 – 10 years with the same number of respondent of 15 each and the percentage of (36.6%).

ii. Section B – Respondent Perspective

Section B consist of all the issue that stated in the questionnaire above in the earlier stage. In this survey it is to test the effectiveness of the existing method with the new method use which is Organisational Record Management Indicator (ORI) by hearing the respondents' perspectives towards the project progress. On a scale from 1 to 5, respondents were asked to rank their level of agreement with the following statements. This survey displays the results of a questionnaire distributed to respondents regarding the site which involves all the categories of designation above to help carry out the study.

The questionnaire which has been distributed is only 1 but it covers the question on before and after the product development, the step token will be easier to the users to only answer it once and it also saves their time in answering the questions.

For the After the development of the product, there are 3 sections to this questionnaire which being Section A questions on the respondent Demographic, then at Section B questions on the effectiveness of using Organisational Record Management Indicator (ORI) and Section C being all the Comments on the usage of the product

4.4.2 Data Analysis Using SPSS

A wide spectrum of academics utilises SPSS, which stands for Statistical Package for the Social Sciences, to study complex statistical data. SPSS will be used to analyse the data in this investigation. the methodical use of reasoning and statistics to provide an explanation, support, or summary. Data should be reviewed and summarised. Researchers utilise data analysis to distil data into a narrative and assess it to gain a range of viewpoints. Massive amounts of data can be broken down into smaller, more manageable chunks (parts) with the help of data analysis.

i. Reliability Test

Reliability Test is a measurement of how accurately a test evaluates something. It has a close connection to test validity. It can be viewed as precision, or the degree to which measurements are error-free. The degree to which a test accurately measures the underlying construct that is hypothesised can be referred to as test validity. It is more accurate to think of dependability as distinct sorts of reliability for various populations at various levels of the construct being tested rather than as a constant quality of a test.

Table 4.1: Reliability Test Value using Existing Method

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.984	0.984	8

Table 4.2: Reliability Test Value using ORI

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.989	0.989	8

ii. Frequency Data

Not just in social measurement research but throughout many scientific areas, frequency analysis is a general method of analysis. In addition, it is a branch of statistics that examines the quantity of occurrences (frequency) and evaluates metrics like central tendency, dispersion, percentiles, and so forth. Getting the analysis frequency date using SPSS.

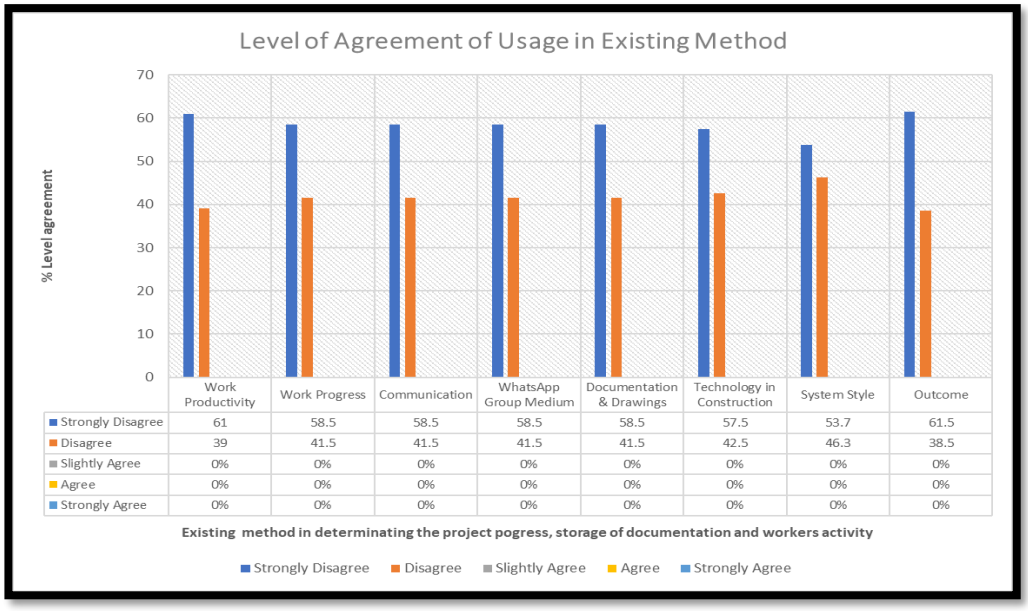


Figure 4.9: Percentage of Agreement using Existing Method

From the figure above it shows the agreement of the respondent using the Existing Method for future project progress. By the percentage it is clarified that the element of IOT must be used for future development at the site.

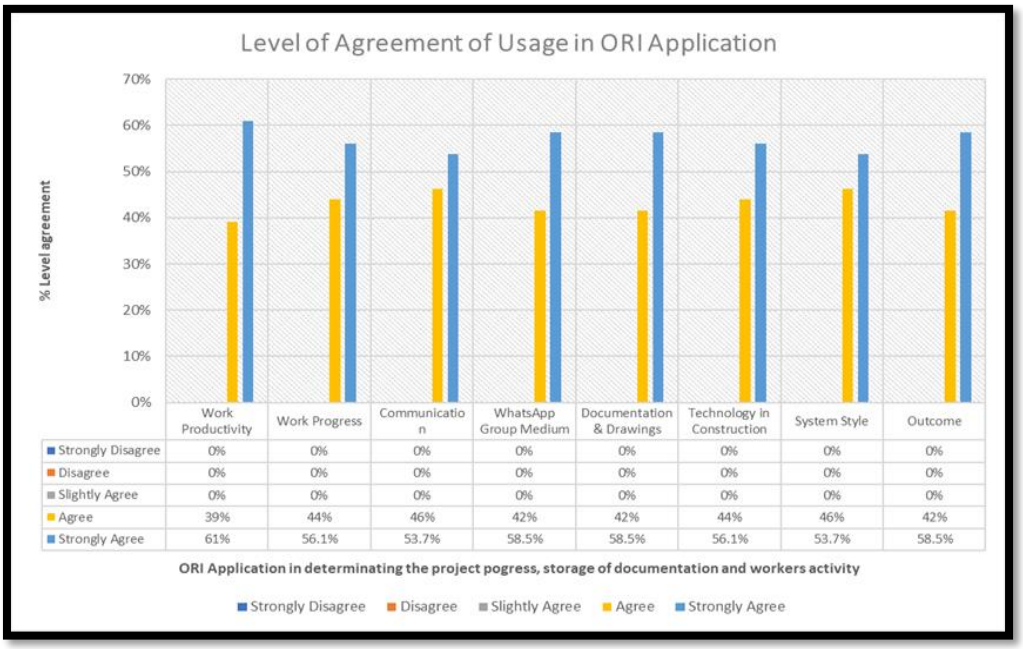


Figure 4.10: Percentage of Agreement using ORI

Figure 4.10 shows the variables of agreement on the development of ORI which makes work more efficient, boost up work progress, avoid miscommunication a good way to bring in IOT into construction, easy system style and the outcome form it satisfy the users.

iii. Descriptive Test

The purpose of descriptive testing is to monitor and evaluate people's thoughts and perceptions. They are used to specify the product features and recreate their intensities, in other words, to characterise products in terms of quality and quantity.

Table 4.3: Issue Regarding Existing Method

	N	**Mean**		**Std.**	**Variance**
	Statistic	Statistic	Std. Error	**Deviation**	**Statistic**
Work Productivity	41	1.39	0.077	0.494	0.244
Work Progress	41	1.41	0.078	0.499	0.249
Communication	41	1.41	0.078	0.499	0.249
WhatsApp Group Medium	41	1.41	0.078	0.499	0.249
Documentation and Drawings	41	1.41	0.078	0.499	0.249
Technology in Construction	41	1.44	0.078	0.502	0.252
System Style	41	1.46	0.079	0.505	0.255
Outcome	41	1.39	0.077	0.494	0.244

From the table 4.3 above it shows Issues Related to the Existing method in determining the project progress, storage of documentation and workers activity. There are 8 elements which are always a constraint towards an activity to be carried out and slows down the project progress. Data above was keyed in and generated using SPSS Software Version 26.

Table 4.4: Effectiveness of ORI

	N	**Mean**		**Std.**	**Variance**
	Statistic	Statistic	Std. Error	**Deviation**	**Statistic**
Work Productivity	41	4.61	0.077	0.494	0.244
Work Progress	41	4.56	0.078	0.502	0.252
Communication	41	4.54	0.079	0.505	0.255
WhatsApp Group Medium	41	4.59	0.078	0.499	0.249
Documentation and Drawings	41	4.59	0.078	0.499	0.249
Technology in Construction	41	4.56	0.078	0.502	0.252
System Style	41	4.54	0.079	0.505	0.255
Outcome	41	4.59	0.078	0.499	0.249

From the table 4.4 above it shows the Effectiveness of ORI in determining the project progress, storage of documentation and workers activity. There are 8 elements which are always a constraint towards an activity to be carried out and slows down the project progress. Data above was keyed in and generated using SPSS Software Version 26.

iv. Mean

Table 4.5: Mean categories for Existing Method

No	Issues Related to the Existing method in determining the project progress, storage of documentation and workers activity	Mean	Mean (%)	Std Deviation	Interpretation for Result
1	Work Productivity	1.39	12.28	0.494	Very Poor
2	Work Progress	1.41	12.46	0.499	Very Poor
3	Communication	1.41	12.46	0.499	Very Poor
4	WhatsApp Group Medium	1.41	12.46	0.499	Very Poor
5	Documentation and Drawings	1.41	12.46	0.499	Very Poor
6	Technology in Construction	1.44	12.72	0.502	Very Poor
7	System Style	1.46	12.90	0.505	Very Poor
8	Outcome	1.39	12.28	0.494	Very Poor
	Average	**1.42**	**100**	0.500	

Table 4.6: Mean categories for ORI

No	Effectiveness of ORI in determining the project progress, storage of documentation and workers activity	Mean	Mean (%)	Std Deviation	Interpretation for Result
1	Work Productivity	4.61	12.60	0.494	Very Good
2	Work Progress	4.56	12.47	0.502	Very Good
3	Lack of Communication	4.54	12.41	0.505	Very Good
4	WhatsApp Group Medium	4.59	12.55	0.499	Very Good
5	Documentation and Drawings	4.59	12.55	0.499	Very Good
6	Technology in Construction	4.56	12.47	0.502	Very Good
7	System Style	4.54	12.41	0.505	Very Good
8	Outcome	4.59	12.55	0.499	Very Good
	Average	**4.57**	**100**	0.500	

Table 4.5 shows the percentage of Mean for all the categories which are involved in the issue. According to the statistic the highest percentage being the system style (12.90%) which being old and less effective it the key reason of the development of a new system where ORI is been born. Besides that, technology in construction (12.72%) plays a part with old method being used. Work Progress, Communication, WhatsApp Group Medium and Documentation & Drawings all share the same percentage of (12.46%). Finally, being the Work Productivity and Outcome all coming out at (12.28%). Regardless of the percentage ORI has to be available to sustain a workflow and work progress.

