POLITEKNIK UNGKU OMAR

COMPREHENSIVE METHOD STATEMENT WITH E-REPORTING (CMSxER)

RAIMI IMRAN BIN MOHAMED NASIR

(01BCT19F3031)

CIVIL ENGINEERING DEPARTMENT

SESSION 2 2022/2023

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A project report/thesis submitted in partial fulfilment of the requirement for the award of the Bachelor's Degree of Civil Engineering Technology

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STATEMENT OF AUTHENTICITY AND PROPRIETARY RIGHTS

COMPREHENSIVE METHOD STATEMENT WITH E-REPORTING (CMSxER)

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APPRECIATION

In the Name of Allah SWT, Lord of the Universe. All Praise is only for Him. Thanks to God for His abundant grace and His permission, the writer was given good health and strength, so this final year project was born which was named Conventional Method Statement with E-Reporting (CMSxER). My deepest appreciation goes to my beloved mother and father, Ramlah binti Aziz (mother), and Mohamed Nasir bin Abdul Rahman (father) for always providing moral support, help from various aspects and an injection of enthusiasm for me to continue the journey of producing this final year project. Next, infinite appreciation to my final year project supervisor Dr. Seri Bunian Mokhtar for all the motivation, encouragement, help given and notes that really helped me produce a better final year project report. Without the encouragement, motivation and references that were given, it would be quite difficult for me to finish this project well. In the meantime, I would like to say a thousand thanks to my mentor / industry supervisor, Mr. Chong Chee Leong (Director of Management) for giving me a good opportunity by hiring me as an internship employee at CLCE Construction & Engineering Sdn Bhd. Not forgetting the company staff who provided information and shared their experiences to facilitate the implementation process of the project I was running. Finally, I would also like to say a million thanks to any party who helped me in the production of this final year project directly or indirectly. Your help is greatly appreciated. May Allah SWT reward you all for your services.

ABSTRACT

Reporting work through the production of a method statement is one of the methods of producing useful reports for a company, but the production of a method statement is seen to be somewhat lacking formality, informative and systematic. Comprehensive Method Statement with E-Reporting (CMSxER) is a mobile application which is designed to solve the problem of lacking information, difficulty obtaining information related to accurate procedures in the project carried out, difficult to know the period of time taken in each procedure carried out and the equipment used for company reference while making a report in terms of method statement. The aim of this project was to develop the Comprehensive Method Statement with E-Reporting application and to examine the usability of the CMSxER to the staff, especially to the employer of the company. The project involves designing and developing CMSxER using MIT Inventor. Data collection was conducted through questionnaires, and Statistical Online Software was used to analyze the data. The usability and effectiveness of the CMSxER application were tested through an online survey adapted from the Technology Acceptance Model (TAM) questionnaire, which includes variables like Perceived Ease of Use, Perceived Usefulness, Attitude Towards Using Technology, and Behavioural Intention to Use. The results of the survey indicate that CMSxER received positive feedback with a higher mean score (> 4.00), and company staff expressed their intention to use it for acquiring more information on Comprehensive Method Statement. The paired t-test analysis suggests that CMSxER is significantly more effective in terms of usability compared to the existing method. This mean that CMSxER was more effective in term of usability compared with the existing method. In a nutshell, CMSxER application is seen as a certainty and is of interest to the company and contribute impact in the implementation of the task of doing method statement more easily for all company projects.

Keywords: Comprehensive Method Statement, MIT App Inventor, Social Science Statistics, E-Reporting Technology.

ABSTRAK

Kerja pelaporan melalui penghasilan penyataan kaedah merupakan salah satu kaedah menghasilkan laporan yang berguna bagi sesebuah syarikat, namun penghasilan penyataan kaedah dilihat agak kurang formaliti, bermaklumat dan sistematik. Pernyataan Kaedah Komprehensif dengan E-Pelaporan (CMSxER) adalah aplikasi mudah alih yang direka untuk menyelesaikan masalah kekurangan maklumat, kesukaran mendapatkan maklumat berkaitan prosedur yang tepat dalam projek yang dijalankan, sukar untuk mengetahui tempoh masa yang diambil dalam setiap prosedur yang dijalankan. keluar dan peralatan yang digunakan untuk rujukan syarikat semasa membuat laporan dari segi penyataan kaedah. Matlamat projek ini adalah untuk membangunkan aplikasi Penyata Kaedah Komprehensif dengan E-Pelaporan dan untuk mengkaji kebolehgunaan CMSxER kepada kakitangan, terutamanya kepada majikan syarikat. Projek ini melibatkan mereka bentuk dan membangunkan CMSxER menggunakan MIT Inventor. Pengumpulan data dijalankan melalui soal selidik, dan Perisian Dalam Talian Statistik digunakan untuk menganalisis data. Kebolehgunaan dan keberkesanan aplikasi CMSxER telah diuji melalui tinjauan dalam talian yang diadaptasi daripada soal selidik Model Penerimaan Teknologi (TAM), yang merangkumi pembolehubah seperti Persepsi Mudah Guna, Persepsi Kegunaan, Sikap Terhadap Menggunakan Teknologi dan Niat Tingkah Laku untuk Menggunakan. Keputusan tinjauan menunjukkan bahawa CMSxER menerima maklum balas positif dengan skor min yang lebih tinggi (> 4.00), dan kakitangan syarikat menyatakan hasrat mereka untuk menggunakannya untuk memperoleh lebih banyak maklumat mengenai Pernyataan Kaedah Komprehensif. Analisis ujian-t berpasangan menunjukkan bahawa CMSxER adalah lebih berkesan dari segi kebolehgunaan berbanding kaedah sedia ada. Ini bermakna CMSxER lebih berkesan dari segi kebolehgunaan berbanding kaedah sedia ada. Secara ringkasnya, aplikasi CMSxER dilihat sebagai suatu kepastian dan menarik minat syarikat serta menyumbang impak dalam pelaksanaan tugasan melakukan method statement dengan lebih mudah untuk semua projek syarikat.