Table 4.6 shows the percentage of Mean for all the categories which are involved to prove the effectiveness of ORI. According to the statistic the highest percentage being the Work Productivity (12.60%) which being mostly appreciated with faster work productivity. Then comes, the WhatsApp group medium, ORI development follows the idea but in a better way to divide each and every element, documentation and drawings and outcome with (12.55%). Boosting up work progress and bringing technology into construction is shown positiveness (12.47%). Finally, system style has been improved and there will not be lack of communication (12.41%).

4.5 PAIRED SAMPLE STATISTICS T TEST

Paired Sample Statistic is a test conducted to compare the effectiveness of the Existing method in determining the project progress, storage of documentation and workers activity towards the effectiveness of using Organisational Record Management Indicator (ORI) in determining the project progress, storage of documentation and workers activity. This method proves that the result gain from the survey will be valid and produce a mean with good value to declare it as the project will be approved or rejected.

Table 4.7: Paired Statistic Sample

	Paired sample statistics	
	Mean	
Effectiveness Category	Existing Method	ORI
Work Productivity	1.39	4.61
Work Progress	1.41	4.56
Communication	1.41	4.54
WhatsApp Medium Group	1.41	4.59
Documentation & Drawings	1.41	4.59
Technology in Construction	1.44	4.56
System Style	1.46	4.54
Outcome	1.39	4.59

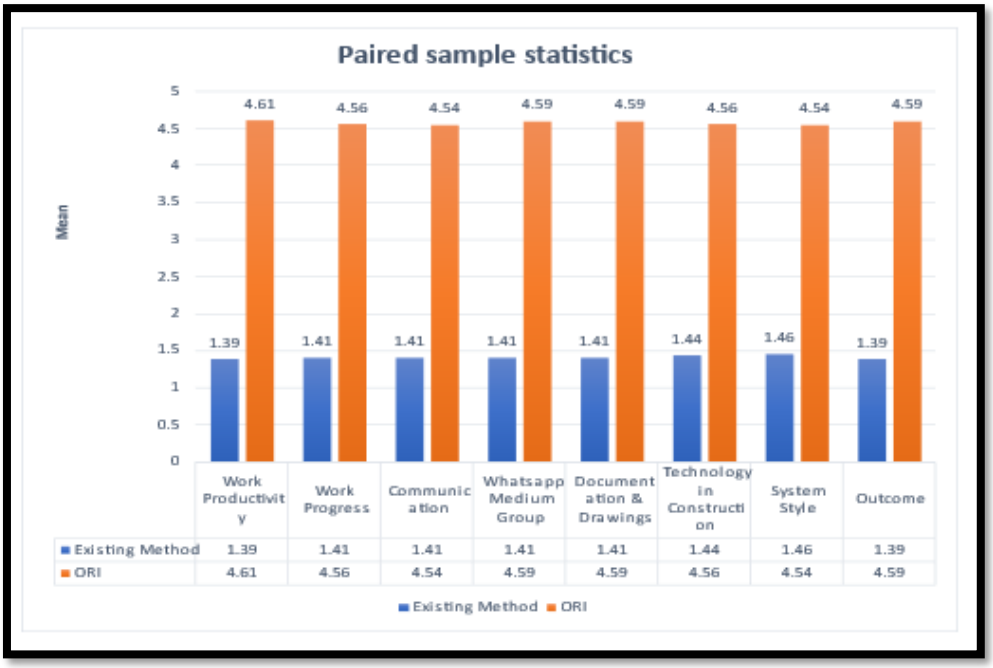


Figure 4.111: Paired Statistic Sample

Evaluation of Organisational Record management Indicator (ORI) in a project has been done, with a set of paired samples of T Test before the usage of ORI and regardless after the usage. Table 4.33 above shows the result of both paired samples with their respective mean, it shows that the respondent preferring the usage of ORI compared to the Existing Method. From the data gained above it shows the Existing Method variables such as Work Productivity (Mean = 1.39), Work Progress (Mean = 1.41), Communication (Mean = 1.41), WhatsApp Medium Group (Mean = 1.41), Documentation & Drawings (Mean = 1.41), Technology in Construction (Mean = 1.44), System Style (Mean = 1.46) and finally, Outcome (Mean = 1.39) has a lower mean compared to the new method which is ORI with the variables being Work Productivity (Mean = 4.61), Work Progress (Mean = 4.56), Communication (Mean = 4.54), WhatsApp Medium Group (Mean = 4.59), Documentation & Drawings (Mean = 4.59), Technology in Construction (Mean = 4.56), System Style (Mean = 4.54) and finally, Outcome (Mean = 4.59).

Table 4.8: Sum of Different Paired Variables

Variables	Paired Different		Significant (two tailed)
	Mean	t	
Work Productivity	3.22	20.87	.000
Work Progress	3.15	20.37	.000
Communication	3.13	20.41	.000
WhatsApp Medium Group	3.18	20.35	.000
Documentation & Drawings	3.18	20.35	.000
Technology in Construction	3.12	19.89	.000
System Style	3.08	19.49	.000
Outcome	3.20	20.87	.000

A paired sample t-test found this difference to be significant for all variables being measured, the value of t of Work Productivity is 20.87 and the value of p is < .00001. The result is significant at $p < .05$. The value of t for Work Progress is 20.37 and value of p is < .00001. The result is significant at $p < .05$. The value of t of Communication is 20.41 and the value of p is < .00001. The result is significant at $p < .05$. The value of t for WhatsApp Medium Group is 20.35 and the value of p is < .00001. The result is significant at $p < .05$. The value of t for Documentation and Drawings is 20.35 and the value of p is < .00001. The result is significant at $p < .05$. The value of t for Technology in Construction is 19.89 and the value of p is < .00001. The result is significant at $p < .05$. The value of t for System Style is 19.49 and the value of p is < .00001. The result is significant at $p < .05$. Lastly, the value of t for Outcome is 20.87 and the value of p is < .00001. From the result above it has been proven that the effectiveness of using ORI provides better productivity and faster performance at site compared to the Existing Method. The result is shown that ORI shows more effectiveness towards project progress.

4.6 SUMMARY

This Chapter refers to fulfilling all the objectives stated. In construction it is not easy to carry out a job when there is a lot of parties involves, it creates a lot of heat when dealing with each another of the superior, with that objectives has been develop and to fulfil the objective there are many surveys being done to get the perfect solution to solve the problem caused. Related to the survey at the early stages of proposal 2 surveys have been carried out to find the main problem being Miscommunication and Slow Project Progress, and the second questionnaire is to find the sub problems which creates the main problem being Documentation, Drawings, Attitude of an Individual and being system style. All data has been shown to comply the First Objective which is identify the main problem in order to solve clients' needs on site.

Through the empathy perspective towards the problem caused at site, a problem statement has been produced with that the objectives have been set and process of ideation on how to solve the problem begins. After a couple thoughts on it a solution on developing a system which considers the combination of Application and Website which name has been given as Organisational Record Management Indicator (ORI). As per design another survey has been conducted to enquire about the design of the system which has receive good feedback and acknowledgments.

After the development of the system the final survey will be handed to evaluate the effectiveness of before using the system and after using the system to get the respondent feedback on which method is reliable to be used is it the Existing Method or ORI (New Method). From the evaluation done statistic shows that the new method is preferred by the users to help into the work process and standardise the work order to make work more efficient and to fasten up the progress, it also acts as a storage to store all documentation based on the project. The method above is easier to update the CPM Chart.

CHAPTER 5

DISCUSSION, RECOMMENDATION AND CONCLUSION

5.1 INTRODUCTION

The study has been conducted and summarised, results were obtained and interpreted from the previous chapters. From the findings, it has been proven that Organisational Record Management Indicator (ORI) has the productiveness to be applied in the company also towards the whole construction sector. IR 4.0 quick revolution in innovation has delivered another model of education for the future which means the implementation of technology in construction has to be utilise due to construction projects became continually further complex, budget and schedule weights are increasing while quality potentials growing. In Construction effective communication is defined as being able to successfully convey information, knowledge, and ideas in a way that is received, understood, and acted upon as originally intended. When discussing communication in the construction sector, effective communication is essential in ensuring the successful and safe operation of an organization and completion of projects. Construction industry should utalise the usage of technology more because it speeds up the process of progress, enhance productivity and reduce time consumption. The result of Organisational Record Management Indicator (ORI) is to comply with all the objectives set.

Organisational Record Management Indicator (ORI) has been established to less down time consumption on an activity, faster up the project progress and enhance the productivity. The system functions as an organizer for works to be carried out to prevent

miscommunication, act as a reminder app for daily activity and as a storage for important documents to be stored. This is to improve the project progress with having this system. ORI is a friendly user software for the users to use, it is very easy and straight forward. The app consists of 3 categories, firstly being Event, which is the concept of uploading daily activity for the day. After that, the storage area where all important documents will be saved and third being Task for the week will be posted with in depth specification of the weekly task to be carried out.

5.2 DISCUSSION

The study is at LRA Bukit Selambau (Zone B) there were many problems with this site that leads to the progress being slow. To solve the problem of the site the method of design thinking has been used. The first process of design thinking is empathy which helps in understand or feel what another person is experiencing. Basically, collecting data to understand client's needs. To gain the data, a questionnaire has been prepared with the purpose of finding out the main problem that is occurring on site. Next comes the process to define where all the data gained will be transferred to create a problem statement. Objectives to solve the problem have been stated with that ideation process will start where ideas will be noted down to produce a produce to solve each objective that has been stated. Storyboard has been created at the prototype phase to then be transferred to create the real product. Finally, to test the product a set of questionnaires will be distributed to evaluate the effectiveness of the product towards the existing method.

3 set of questionnaires were prepared towards the perfect phase to gain information at first being at the empathies phase where Questionnaire (1) is to gain the main problem faced at site, followed by the Questionnaire (2) being the supporting problem that occurs at site for the main problem. All feedback was gathered to create a problem statement. Questionnaire (3) consists of questions to acknowledge the effectiveness of the product towards the existing method and also to gain the recommendations and feedback

towards the Organisational Record Indicator (ORI). All the data collected above is transferred and valued towards the test carried out by using T Test and SPSS method.

The system consists of 3 categories, firstly being Event, which is the concept of uploading daily activity for the day, users can upload all the activity that is being carried out to inform the superiors on what activity is the user in charge of. After that, the storage area where all important documents, it could be stored in the system to easy up the users to have a look at it in the future users also could download the document if needed. third being Task section where planners could plan for the upcoming activity upload all the document for the activity, post a photo at where the activity will take place also place the date of start and the date of finish with the person in charge as well for the activity. It will notify the assigned users on the specific date to carry out the task with the date and time suggested. All above that, the list of activities could be downloaded to update CPM and do claim towards the progress.

Throughout the result from the questionnaire, there are many respondents that support the development of ORI for LRA Bukit Selambau. With the amount of (100%) approximately users agree with the effectiveness of Organisational Record management Indicator (ORI). With the survey the data was formulated through T-Test Paired Sample and SPSS the with the result of the respondent select ORI (Mean = 4.57, SD = 0.48) over the existing method (Mean = 1.42, SD = 0.47). Further calculation towards the data and the difference of the significant variables has been measured with Work Productivity (Mean = 3.22), Work Progress (3.15), Communication (Mean = 3.13), WhatsApp Medium Group (Mean = 3.18), Documentation & Drawings (Mean = 3.18), Technology in Construction (Mean = 3.12), System Style (Mean = 3.08) and finally the Outcome being (Mean = 3.20). By using SPSS method, the significant result is in the range of 0.989 which is acceptable with $p = 0.0001$ and $p < 0.05$. it stated that the productivity and efficiency of Organisational Record Management Indicator (ORI) is useful and far more convenient and ingenious than using the current way.

This demonstrated how much straightforward and more impactful using the Organisational Record Management Indicator compared to the existing process. As a result, the Organisational Record Management Indicator system is recommended to be implement in the company because it benefits towards construction professionals and towards the company as well to prevent miscommunication and fasten up project progress. The Organisational Record Management Indicator (ORI) has better managing system compared to the existing method with the help of it could track each and every user on what activity they are on this ensure all workers have an activity to be active on that day. Documents and drawings could be referred in the system as well. With a small amount of coverage as well all users will be able to gain access into the system to review or upload to the specific interface. Keeping in mind this system is designed to be user friendly.

5.3 ADVANTAGES OF ORI

Organisational Record Management Indicator (ORI) has many Advantages in construction project which complies towards the site progress, below stated the advantages of the application:

i. ORI is a User-Friendly system where users without experience will be able to use it the system supports both IOS & Android
ii. ORI reduce the usage of paper during construction project, improves communication between different construction parties involved to make project planning as easy as possible.
iii. ORI system helps to track daily activities, able to store all documentation and drawings and view in the future.
iv. It helps in making work programme chart update easy and preparing claim for cash out payment slightly helpful and acts as a site diary.
v. It is usable everywhere at office or at site with a little bit of internet.

5.4 RECCOMENDATIONS

Based on the results of all the questionnaire the respondent seems very interested to use Organisational Record Management Indicator (ORI) with many good comments such as good app, great features, amazing, keen to use the app and many more of the above research, the researcher would like to make some recommendations for the improvement of the organisational record indicator (ORI).

i. For future development ORI could work with both online and offline for accessibility of the storage and tasks and could link up to work programme for automatically updates
ii. Future Development could be done to ORI in adding new features to make the software more fun to use such as Machinery Tracking system, Workers Information system and progress claim.
iii. ORI could be use from design phase all the way to certificate of completion and compliance (ccc) phase.

5.5 SUMMARY

In this chapter it is acknowledge about discussion, advantages of ORI and Finally, the recommendation towards it. study has been conducted and summarised, results were obtained and interpreted from the previous chapter it has been proven that Organisational Record Management Indicator (ORI) has the productiveness to be applied in the company also towards the whole construction sector. Organisational Record Management Indicator (ORI) has been established to less down time consumption on an activity, faster up the project progress and enhance the productivity.

Three sets of questionnaires were created to help in the process of gathering information. With the amount of (100%) approximately users agree with the effectiveness of Organisational Record management Indicator (ORI). With the survey the data was formulated through T-Test Paired Sample and SPSS the with the result of

the respondent select ORI (Mean = 4.57, SD = 0.48) over the existing method (Mean = 1.42, SD = 0.47).

Advantages of the system include ORI is a User-Friendly system where users without experience will be able to use it. ORI system supports both IOS & Android, reduce the usage of paper during construction project, improves communication between different construction parties involved, easy up project planning. It also acts as a storage to store all documentation and drawings, besides that able to download and view all activity and documents in the future is another key about the system, able to track daily activities. Easy to update work programme chart, easy to do prepare claim and cash out payment. When there is a bit of coverage is enough for users to use the system. It is usable everywhere at office or at site.

From the recommendation there are some tweaks that could be done in the future where the system could be better with being available online and offline to retrieve information towards the storage and tasks. In future ORI could be in the starting to the completion phase, collaboration of another application to integrate workers information, progress claim and more. It also could be used in different companies.

5.6 CONCLUSION

There are obvious explanations of the problem formulation, in particular for the industrial-based issue in project delays form documentation causes project progress to be slow and also without and proper attitude of workers at site arise miscommunication. From the industrial problem, the aim and objective has been set which are to identify the main problem in order to solve clients' needs on site; to develop Organizational Record Management Indicator (ORI) for LRA Bukit Selambau Zone B and finally to evaluate the effectiveness of Organizational Record Indicator in project. The Scope of the study which has been proposed is Loji Rawatan Air Bukit Selambau (LRA Bukit Selambau).

Development of Organisational Record Management Indicator (ORI) includes smart goals, design thinking which has been used a lot to gain the main problem which is causing the site to be delayed, challengers like delays in project, the cause of delay and the effect of delays will prevent the project to proceed with ace, also Industry Revolution 4.0 has given a major impact towards the construction industry where technology has been introduced but yet still most of the companies are still using the traditional method to get a job done. Most companies still use traditional method which lead to miscommunication involving all the people in charge.

Design thinking process is used on the development of Orginisational Record Management Indicator (ORI) where from the empathy finding out the problem based on site to define the problem statement , ideating using all the sources and coming up with an idea on how to possible help in the site problems to coming out with a prototype that is functional towards reducing the problem faced on site and finally testing the effectiveness of the prototype. Software used to create a system are android studio, flutter, PHP API, MySQL and JWT.

After the prototype is created, fulfilling all the objectives is the main statement to test the effectiveness of the product to solve the problem causes on site. Three sets of questionnaires were created to help in the process of gathering information. With the amount of (100%) approximately users agree with the effectiveness of Organisational Record management Indicator (ORI). With the survey the data was formulated through T-Test Paired Sample and SPSS the with the result of the respondent select ORI (Mean = 4.57, SD = 0.48) over the existing method (Mean = 1.42, SD = 0.47). This shows the effectiveness and productivity towards project progress while preventing miscommunication as well.

Discussion towards the system has been voiced out with that it has given all the advantages of the application being ORI is a User-Friendly system where users without experience will be able to use it. ORI system supports both IOS & Android, reduce the usage of paper during construction project, improves communication between different

construction parties involved, easy up project planning. It also acts as a storage to store all documentation and drawings, besides that able to download and view all activity and documents in the future is another key about the system, able to track daily activities. Easy to update work programme chart, easy to do prepare claim and cash out payment. When there is a bit of coverage is enough for users to use the system. It is usable everywhere at office or at site. The recommendation as well being there are some tweaks that could be done in the future where the system could be better with being available online and offline to retrieve information towards the storage and tasks. In future ORI could be in the starting to the completion phase, collaboration of another application to integrate workers information, progress claim and more. It also could be used in different companies.