Kata kunci: Penyata Kaedah Komprehensif, Pencipta Aplikasi MIT, Statistik Sains Sosial, Teknologi E-Pelaporan.

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LIST OF ABBREVIATION

CIDB	Construction Industry Development Board
IR 4.0	Fourth Industrial Revolution
HSE	Health and Safety Executive
IOT	Internet of Things
I4.0	Industry 4.0
AI	Artificial Intelligent
M2M	Machine to Machine
CPS	Cyber Physical System
TCP/IP	Transmission Control Protocol/ Internet Protocol
UN	United Nations
SDG	Sustainable Development Goals
MEP	Mechanical, Electrical and Plumbing
PPE	Personal Protective Equipment
QR	Quick Response
MIT	Massachusetts Institute of Technology
TAM	Technology Acceptance Model

CHAPTER 1

INTRODUCTION

1.1 Introduction

In today's era of globalization, technology is growing overtime in line with economic, social, cultural, development and more changes. This is because people are still thirsty for more innovations that can facilitate the work of all people around the world in various aspects. The development of innovation from one generation to another is able to produce products, services, and other benefits that are useful among the universal human races. As this technology is growing, there is no doubt that the benefits provided are capable of changing the conventional system to a more systematic and modern one.

Presently, the fourth industrial revolution (4IR) theory seems to be in vogue. From conservatives to progressives, intellectuals, corporate executives, politicians, educators, and everyday citizens often act as though it is a given that it exists. There are disagreements regarding it, but few contest the existence of the 4IR. However, another researcher has shown elsewhere that such a phenomenon does not exist. Beyond the distinguishing traits of the third industrial revolution, there is just no evidence of a contemporary, grand convergence of digital technologies that is dramatically reshaping work, society, and global power (3IR). However, the 4IR's ideologies are still in power.

A number of concerns, including an antiquated process and activities, adhering to regulations, data collection and recording, monitoring, the availability of skilled labor, and a waning interest in pursuing careers in the field, continue to pose challenges to the construction business. The performance in relation to the projects' cost, environment, health and safety, productivity, quality, and time requirement is then met with challenges. Research was carried out to ascertain the obstacles encountered, performance in relation to the project criteria, and the potential of industry 4.0 to help to overcome the challenges in light of the challenges and the arrival of industry 4.0.

In the era of Industrial Revolution 4.0, the Internet of Things (IoT) has found applications in various industries, but its adoption in the construction industry remains limited. This research aims to uncover, identify, and assess the challenges associated with implementing IoT in construction projects. The findings of this study highlight several key challenges, including concerns related to safety and security, a lack of documented standards, insufficient awareness of the benefits of IoT, inadequate introduction of IoT technologies, and issues pertaining to connectivity reliability. Additionally, the study examined the awareness of construction practitioners regarding IoT and its potential application in construction projects. The results revealed that construction practitioners recognize the benefits of IoT in enhancing the efficiency of construction projects (Gamil, A. Abdullah, Abd Rahman, & Asad, 2020).

The preparation of reports is one of the elements that is definitely important to provide accurate information where it includes every aspect of the work done by the workforce. A method statement is one example of compact reporting with a clear description along with the help provided such as photos, times, date, title, and others. Therefore, there are still many companies that do not use technology in the preparation of the intended method statement reporting. However, the innovation that provides various facilities from this form of reporting is a computer software platform through a smart device which is a mobile application where it provides reporting with a more systematic and comprehensive and more efficient method.

1.2 Problem Statement

The organization has a number of initiatives it wishes to implement, including ones with varying degrees of risk, from the lowest to the highest. As a result, it is imperative that the main contractor for the project provide a complete method statement in sequence along with key elements like the importance of performing task in a safe environment, care procedures to produce quality work, expected time to be ready expressed periodically, and more. However, the issue is that no individual from the company prepares a comprehensive report, such as a report in the manner of a method statement to be produced.

In keeping with that, it can be seen that the report, which had previously just shown a picture of the task completed, has now been supplemented with the title of the work completed and the assignment's completion date. The creation of a method statement, on the other hand, it's different because it comes with a variety of helpful, an in-depth characteristic that make it a useful resource for company workers. The top management in the organization lacks a clear review of the activities performed, the items utilized for any projects, the members involved in the duties, the safety precautions taken by the employees, and other information.

Today, the age of technology is rapidly developing with various innovations that can make it easier for many people to carry out their daily tasks. But it is not strange for the company's staff to also use various types of technology in their work. In the preparation of this project, it has become a certainty for the writer to highlight the idea of using technology as a platform to produce a good method statement. Various phases in the production of this project need to be passed, especially to identify what the real problem is and what is the best solution to solve the resulting problem. Therefore, the problem-solving framework needs to be done in more depth overtime and get information from the company's staff as well as references from the researchers on the internet. In the production of this project, it is also necessary to follow the procedure known as the design thinking process which consists of empathy, define, ideate, prototype, and the last is the testing process to produce a project that is able to solve various problems and build an innovation solution.

Through researcher from the website stated that according to HSE.Gov, in 2021, fatal injuries in the construction sector in the UK rose by three to 39. Health and safety documents like a method statement can help mitigate potential hazards within the workplace.