As a conclusion, Organisational Record Management Indicator (ORI) has been developed to help solve the problem occur at site with using Design Thinking Method. From collection data of the main problem, finding the sub problems creating storyboards for the system, developing the system prototype, testing the system by handing out survey forms, calculating the data and analysing towards the effectiveness of Organisational Record Management Indicator (ORI) compared to the Existing traditional method. It shows that overall, of the respondent are very pleased with the application being developed to solve the misunderstanding at site and fasten up the project progress.

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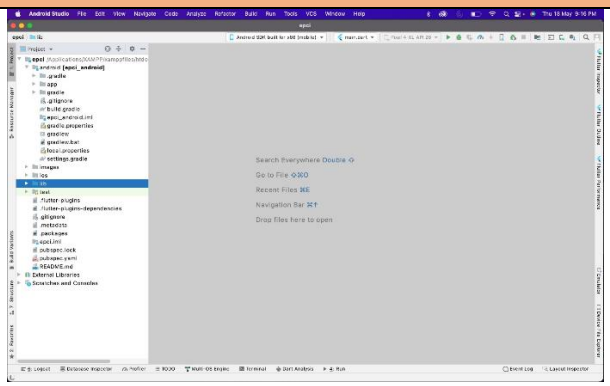
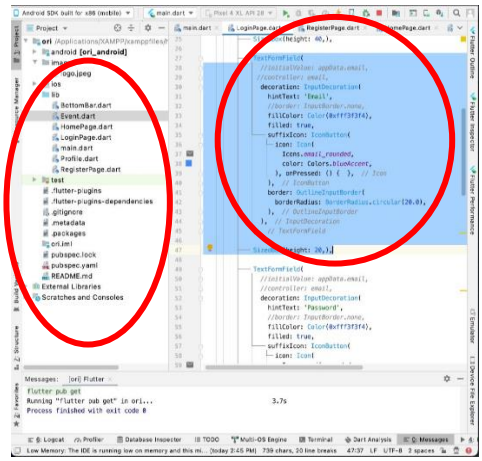
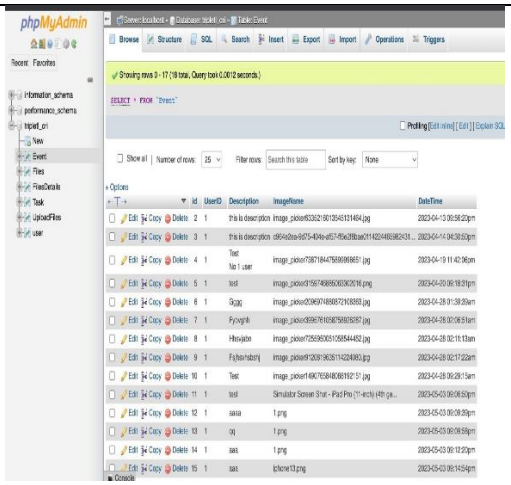
APPENDIX 1

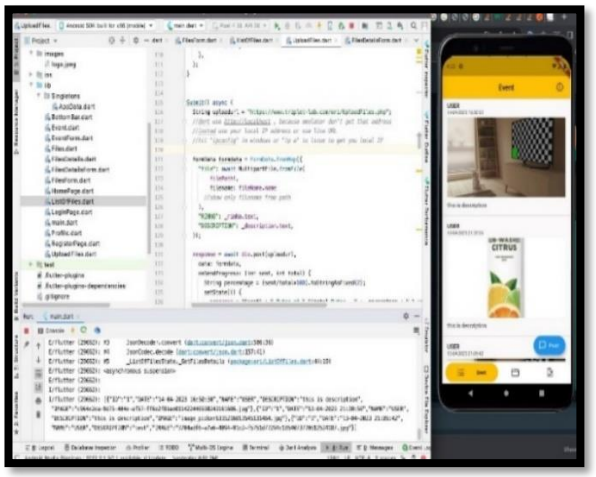
DEVELOPMENT OF ORI APPLICATION

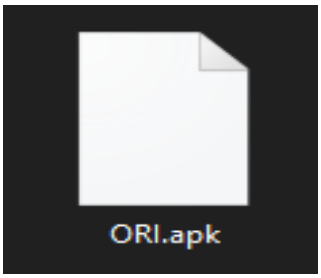
Interface	Description
	**Step 1**: Android Studio Android Studio will be used as the Setup for the application appearances and how the UI will Look in a Device.
	**Step 2**: Coding Process (Flutter) Firstly, Coding will be done with putting all the element required to be in the format following the application such as Event, Storage and Event. The coding is to create the interface of each element. With using Flutter Software
	**Step 3**: Database Process (MySQL) MySQL provides a base to store all files such as RFI, PTW, Drawings and many more regarding all the building

<table>
<tr>
<td>

```php
<?php

class HashPassUtils{

    public static function HashPassword($username,$password){
        $salt = hash('sha256', uniqid(mt_rand(), true) . 'something random' . strtolower($username));

        // Prefix the password with the salt
        $hash = $salt . $password;

        // Hash the salted password a bunch of times
        for ( $i = 0; $i < 100000; $i ++ ){
            $hash = hash('sha256', $hash);
        }

        // Prefix the hash with the salt so we can find it back later
        $hash = $salt . $hash;

        return $hash;
    }

    public static function RetHashPass($hashDB,$pass){
        $salt = substr($hashDB, 0, 64);

        $hash = $salt . $pass;

        // Hash the password as we did before
        for ( $i = 0; $i < 100000; $i ++ ){
            $hash = hash('sha256', $hash);
        }

        $hash = $salt . $hash;
```

</td>
<td>Step 4: Security Process (JWT)

Jason Web Token acts as a Security patch to provide a secure usage towards the Application and The most main it secures all the files that is in the system.</td>
</tr>
<tr>
<td>  </td>
<td>Step 5: Test Run

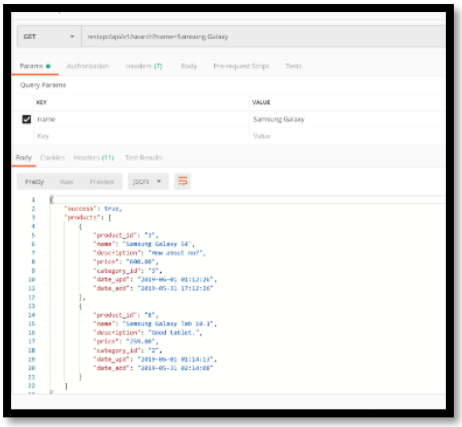
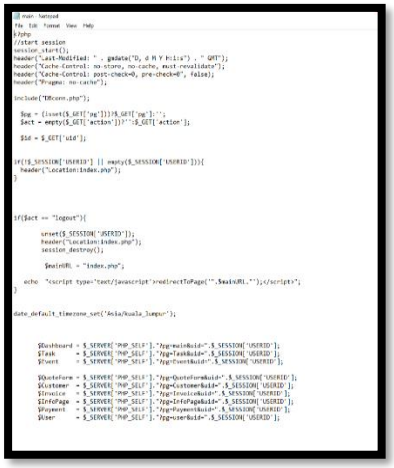
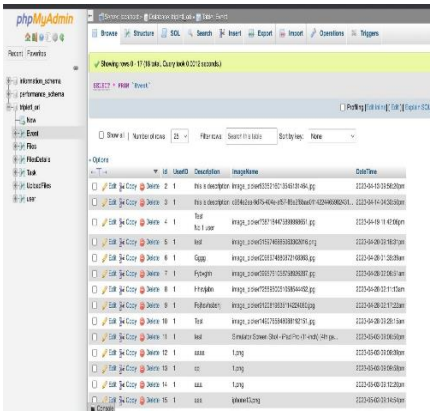
After all the coding with the interpretation of the database and security, a test run will be conducted to experience the first-time usage before releasing the APK to prevent bugs and security breach.</td>
</tr>
<tr>
<td> 

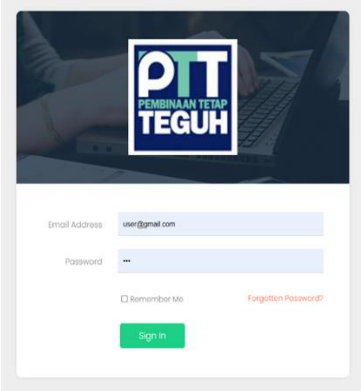

</td>
<td>Step 6: APK Release

Finally, the APK will be released, Users could download the Application and use it without any worries.</td>
</tr>
</table>

APPENDIX 2

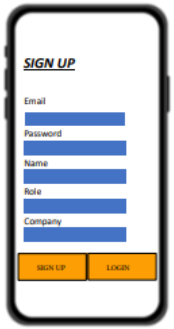
DEVELOPMENT OF ORI WEBSITE

Interface	Description
	**Step 1:** PHP API PHP API is the interface for coding and merging application format to make it website interface
	**Step 2**: Coding Process Coding process involve all the elements required to be in the format following the application such as Event, Storage and Event. The coding is to create the interface of each element
	**Step 3**: database Process (MySQL) Like the Application MySQL provides a base to store all files such as RFI, PTW, Drawings and many more regarding all the building also for the Website
	**Step 4**: Security Process (JWT) Jason Web Token acts as a Security patch to provide a secure usage towards the Application and The most main it secures all the files that is in the system.