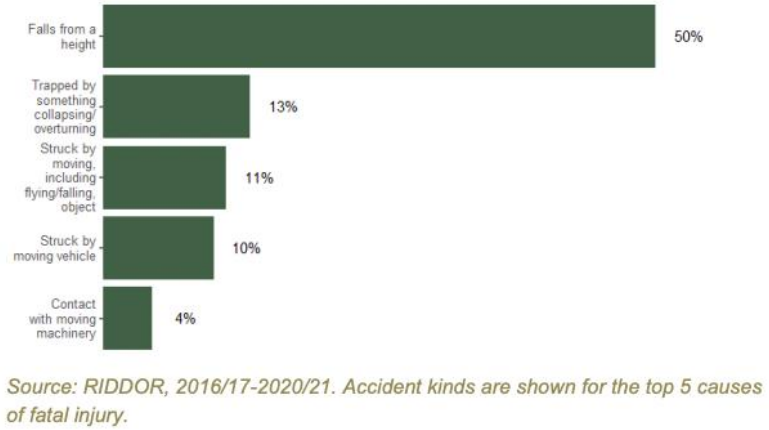


Figure 1.1: Fatalities rate in construction

From the above statistics, we can see that the highest percentage of deaths on construction sites is caused by accidents from falling from a high place where the percentage is as much as 50% and this is interspersed with other factors such as being hit/trapped by something, collapse, landslides, or soil structural weakness. Next, factors from heavy objects falling from high places and accidents due to being run over/hit by moving machinery are also among other factors that contribute to the increase in the death rate at construction sites. Among the solutions are all risks that should be identified and a risk assessment log for each high-risk job in the construction sector. A good method statement for each task should include more detailed planning than possible risk assessments. Each employee should further divide each task identified in the risk assessment into steps. While a risk assessment is used to assess the hazards involved in each step, the method statement should describe all precautions and safety protocols to reduce risk. Method statements should also include hazards associated with the by-products of tasks and activities. For example, if there is waste produced, the document should cover how to dispose of the waste with safe and accurate implementation (Minett, 2020)

From another researcher, approximately 25000 workers were injured on construction sites due to unsafe work practices in the past three years alone. Of these, 1700 people were permanently disabled and 23 lost their lives. These are alarming statistics. If you're a construction project manager, it's up to you to take the right precautions and safeguard your workplace from unnecessary risks (Australia, 2022)

This body has also presented its solution to the issues that occur at the construction site. A safe work method statement (SWMS) must be prepared for all high-risk construction projects before work begins. The SWMS should outline the scope of work involved, any potential safety issues, and how risks will be prevented and managed. By law, construction work cannot begin until SWMS standards are met.

In another summary of studies, poor documentation might impact construction project in many ways. Without them, work cannot be done, and contractors cannot get paid. Documents serve as the critical evidence to support or dispute any claims. Because of their importance, it is critical that the project has proper document control procedures. The construction companies that do not have proper documentation procedures experience troubles like files missing, files getting in the wrong hands, or not getting updated. Struggling to get the necessary backup documents to face any claims or to get a time extension. Jotted down some of the most problems that construction companies face. If any of the problems are faced by you, then using a construction project management process is ideal (Software, 2022)

Because of that, this body has also presented its solution to the issues that occur at the construction site due to the weakness of documentation management. Using the construction project management process is ideal for overcoming documentation management problems such as missing files, files reaching the wrong hands or not being updated. Additionally, construction crews need a quick and fast response when dealing with any changes or data requests. In the absence of a good document control system, changes will not be communicated to them quickly and this will slow down the entire work process.

Written in an article, the importance of implementing safety procedures on construction sites. She states that a failure to install adequate health and safety procedures can result in serious injuries and fatalities. A work-related illness or injury can not only put an employee out of work for a while and impact their quality of life; it may also damage your business's productivity, finances, and reputation. All of which can be difficult to recover from. a good reputation is a crucial part of a business's success. It can bring you a greater volume of investors and clients, and improve community opinion of your business, in a larger number of individuals who will be eager to join your team. However, the poor health and safety culture will cost your reputation. Martinelli also mentioned that as an employer, it is your legal responsibility to make your workplace a safe environment for your employees. If you neglect your legal responsibility, you may face high legal costs, hefty fines, and the possibility of a jail sentence. My respecting your health and safety responsibilities, you keep your staffs motivated and retain good employees who can work productively and free of harm (Martinelli, 2017).

In terms of conclusions that can be made through studies based on previous studies about problems and solutions related to the work of reporting and documentation management, there is still no study made by any party about the innovation of a systematic and comprehensive method statement application with e-reporting. Therefore, the study of this report leads to the main objective which is to produce an application named Comprehensive Method Statement with E-Reporting (CMSxER) where it will be seen as a solution for employees in the company to refer to method statements made by general workers and sub-contractors on the construction site and easy to update at any site location projects.

1.3 Objectives

The main target of this research project is to produce an application called Comprehensive Method Statement with E-Reporting (CMSxER) to solve the problem of conventional reporting that lacks information to one that is more systematic and easier to handle. Among the objectives to be targeted are as follows:

i) To design the "Comprehensive Method Statement with E-Reporting" application to enhance the reporting format that dense with information about on-site tasks according to I.R 4.0

ii) To build the "Comprehensive Method Statement with E-Reporting" application by using the MIT App Inventor

iii) To examine the usability of the "Comprehensive Method Statement with E-Reporting" application to the staff, especially to the employer of the company

1.4 Scope of Study

The scope of the study for the final year project to be implemented is focused on the location of the construction site where the project is under the supervision of CLCE Construction and Engineering as the main contractor for the project of the Semi Converter Industries (SCI) Sdn Bhd factory located in the Gopeng Industrial Area, Gopeng District. This project consists of the proposed construction of a one-story factory.

Figure 1.2: Semi Converter Industries Site Location (Google Map, 2022)

The CMSxER application is a production innovation that focuses on the type of work carried out by paid sub-contractors and general workers of the company where it includes work produced in groups, systematically, involving special machinery and equipment according to the correct standard procedures and adding filling others such as the type of clothing that is suitable for some projects, the safety measures that need to be applied, the health level of the workers, keeping the memory of previous method statements up to now according to the year, and even displaying any problems that arise along with solutions during the execution of the project.