	**Step 5**: HTML Release Provided link will take users to the main page for the website. Users could log in with their User ID and use the website to access all the information. https://triplet-lab.com/ori/admin/index.php

APPENDIX 3

DESIGN FOR ORI APPLICATION

Start Up Page	Sign Up Page	Login Page
1 	2 	3 
Greeted by the First-time users only	Sign Up Page	Login Page

Home Page
4 
First Page for User to Interact

Home Page

5

Event Section is selected

Event Interface

6

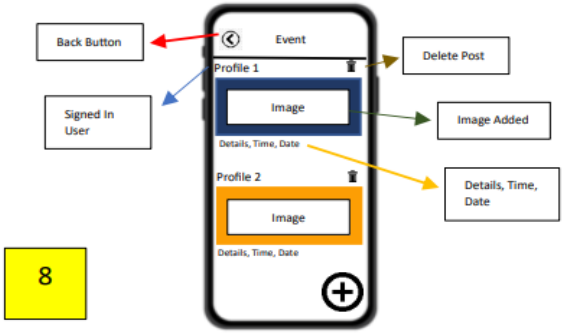
Then it will take to the Event Interface

Add Event Page

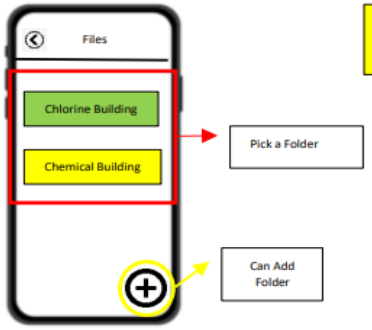
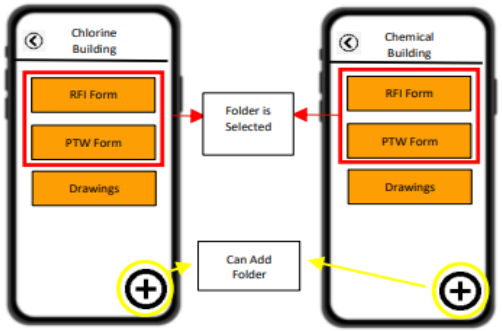
7

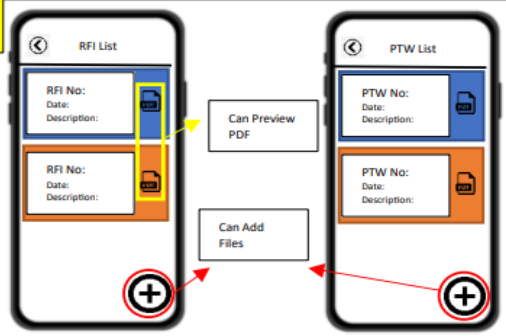
Event Uploading page will pop out when the + button is selected

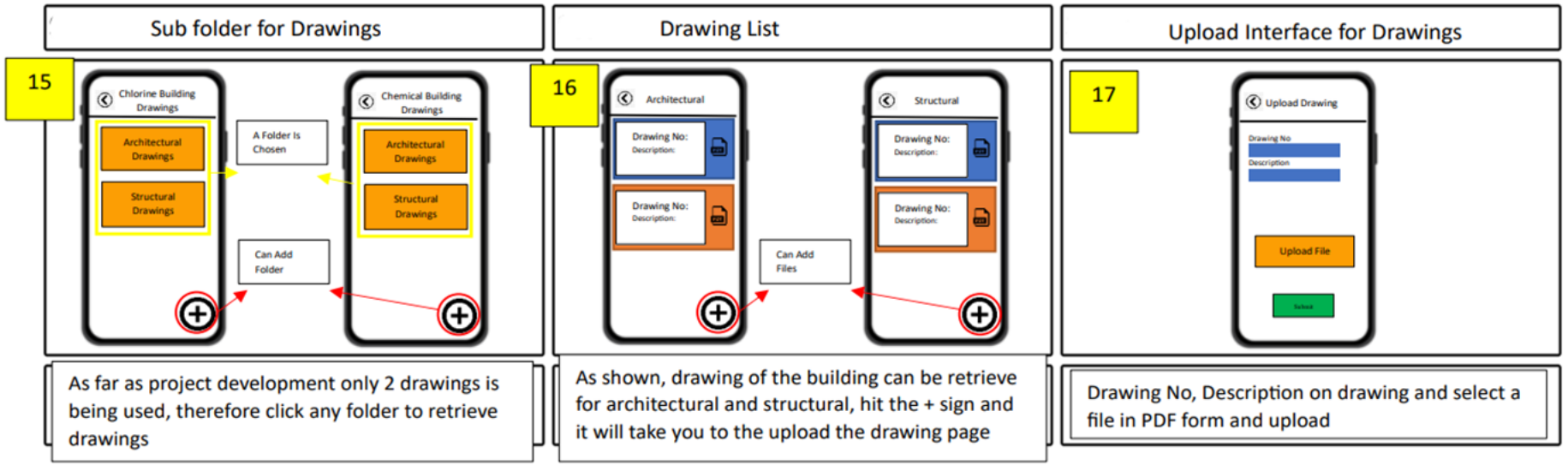
Event Interface



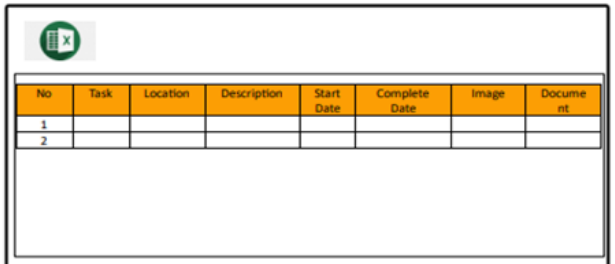
Full Event Interface

Home Page	Buildings Folder	Documents Folder Selection
9 	10 	11 
File Section is selected	A folder section of buildings is shown, click the folder section to retrieve files	Another set of folders which contains specific files are shown, click the folder to retrieve files

Documents List	Upload Interface for Files	Drawing Folder Selection
12 	13 	14 
List of Documents is being shown, Click the + button to add Files	This page is where the document are uploaded in the folder	Same with drawings, select the folder of the specific building and it will take you to another set of folder


Sub folder for Drawings
15
Chlorine Building Drawings
Architectural Drawings
Structural Drawings
A Folder Is Chosen
Can Add Folder
Chemical Building Drawings
Architectural Drawings
Structural Drawings
As far as project development only 2 drawings is being used, therefore click any folder to retrieve drawings
Drawing List
16
Architectural
Drawing No:
Description:
Drawing No:
Description:
Can Add Files
Structural
Drawing No:
Description:
Drawing No:
Description:
As shown, drawing of the building can be retrieve for architectural and structural, hit the + sign and it will take you to the upload the drawing page
Upload Interface for Drawings
17
Upload Drawing
Drawing No
Description
Upload File
Drawing No, Description on drawing and select a file in PDF form and upload

Home Page	Task Interface	Upload Interface for Task
18 	19 	20 
Final section, Task section selected	Task Interface, where all the upcoming task is shown. Hit the + to add task	Add task page will pop up to add upcoming task

Download monthly task excel sheet	Excel Sheet
21 	 22
Task Interface, where all the upcoming task is shown. Also when the Download button is pressed	Excel sheet is created to record all task being done in the month.

APPENDIX 4

DESIGN FOR ORI WEBSITE

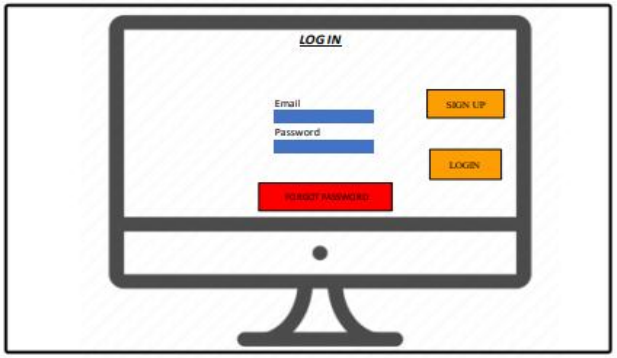
1. Start Up Page

Greeted by the First-time users only

2. Sign Up Page

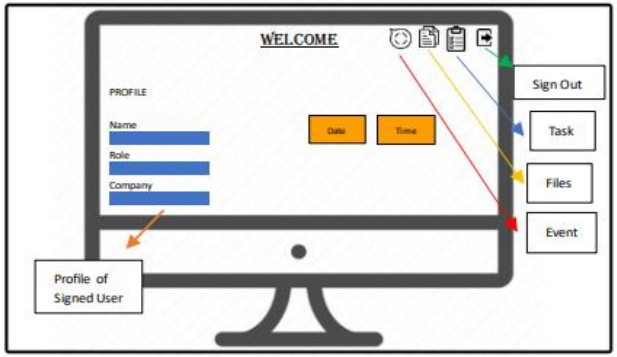
Sign Up Page

3. Login Page



Login Page

4. Home Page

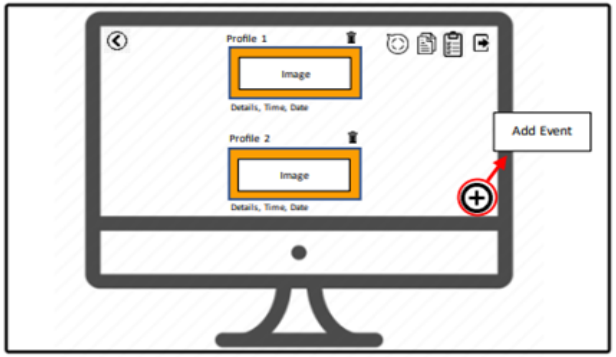


First Page for User to Interact

5. Home Page

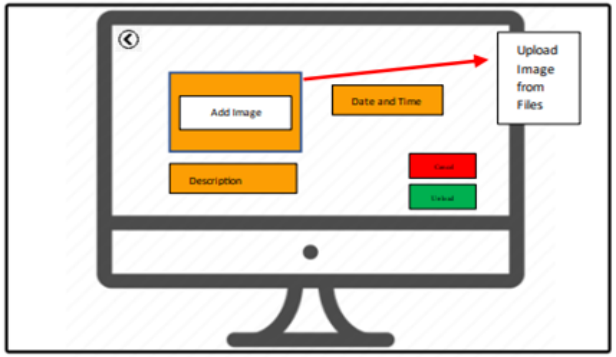
Event Section is selected.

6. Event Interface



Then it will take to the Event Interface

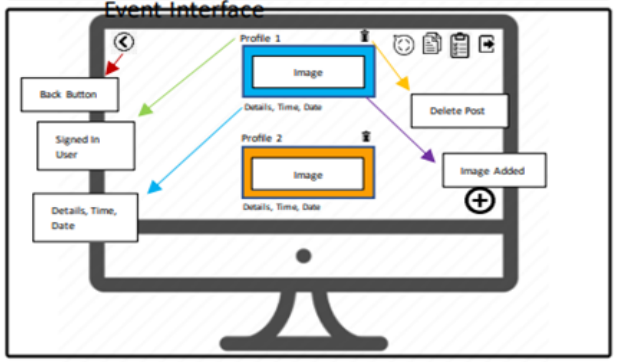
7. Add Event Page



Event Uploading page will pop out when the + button is selected

8. Event Interface Final

Event Interface



Full Event Interface

9. Home Page

File Section is selected

10. Buildings Folder

A folder section of buildings is shown, click the folder section to retrieve files

11. Documents Folder Selection

Another set of folders which contains specific files are shown, click the folder to retrieve files

12. Documents List

List of Documents is being shown, Click the + button to add Files

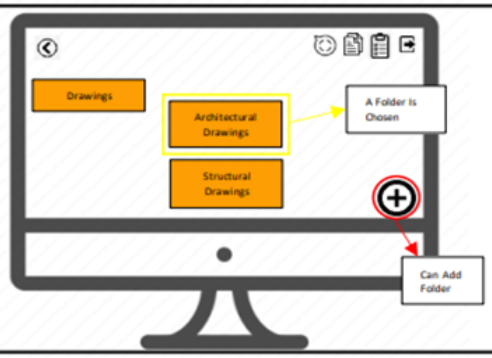
13. Upload Interface for Files

This page is where the document are uploaded in the folder

14. Drawing Folder Selection

Same with drawings, select the folder of the specific building and it will take you to another set of folder

15. Sub folder for Drawings



As far as project development only 2 drawings is being used, therefore click any folder to retrieve drawings

16. Drawing List

As shown, drawing of the building can be retrieve for architectural and structural, hit the + sign and it will take you to the upload the drawing page

17. Upload Interface for Drawings

Drawing No, Description on drawing and select a file in PDF form and upload

18. Home Page

Final section, Task section selected

19. Task Interface

Task Interface, where all the upcoming task is shown. Hit the + to add task

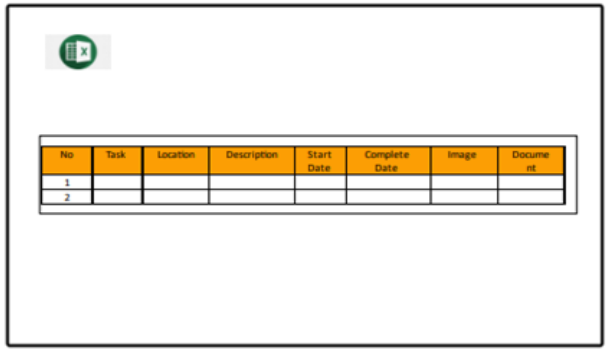
20. Upload Interface for Task

Add task page will pop up to add upcoming task

21. Download monthly task excel sheet

Task Interface, where all the upcoming task is shown. Also when the Download button is pressed to download excel sheet

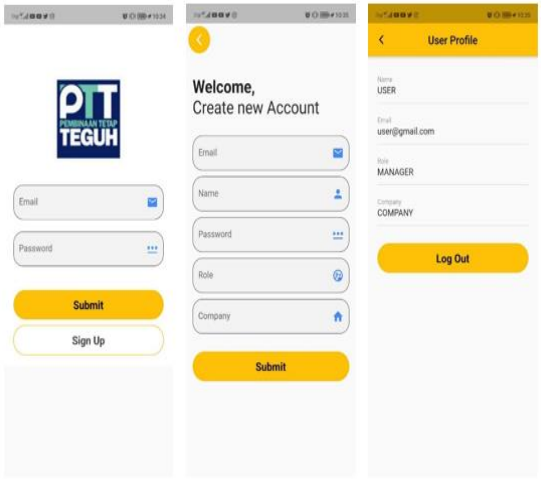
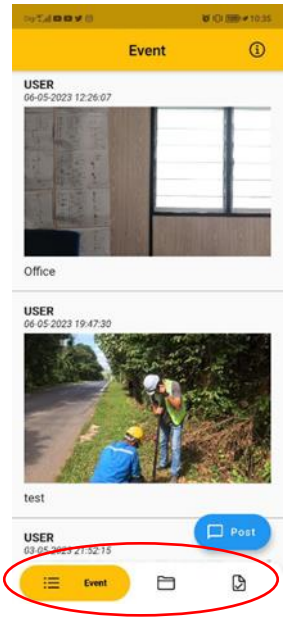
22. Excel Sheet

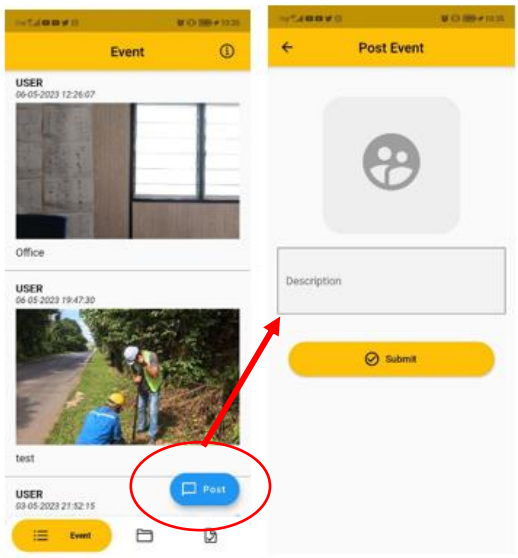
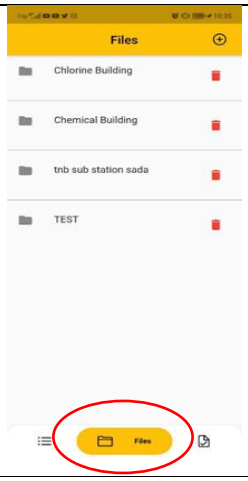
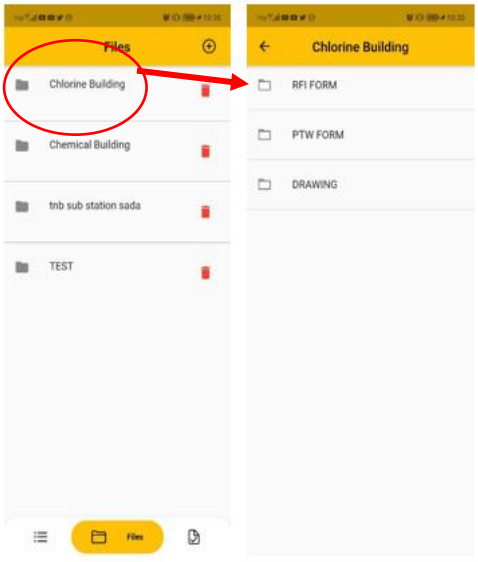


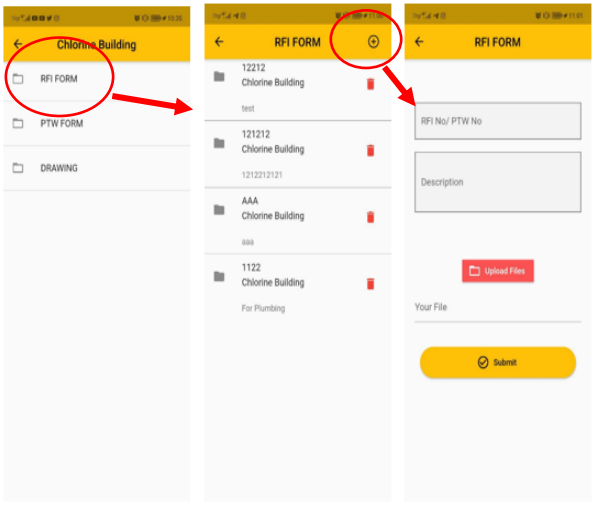
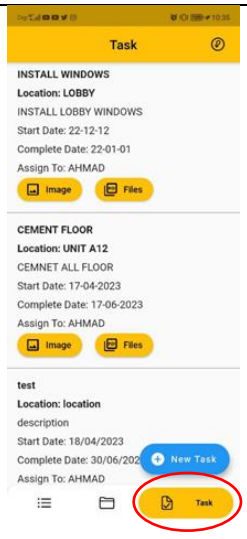
Excel sheet is created to record all task being done in the month.