1.5 Significance of Study

This final year project study is an application that appears to be very helpful because of the features found in it in solving problems innovatively compared to the previous system where this application will reduce the workforce on behalf of the company's staff to obtain authentic resources from employees related to materials and services carried out. At the same time, this application is seen to be able to reduce the risk of repeated accidents when employees want to do any high-risk job. It will make it easier for workers to always practice the correct working style without any confusion and negligence when performing work on the construction site. Finally, it can avoid waste in managing the company's finances with a method statement that displays all the materials used by employees, the number of employees on duty, and the time it takes to complete their work.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The construction industry is known to be overwhelmed with resource planning, risk management and logistic challenges which often result in design defect, project delivery delays, cost overruns and contractual disputes. These challenges have instigated research in the application of advanced machine learning algorithms such as deep learning to help with diagnostic and prescriptive analysis of causes and preventive measures. However, the publicity created by tech firms like Google, Facebook and Amazon about artificial intelligence and applications to unstructured data is not the end of the field. there abound many applications of deep learning, particularly within the construction sector in areas such as site planning and management, health and safety and construction cost prediction, which are yet to be explored (D. Akinosho, et al.).

Application software is abstracted from the underlying technology that runs it. abstraction in programming means that the final product, seen by the end user, doesn't clearly show all the details under the surface. in application development, this means the program and code that manage the application. users don't need to know how the program is written; they only need to use the interface. abstraction makes applications easier to view and use. figuratively speaking, applications sit on top of system software because they are unable to run without the operating system and system utilities. system software consists of low-level programs that interact with the computer at a very basic level (Beal, 2022)

2.2 Reporting in the Form of a Method Statement

Method statement is a written instructions on how to perform job safely. Method statement is essential for safeguarding the health and safety construction sites. Method statement is used to outline the safety measures used in high risk working environments in order to reduce risks that were identified during the risk assessment. They go over the Personal Protective Equipment (PPE), health and safety contacts, and control equipment needed to keep employees inside visitors safe while tasks are being performed.

As the author mentioned earlier, the use of method statements is common in the construction industry as a way to manage certain health and safety risks that have been identified which possibly as a result of the creation of a risk assessment, such as lifting operations, demolition or dismantling, working at heights, installing equipment, the use of plants, and so forth. The Construction (Design and Management) Regulations do not include method statements as a requirement, but the Health and Safety Executive (HSE) has identified them as a way to satisfy the regulations' requirements and an effective way to assess risks, manage risks, gather worker opinions and brief workers.

The main purpose of method statement is, it plays a very important role when it comes to the HSE and quality of any projects, particularly in any construction industries. these documents also include tools and tackles, knows your PPE (Personal Protective Equipment), scope of work, risk assessment (to make sure certain high-risk tasks and activities involved in the for which method statement is prepared). the purpose of method statement is to describe the safety precautions to put in place to control the risk identified in risk assessment. it details the equipment's that are going to be used on that task and also PPE required to keep workers inside visitors safe while ongoing task.

According to him further that there are 10 advantages that coincide with the implementation of the method statement. Among the intended advantages is it comply with the law, fulfil the client requirements, method statement can put controls in place, make better decisions, commit to health and safety, communicate arrangements also to coordinate with other activities. The implementation also can help to monitor the health and safety performance, keep people safe and also with the help of method statement the work can plan properly.

2.2.1 Advantages That Coincide with The Implementation of The Method Statement

i) Comply with the Law

All employers have their own legal health and safety responsibilities, and these are documented in various health and safety regulations. In fact, even before the regulations, organization have to take care of their employees. All businesses have a legal requirement to risk assess the health and safety risks arising from the work they carry out.

ii) Fulfill Client's Requirement

For every organization, they must write a new risk assessments method statement when they are awarded a job and asked for a copy from their clients. In the construction industry, health and safety documentation for nearly every new project they have to prepare. The client will ask for these documents because they want to check how the work will be carried out safely.

iii) With The Help of Method Statement, You Can Plan Work

When carrying out the assessment, encourages planning for the task or activity. Rather than just going ahead for the work, and finding out the risks, you can think about the challenges of the task first. Consider what hazards you might face, and how you can control that risk.

iv) Put Controls in Place

While preparing method statement, it is much easier to put controls in place and risk assessment. During planning stages, you are in a better position to gather resources for the activity and decide on the most appropriate controls. You also have time on your side. If you are already on this side or doing the task, it is often too late to look for a safer way to do things without causing delays.

v) Make Better Decisions

While preparing method statement, thinking ahead about how the work will be carried out, and considering the options available, it will help you make better decisions. For example, your risk assessment may identify a number of controls that can be put in place to improve health and safety standards for a particular activity.

vi) Commit to Health and Safety

While preparing method statement, your risk assessment and method of work gives a degree of commitment to what is written down. The document then forms a basis for the management of the activity that can be developed and amended in the future.

vii) Monitor Health and Safety Performance

Prepared method statement will provide a record, not only to show you have complied with their legal duties, but as something they can refer back to, and use to monitor activities. Written records of decisions made, instructions given, and feedback allow you to check their procedures are being followed and identify any weaknesses in health and safety management.

2.3 I.R. 4.0 Agenda

Technologist and technicians are the pillars of strength who will determine the success of the fourth industrial revolution (Industry 4.0). We should aim to be among the top nations in the world with regard to domestic economy, prosperity and innovation. in industry 4.0 (I4.0), the value of technology is highly emphasized. Forward-looking principles such as the Internet of Things (IoT), 3D printing, autonomous vehicle, biotechnology and nanotechnology are embedded within I4.0. Emerging technologies have changed the nature of jobs in Malaysia. Sufficient skilled human power to operate rising technologies is the key in the continuous development of a country like ours. There is a host of new types of jobs requiring mastering of new tasks. Nevertheless, it has to be

stated that technologies do not replace technologists. instead, they empower them to do their jobs. Technologists use human skills and characteristics that machines cannot replicate such as intelligence, creativity and experience. This is the kind of mindset we need to adopt. (Tan Sri Dato' Academician (Dr.) Ts. Ahmad Zaidee Laidin FASc, 2017)

According to other sources, Industry 4.0 refers to the current trends of process automation and data exchange using advanced manufacturing technologies. These include the Internet of Things (IoT), Industrial IoT, cyber physical systems (CPS), cloud computing, artificial intelligence (AI), cognitive computing, 3D printing, predictive maintenance, smart sensors, and others. These technological trends are designed to facilitate machine to machine (M2M) communication using minimal to no dependence on human force. The aim of adopting the industry 4.0 model is to make complete transformation of one's manufacturing firm into a "Smart factory", giving a competitive edge over other brands and retailers. Industry 4.0 Transformers the way products are built, designed, delivered, used, and operated. It also enhances and monitors the after-purchase performance like maintenance and servicing. Overall, the fourth industrial revolution has the ability to transform processes, operations, machinery, supply chain management, and the entire energy footprint of manufacturing firms to create "Smart factories". With the implementation of Industry 4.0, Malaysia has become successful in widening its market globally and extending its services to international clients. Besides automating core business functions, this month technologies have allowed industries to customize their products to cater to the unique needs of modern-day digital consumers.

2.4 Internet of Things (IoT)

The Internet of Things is the latest paradigm shift produced in the IT arena. The phrase given the name "Internet of Things" also known as IoT was soon coined from two words, the first word being "Internet" and the second word being "Things". Additionally, the Internet is a global system of interconnected computer networks that use the standard Internet protocol suite (TCP/IP) to serve billions of users worldwide. It is a network of networks consisting of millions of private, public, academic, business and government networks, from local to global in scope, linked by a wide range of electronic, wireless and optical networking technologies.

The Internet of Things, also known as ambient technologies or Embedded Systems, is a global system of IP-connected computers networks, sensors, actuators, machines, and devices, merging this physical world with the virtual world of the Internet. The Internet of Things is a key part of the Future Internet. Many new opportunities can be foreseen for businesses and marketers, but also for the society as a whole (Haller et al.). Cognitive IoT technologies will make it possible for business leaders to understand what is happening in the world more deeply. By infusing intelligence into systems and processes, businesses will be able to not only do things more efficiently, but to improve customer satisfaction, to discover new business opportunities, and to anticipate risks and threats so they can better deal with them.

Innovative technologies like the internet of things (IoT), big data, and cyber physical systems are revolutionising the conventional methods of designing and implementing building projects. In other context, Principles of Design for Manufacture and Assembly and Industry 4.0 have transformed construction to be seen as a manufacturing process with huge opportunities to use Big Data for improving operations and making informed decisions at various stages. This is done in an effort to improve overall productivity and business value in the construction industry. The use of IoT in the construction industry has various benefits. This includes better implementation monitoring, efficient control, better quality, lower costs and time savings. Due to the availability of real-time data analytics, it has also been extended to be used in quick decision making. Environmentally related applications for IOT technology include waste management, pond pollution and flood concentration analysis.

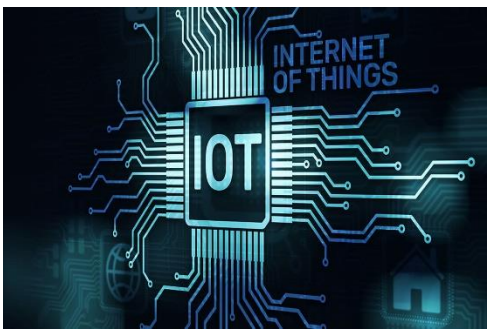


Figure 2.1: Internet of Things (IoT)

2.5 Previous Studies on MIT App Inventor

When MIT professor Hal Abelson took a leave of absence to work at Google Labs Labs in 2007, the App Inventor project began. The growing interest in educational block-based programming languages such as Scratch and the launch of the new Android operating system are inspiring for project leaders. When Google closed Google Labs in 2011, this teaching project was moved to MIT. We briefly discuss the creation and early development of the App Inventor platform in this section, initially at Google and later at MIT.

Some blocks are assembled using the App Inventor method. The process can then be called to repeatedly use the block set. If a procedure requires an argument, the name block is used to specify the argument. App Inventor automatically creates a call block and adds it to the My Definitions menu when you build a procedure. To start the procedure, use the call block.

The name for the new process block is automatically chosen by App Inventor when you create it. To modify a name, just click on it and type. App procedure names must be different. You cannot define two procedures with the same name in the same app in App Inventor. By changing the label in the block, you can rename the process at any time as you develop the program. The associated call block will be automatically renamed to match by App Inventor.

Let's create a procedure to perform duplicate code block tasks. Similar to how you define variables in App Inventor, you define procedures the same way. Drag one of the procedure blocks the procedure create block or the procedure return block from the Procedures drawer. If your procedure needs to calculate a value and return it, use the latter. By clicking the word procedure and entering a new name, you can change the procedure block name from the default procedure after dragging it out.

2.6 Impacts of Poor documentation to Construction Projects and How the Previous Researchers Find the Solutions

A method statement is a document that details exactly how to carry out work safely. To ensure building site health and safety, method statements are key. The purpose of the method statement is to describe safety precautions in high-risk work environments to control the risks identified in the risk assessment. They detail the personal protective equipment, health and safety contact and control equipment required to keep workers and site visitors safe while the task is in progress.

A statement of safe working methods should only be completed after a risk assessment has identified all potential hazards. HSE.Gov explained that risk assessments should be "appropriate and adequate" as a legal requirement. A risk assessment should be completed for all projects, from small works to complex operations. They detail each task on the project and assign them a risk score before detailing any precautions needed to mitigate the risks described.

Poor health and work-related illnesses can cost a business time and money. The government reports that "the combined costs of unemployment and sickness absence amount to around £100 billion each year" across the UK. It is desirable for those on construction sites to have safe systems such as method statements to control steps, reduce risk and protect workers, site visitors and the public from harm. This will ultimately protect your team and save you money.