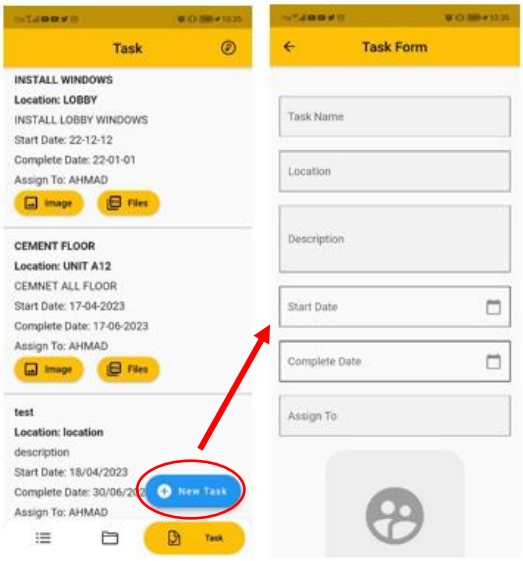
APPENDIX 5

USAGE MANUAL FOR ORI APPLICATION

Design / Function	Description
	Step 1 Click on the ORI Icon at your Mobile Device to access the Application
	Step 2 User will be brought to the Login / Sign up interface where if the users are using the application first time they could SIGN UP, where else if the users already have an account, they could LOG IN.
	Step 3 Greeted by the main page (Event) where all activity will be shown such as “Instagram” where all daily tasks will be uploaded by every user so that it could notify us on the ongoing task. There 3 buttons as shown in the red circle which are: ➢ Event Page ➢ Files ➢ Task Page

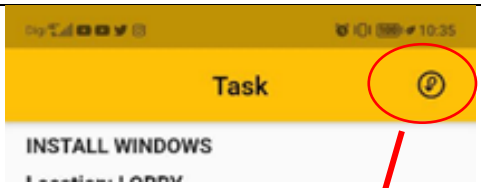
	Step 4 When the Post icon is clicked it will take users to another interface where users could post images on the task which is ongoing and write a brief explanation towards it. When the submit button is clicked it will automatically upload the image with its description to the event page.
	Step 5 The Second Page will be the Files Pages where all the involvement of Documentation of a Buildings will be stored
	Step 6 Click on a Specific building and it will take the users to another page where holds all the documents following the specific building.

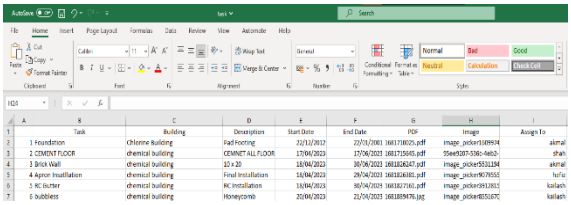
	Step 7 1. From the specific Building folder documents such as RFI, PTW and Drawings will be shown. Users can picture a folder and all the documents will be shown. 2. Press the + button and it will take to another interface of adding the document in this interface it will show the RFI number with description and could add the file to be stored for further references.
	Step 8 From the Files page all the Documents can be downloaded for future references
	Step 9 The Third page is called Task Page. At this page it will show the users all the upcoming task and will notify on the task which is on the date



Step 10

If Users click on the New Task Button it will take users to the Task Upload page where users could add the upcoming task with images of where it is going to take place and its specific document regarding the activity. Also, users could key in the start date and add the finish date. it could also assign the user that is it involve for the activity.



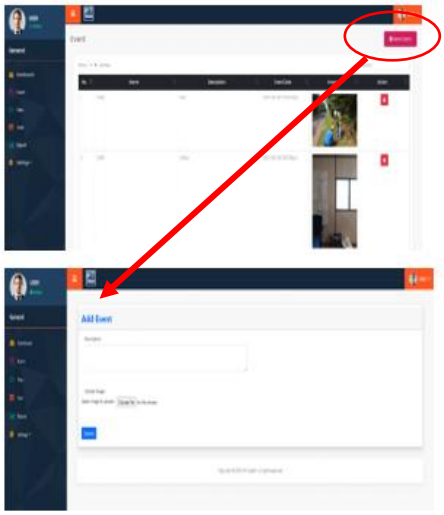


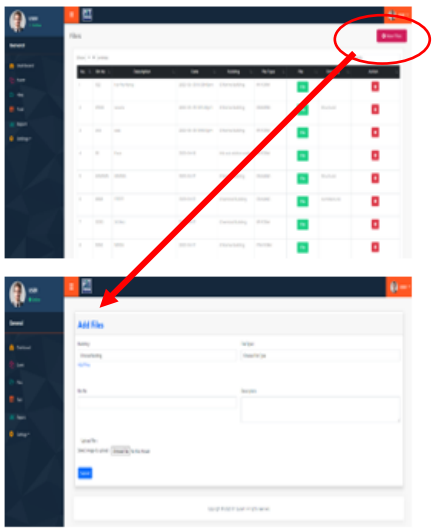
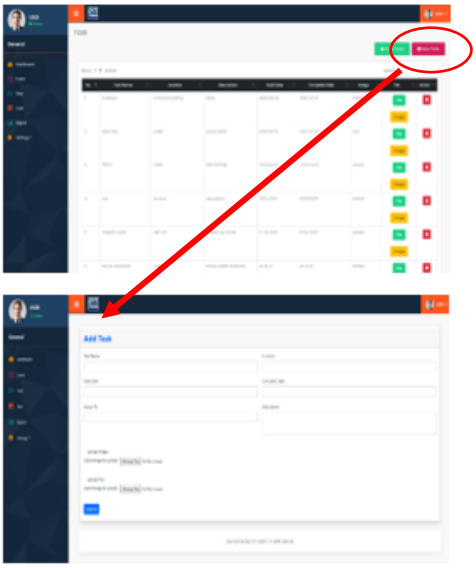
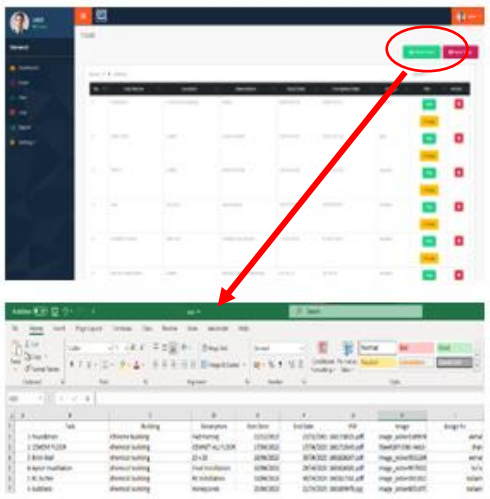
Step 11

Finally, on the task page there will be a button for download. When Users press the download button a list of Excel will be downloaded showing all the Task following by the Month and Users are able to track all progress and update Gantt Chart.

APPENDIX 6

USAGE MANUAL FOR ORI WEBSITE

Design / Function	Description
	By using the link provided Users could find the Website. The Lock sign shows that the link is secured, and all information will not be leaked out
	Users could either Sign Up, or Login if they have an account already. If Users forget their Password, users can press the forgot password to reset it
	When the Post icon is clicked it will take users to another interface where users could post images on the task which is ongoing and write a brief explanation towards it. When the submit button is clicked it will automatically upload the image with its description to the event page. The Website acts same as the Application.

	All The Documentation is Shown in this Tab where users could use the search button to search for the building or the document number. Users could download the file or view through the website.
	If Users click on the New Task Button it will take users to the Task Upload page where users could add the upcoming task with images of where it is going to take place and its specific document regarding the activity. Also, users could key in the start date and add the finish date. it could also assign the user that is it involve for the activity.
	Finally, on the task page there will be a button for download. When Users press the download button a list of Excel will be downloaded showing all the Task following by the Month and Users are able to track all progress and update Gantt Chart.

APPENDIX 7

QUESTIONNAIRE

BACHELOR OF CIVIL ENGINEERING TECHNOLOGY

Dear respondents, I am Kailash Pal Singh a student of Bachelor in Civil Engineering Technology from Polytechnic Ungku Omar would like to invite you to participate in a survey for my Final Year Project on "ORI (ORGANIZATIONAL RECORD MANAGMENT INDICATOR) for Bukit Selamabu Water Treatment Plant". This survey is conducted to evaluating the development of the Application

This questionnaire is an instrument to collect information data especially on the subject to evaluate the application based on the pre and post development for My APP which is "ORI". All your feedback is confidential and is used for the purposes of this research only. Your cooperation in this study is greatly appreciated. There are 3 Part to this questionnaire please do answer all. Thank you

* Indicates required question

Skip to question 1Skip to question 1

Part A: Demography of Respondent

Please select one box

1. *1. Gender* *

   Mark only one oval.

   - ◯ Male
   - ◯ Female

2. *2. Age*

   Mark only one oval.

   - ◯ Below 25
   - ◯ 26 - 35
   - ◯ 36 - 45
   - ◯ Above 45

3. *3. Designation*

Mark only one oval.

- ◯ Consultant
- ◯ Project Manager
- ◯ Site Engineer
- ◯ Site Supervisor
- ◯ Safety Health Officer (SHO)
- ◯ Traffic Managment Officer (TMO)
- ◯ Other: _____

4. *4. Work Experience*

Mark only one oval.

- ◯ Below 2 years
- ◯ 3 - 5 Years
- ◯ 6 - 10 Years
- ◯ Above 10 Years

5. *5. Existing method is easy to determine project progress*

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Slightly Agree
- ◯ Agree
- ◯ Strongly Agree

6. *6. Existing method is easy to prevent miscommunication*

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Slightly Agree
- ◯ Agree
- ◯ Strongly Agree

Skip to question 7

Section B: Effectiveness of Using Organisational Record Management Indicator (ORI)

Select the Linear

1. Strongly Disagree
2. Slightly Disagree
3. Slightly Agree
4. Agree
5. Strongly Agree

1. Work Productivity

7. *Existing method is reliable to determine project progress with the attitude of workers uncomply of documentation and drawings which could lead to miscommunications*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

8. *BIM is a platform to carry out communication and store all document related towards the project, easy to be used for faster project progress.*

Mark only one oval.