Safety Method Statement Evaluation

Project	
Document reference number	
Document submitted by	
Contractor	
Specialist discipline	
Evaluation of	
This method statement has been Select for consideration *(select, as appropriate)*	
Next action	
Assessed by	
Date	

	Test	Yes	No	In Part	N/A
1	Task/process and area of specialisation				
2	Sequence of work				
3	Supervisory arrangements				
4	Monitoring arrangements				
5	Schedule of plant				
6	Reference to occupational health standards?				
7	First aid				
8	Schedule for personal protective equipment				
9	Schedule of arrangements for demarcation				
10	Controls for the safety of third parties				
11	Are the assessed high risk or safety critical phases identified with controls specified?				
12	Emergency procedures				

Figure 2.2: The Way Method Statement Should Looks Like Suggested by Alex Minett for the Issues Arises

Next, in an article explains that all employers have a responsibility to protect the health and safety of their staff, regardless of their occupation or industry. For construction workers, who are exposed to high-risk environments, there are additional hazards that must be considered. In addition, the next statement is also raised that if you are a construction project manager or site manager, it is up to you to take proper precautions and protect your workplace from unnecessary risks. There are 11 way to secure in construction site start with safety training, minimize and manage risk, site security, safe work message statement, use clear signage throughout the site, entry and exit points, compliant chemical storage, environmental conditions, first aid, provide personal protective equipment (PPE), and lastly dropped objects (Australia, 2022)

In other context, poor documentation impact construction project in many ways. Without them, work cannot be done, and contractors cannot get paid. 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. 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 construction companies near me (Software, 2022).

The construction company you hire needs to have proper documentation of the work they do. However, many construction companies struggle to gain control over a large number of project documents. Architectural plans, RFIs, mark-ups, etc.- one problem in the document can lead to big problems in the construction process for the firm. Poor documentation quality is a major cause of inefficiency in the construction process, leading to delays, rework and variations and contributing to an increase in project time and cost, generally for all project participants.

The next statement is how the production of poor documentation affects the construction firm. Among them are increase in rework due to poor documentation. If the construction crew does not know about the updates happening, then rework has to be done. it deletes the loss of productive time, wastage of money, and delays in completing the project. Better construction project management helps to avoid these issues.

Other than that, the other consequences is wastage of productive time due to poor documentation. it has been seen that a good amount of productive time of the construction crew goes into locating the specific files amid several hundreds uncategorized documents. As a result, it leads to loss of good productive time. the construction crew needs prompt and fast responses when it is dealing with any changes or asking for data.

Next, siloed information due to poor documentation is also the possible consequence happens. several construction companies use law of free storage options that are not ideally designed for storing documents. As a result of this, the files spread over different services and lead to siloed information. the document controlling options differs from one service to the other.

The important consequence happens is due to delays in communication. poor documentation can lead to delay in communication. supposedly a subcontractor needs some documents urgently for completing a job. if the person has the document immediately, then the work gets sorted quickly. but for companies with a poor documentation process, it will take hours or at times several days forgetting the document. for better project site management, proper managing of the documents is needed.

Slow response for changing the orders due poor documentations is another impact happens to construction firm. changes will happen in the construction project. complex with multi traded projects have more changes and it is manually impossible to keep track of them a few hours delay can also cause many problems in the construction work. it will lead to wastage of productive labor time and also wastage of materials. construction management helps in avoiding such delays.

Other than that, poor documentation can leaks in safety and security. though the construction supply companies are not as prone to hacking is the retail and healthcare companies, there have been data leaks in the past few years in this field. poor control over important documents like employee documents, daily logs, or safety logs can present a weak spot to the hackers. using the same login details by different team members can lead to immense access once a single account is hacked. individual login details with permission controls are a safer option for protecting the data.

Last but not least, incomplete closeout packages due to poor documentation will impact the construction firm. the closeout packages must include manuals, warranties, guaranteed drawings of the construction and layout. As you can see, poor documentation is not helpful for the construction company. to better working structure, using construction management software helps to create transparency and keeps all the team members of the project informed. since the construction software uses technology in every manner (iOS, Android, Desktop Versions), the workflows and the processes are better connected, and good documentation management is practiced by the construction company. construction firms that are lacking in document control practices tend to experience a wide range of issues as files go missing, failed to get updated across the entire team, will end up in the wrong hand.

2.7 Conclusion

In conclusion, that the production of innovation that the writer emphasizes is related to the production of a new reporting product in the form of this method statement has received many beneficial credits from various authentic sources. This is because the literature review is a critical component of any research or academic work. It serves as a comprehensive and systematic examination of existing scholarly literature on a specific topic, providing a foundation for the research and helping to identify gaps, trends, and areas for further investigation.

Through the literature review, researchers are able to gain a deeper understanding of the current state of knowledge in their field and identify key theories, concepts, and methodologies that have been previously explored. It allows them to build upon existing research and avoid duplication of efforts, ensuring that their study adds value to the existing body of knowledge. Additionally, the literature review helps researchers to identify gaps in the existing literature, which can serve as opportunities for further research. By identifying these gaps, researchers can propose new research questions or suggest areas where additional empirical evidence is needed to advance the field.

Overall, the literature review plays a vital role in the research process by providing a comprehensive overview of existing knowledge, informing the research design, and identifying gaps for further exploration. It serves as a foundation for the research study and ensures that the findings are built upon a strong scholarly basis.

CHAPTER 3

METHODOLOGY

3.1 Introduction of Research Method

A special topic that tells about the entire method used, the study design, the study framework, the flow chart of the entire study process, and the entire part of the study design that is implemented will be contained in this third chapter which is the methodology. It is one of the steps to tell readers what ideology and findings will be obtained from the implementation of the production project of an application called "Comprehensive Method Statement with E-Reporting (CMSxER)".

3.2 Design of the research

The division of the research process into three main phases, as you described, can be summarized as follows:

Phase 1: Problem Identification and Problem Statement Formation

i) This phase involves identifying the problems or challenges present in the company or organization.
ii) The research team conducts an in-depth analysis to understand the nature and scope of the identified problems.
iii) Based on the analysis, problem statements are formulated, which outline the specific issues that need to be addressed through the research.