	Strongly Disagree
1	
2	
3	
4	
5	
	Strongly Agree

2. *Work Progress*

9. *Existing method is reliable to track project activity with unprofessional behavior of employees, uncomplying documentation and lack of data in drawings towards a task subject to slows project progress*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

10. *ORI is easier to track project progress with a platform set for task being easy to convey an activity being carried out in details.*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

3. Lack of Communication

11. *Existing methods subject to communication is reliable where information is passed around when there are so many parties involved, when there are many activities being carried out at the same time.*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

12. *OM may help to prevent miscommunication among staff which includes managing all activity and document controlling and drawings*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

4. WhatsApp Group Medium

13. *Existing method where posing is reliable for PIC to update all activities carried on site using group, which leads to good information and could lead message as users can accurately convey tone.*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

14. *VR may reduce the inconvenient of updating drawings, overlook information and posing activities at site for faster project progress*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

5. Documentation & Drawings

15. *Existing method of documentation and drawings is reliable to get a job done because of insufficient data towards a section where revise drawings is always being declare causes an activity to be carry out late*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

16. *ORT may reduce the revise drawings being sent and helping in storing documentation systematically.*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

6. Technology in Construction

17. *Existing method is suitable to retrieve information in modern day construction*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

18. *ORI is a good implementation towards IOT in construction*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

7. System Style

19. *Existing method which is manually collecting data is efficient at site*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

20. *OM is more systematic to organise all data and easier to find information*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

8. Outcome

21. *Existing method remains user friendly with easier to track progress and documents*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

22. *CRM is more easier to track documents, progress and staff activity*

Mark only one oval.

Strongly Disagree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Agree

Skip to question 23

Section C: Feedback

Write your answer.

23. Please give us some feedback / improvement regarding Organisational Record Management Indicator for Communication and Document Handling.

Skip to section 5 (THANK YOU)

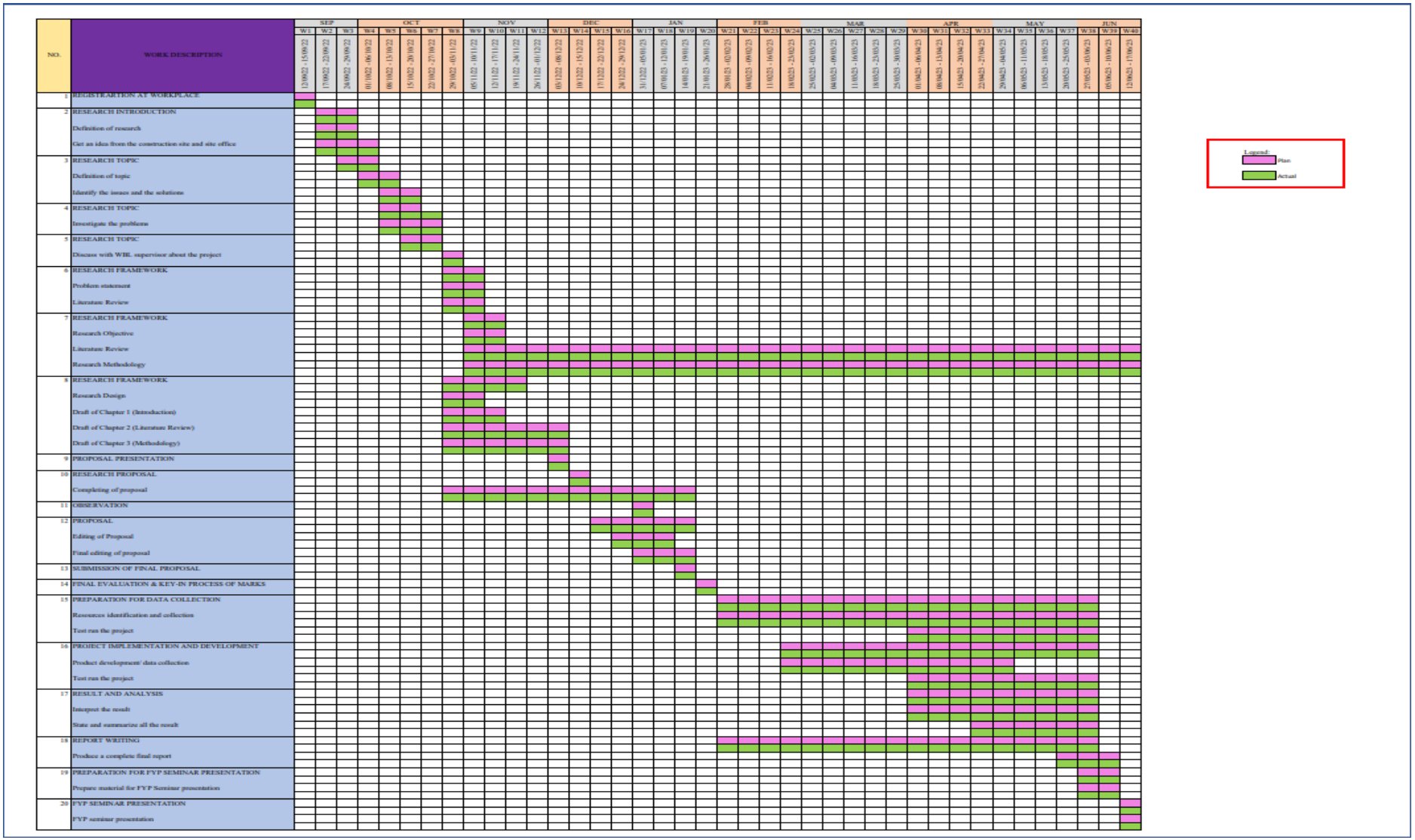
THANK YOU

Thank you for answering all the questions.

All your feedback is confidential and is used for the purposes of this research only.

APPENDIX 8

GANTT CHART


NO.
WORK DESCRIPTION
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
1 REGISTRARTION AT WORKPLACE
2 RESEARCH INTRODUCTION
Definition of research
Get an idea from the construction site and site office
3 RESEARCH TOPIC
Definition of topic
Identify the issues and the solutions
4 RESEARCH TOPIC
Investigate the problems
5 RESEARCH TOPIC
Discuss with WIL supervisor about the project
6 RESEARCH FRAMEWORK
Problem statement
Literature Review
7 RESEARCH FRAMEWORK
Research Objective
Literature Review
Research Methodology
8 RESEARCH FRAMEWORK
Research Design
Draft of Chapter 1 (Introduction)
Draft of Chapter 2 (Literature Review)
Draft of Chapter 3 (Methodology)
9 PROPOSAL PRESENTATION
10 RESEARCH PROPOSAL
Completing of proposal
11 OBSERVATION
12 PROPOSAL
Editing of Proposal
Final editing of proposal
13 SUBMISSION OF FINAL PROPOSAL
14 FINAL EVALUATION & KEY-IN PROCESS OF MARKS
15 PREPARATION FOR DATA COLLECTION
Resources identification and collection
Test run the project
16 PROJECT IMPLEMENTATION AND DEVELOPMENT
Product development/ data collection
Test run the project
17 RESULT AND ANALYSIS
Interpret the result
State and summarize all the result
18 REPORT WRITING
Produce a complete final report
19 PREPARATION FOR FYP SEMINAR PRESENTATION
Prepare material for FYP Seminar presentation
20 FYP SEMINAR PRESENTATION
FYP seminar presentation
Legend:
Plan
Actual

APPENDIX 9

INDUSTRY APPRECIATION LETTER FOR PRODUCT OF ORGANISATIONAL RECORD MANAGEMENT INDICATOR (ORI)

PTT INFRA SDN BHD 198201001934 (81680-M)
(formerly known as Pembinaan ATT Sdn Bhd)
2A-1-1(B), Space U8, No. 6, Persiaran Pasak Bumi, Taman Bukit Jelutong,
Seksyen U8, 40150 Shah Alam, Selangor Darul Ehsan.
T: 03-5037 2822 F: 03-5037 2823

Ruj. Kami : PTTI/GENERAL/IW-WTP(BS)/2023/001

Tarikh : 29 May 2023

Kepada yang berkenaan,

Tuan/Puan,

PENGHARGAAN ATAS PENGHASILAN PRODUK INOVASI ORGANISATIONAL RECORD MANAGEMENT INDICATOR (ORI) UNTUK KEGUNAAN SYARIKAT PEMBINAAN TETAP TEGUH INFRA SDN BHD

Dengan segala hormatnya saya merujuk kepada perkara di atas.

2. Sekalung tahniah saya ucapkan kepada tuan/puan kerana dapat mewujudkan produk inovasi ORGANISATIONAL RECORD MANAGEMENT INDICATOR (ORI). Pihak kami telah mengenalpasti bahawa projek inovasi yang diusahakan oleh tuan/puan mempunyai ciri-ciri inovasi dan berpotensi untuk diaplikasikan di sini.

3. Bersama-sama ini disertakan maklumat produk inovasi yang dihasilkan oleh pelajar dan pensyarah Politeknik Ungku Omar seperti berikut :

Nama produk inovasi : ORGANISATIONAL RECORD MANAGEMENT INDICATOR (ORI)

Nama : 1. KAILASH PAL SINGH A/L BALDEV SINGH
2. SAMIKHAH BINTI MUHAMMAD @ MUNIR

4. Pihak kami berharap, produk inovasi yang dihasilkan ini boleh ditambahbaik berdasarkan nasihat serta pandangan yang telah berikan supaya produk ini berpotensi untuk dikomersialkan.

5. Semoga penglibatan dan usaha murni tuan/puan dalam pembangunan produk inovasi ini dapat diteruskan pada masa hadapan.

Sekian, terima kasih.

Yang benar,

MOHD KHAMIZI ABDILLAH ABU KASIM
Senior Project Manager
PTT INFRA SDN. BHD.

(MOHD KHAMIZI ABDILLAH BIN ABU KASIM)
SENIOR PROJECT MANAGER
PEMBINAAN TETAP TEGUH INFRA SDN BHD
BUKIT SELAMBAU, KUALA MUDA, KEDAH