Phase 2: Proposal Development and Approval Process

i) In this phase, the research team focuses on developing a proposal or plan to address the identified problems.
ii) Statistical analysis may be conducted to gather relevant data and insights that inform the proposal.
iii) The proposal includes the features and functionalities that will be incorporated into the application or solution.
iv) The team seeks approval from relevant stakeholders or decision-makers within the company for the implementation of the proposed project.
v) If the proposal is approved, the team proceeds to the next step of preparing the application software.

Phase 3: Data Collection, Analysis, and Validation

i) This phase involves collecting data from respondents or participants who are relevant to the research project.
ii) The collected data is analyzed using appropriate analytical methods and techniques to derive meaningful insights and conclusions.
iii) In addition to data analysis, the research team may also seek validation from experts or senior staff members within the company.
iv) The validation process ensures the accuracy and credibility of the research findings and recommendations.

It is important to note that while these three phases provide a general framework for the research process, the specific activities, methods, and timelines may vary depending on the nature of the study and the organization involved. Product innovation research design refers to the approach used to study and develop new products or improve existing ones. It involves understanding customer needs, market trends, and technological advancements to create innovative and successful products. Here are some common research designs used in product innovation:

i) User-Centered Design: This design approach focuses on understanding the needs, preferences, and behaviors of end-users. Researchers conduct in-depth interviews, surveys, and usability tests to gather insights and feedback directly from potential customers. These findings guide the development and refinement of products to ensure they meet user expectations and deliver a positive user experience.

ii) Iterative Prototyping: Iterative prototyping involves creating multiple versions of a product or its features and collecting feedback at each stage. Researchers can engage users, stakeholders, and experts in hands-on sessions to evaluate prototypes, provide suggestions, and identify areas for improvement. This iterative process helps refine product concepts and ensures that the final design aligns with user expectations.

iii) Market and Competitive Analysis: Before developing a new product, it is crucial to understand the market landscape and competitive offerings. Researchers can conduct market research, including competitor analysis, customer surveys, focus groups, and trend analysis. This research design provides insights into customer needs, identifies market gaps, and helps in positioning the product effectively.

iv) Technology Assessment: Innovation often relies on leveraging technological advancements. Researchers can explore emerging technologies, conduct feasibility studies, and evaluate the potential impact of these technologies on product development. This design approach ensures that the chosen technologies align with the product vision and can be effectively integrated into the design process.

v) Co-Creation and Open Innovation: Involving external stakeholders, such as customers, suppliers, or partners, in the innovation process can lead to breakthrough ideas and collaborative solutions. Researchers can design co-creation workshops, hackathons, or open innovation platforms to gather diverse perspectives, insights, and contributions. This design approach fosters collaboration, knowledge sharing, and the generation of novel ideas.

vi) Trend and Future Forecasting: Researching market trends, emerging technologies, and societal shifts can provide valuable insights for product innovation. Researchers can use a combination of qualitative and quantitative methods, including trend analysis, scenario planning, expert interviews, and trend mapping. This design approach helps identify future opportunities and shape product development strategies.

These research designs can be used individually or in combination, depending on the specific goals, resources, and constraints of the product innovation project. The key is to apply rigorous research methods to understand user needs, market dynamics, and technological possibilities to create innovative products that meet customer demands and drive business success.

3.3 Development of the research

Below Figure 3.1 shows the framework research of the methodology for this project. The development of a research process involves a systematic and structured approach to planning, conducting, and evaluating research studies. While the specific steps and stages may vary depending on the nature of the research and the field of study, here is a general outline of the typical development of a research process:

i) Identify the Research Problem: The first step is to clearly define and identify the research problem or question. This involves reviewing existing literature, conducting preliminary investigations, and identifying gaps or areas for further exploration.

ii) Review the Literature: Conduct a comprehensive review of relevant literature and studies related to the research problem. This helps in understanding the current state of knowledge, identifying key concepts and theories, and informing the research design.

iii) Formulate Research Objectives: Based on the identified research problem, formulate clear and specific research objectives or research questions that the study aims to address. These objectives guide the overall direction and scope of the research.

iv) Design the Research Methodology: Determine the appropriate research methodology and design for the study. This includes decisions on the research approach (quantitative, qualitative, or mixed methods), data collection methods, sample selection, and data analysis techniques. Consider ethical considerations and ensure the methodology aligns with the research objectives.

v) Collect Data: Implement the chosen data collection methods and collect relevant data. This may involve surveys, interviews, observations, experiments, or analyzing existing datasets. Ensure data collection is rigorous, systematic, and aligned with the research design.

vi) Analyze and Interpret Data: Once data is collected, analyze it using appropriate statistical or qualitative analysis techniques, depending on the research approach. Interpret the findings in light of the research objectives, draw conclusions, and identify any patterns, trends, or relationships.

vii) Draw Conclusions and Make Recommendations: Based on the analysis and interpretation of the data, draw valid and reliable conclusions that address the research objectives. Identify any implications or recommendations that arise from the study's findings and contribute to the existing knowledge or practice.

viii) Communicate and Disseminate Findings: Prepare a research report or manuscript that documents the research process, findings, and conclusions. Share the findings through presentations at conferences, publication in academic journals, or other appropriate channels to contribute to the research community and wider audience.

ix) Evaluate and Reflect: Reflect on the research process, methodology, and outcomes. Assess the strengths and limitations of the study and consider potential areas for future research or improvement.

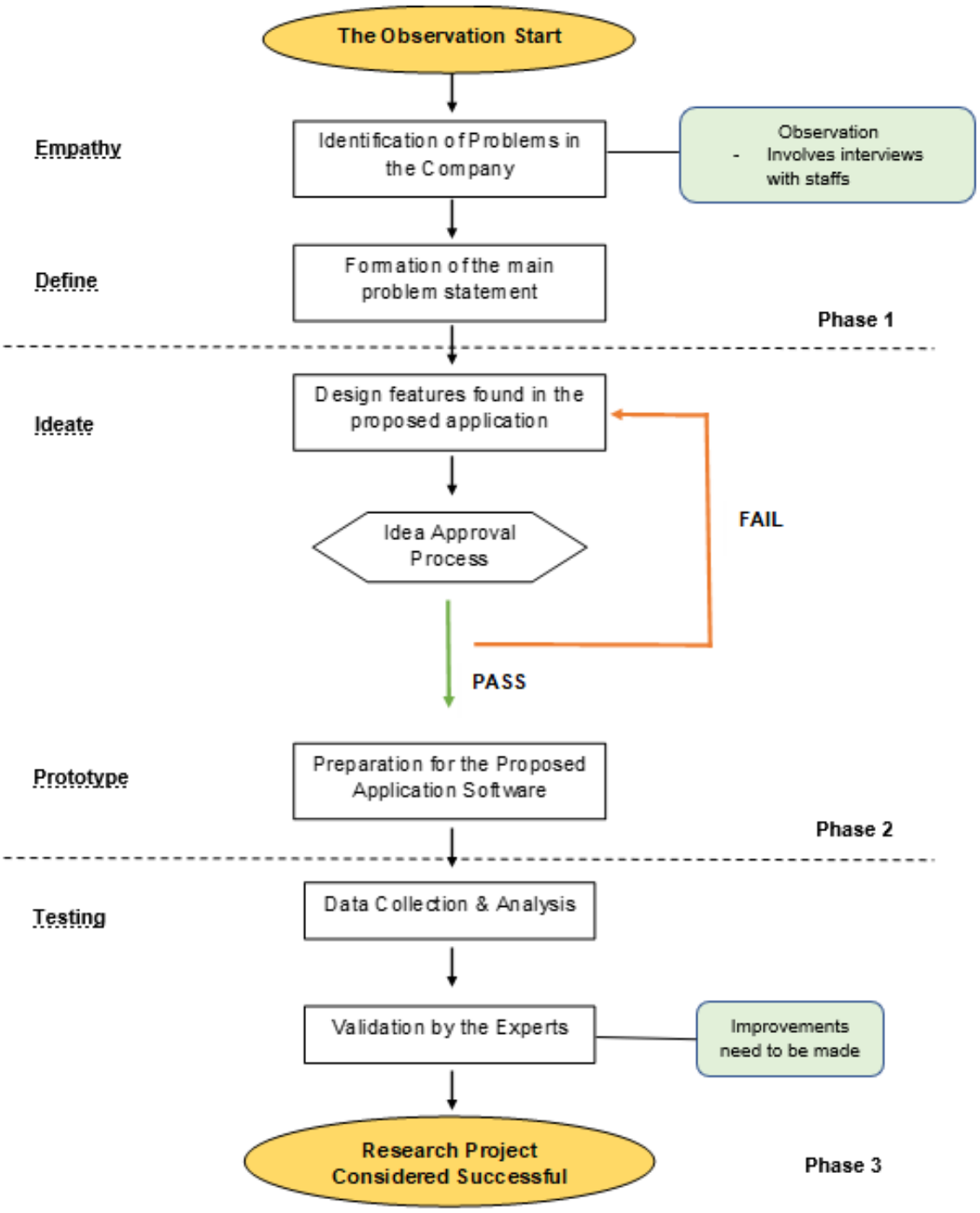


Figure 3.1: Research Framework (Methodology Chart)

3.4 System Design and Development of CMSxER

The things that want to be covered through this sub-topic emphasize on the skills of thinking creatively in the production of the design of an innovation. Most of the researchers will get various benefits from it, among them being able to ensure that all the information that is important for the production of this software application can be fully successful. Among the main systems or driving forces that I can highlight which is a backbone platform for the production of my innovation ie MIT App Inventor the programming learning tool.

3.4.1 System Design

Figure 3.2: MIT App Inventor Logo

The MIT App Inventor software application is one of the main drivers of the end-of-year project production which is the Comprehensive Method Statement with E-Reporting (CMSxER). For users who are familiar with using this inventory application, they surely know that this application is a user-friendly creation regardless of who the individual is and the job they do, even regardless of age because MIT App Inventor it's also a visual programming environment that makes it possible for anybody, including kids, to create fully working apps for smartphones and tablets. MIT App Inventor beginners may launch their first straightforward app in about 30 minutes.

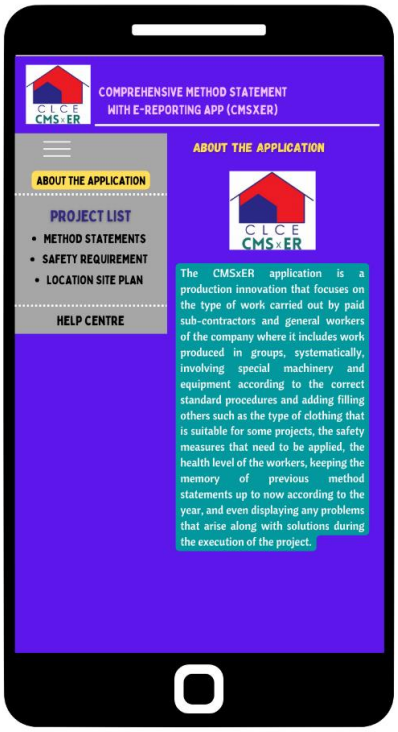
Additionally, our blocks these two speeds up the development of complicated, high impact apps compared to conventional programming environments but enabling everyone, especially young people, to switch from technology consumption to technology creation, the MIT App Inventor initiative aims to democratize software development. Text-to-speech functionality is a helpful feature. These tools are particularly user-friendly, and offer a wide range of resources, including media, drawings, and animations, layout and interface editing, sensor use, and even social aspects of the process. As part of the Hour of Code initiative, Google and MIT collaborated to create MIT app inventor with the goal of assisting students in their learning. It was created and offered for free as a result. It follows that anyone can visit the MIT-hosted website to get started right away. To use this tool, you don't even need to provide any personal information like your name or e-mail address.

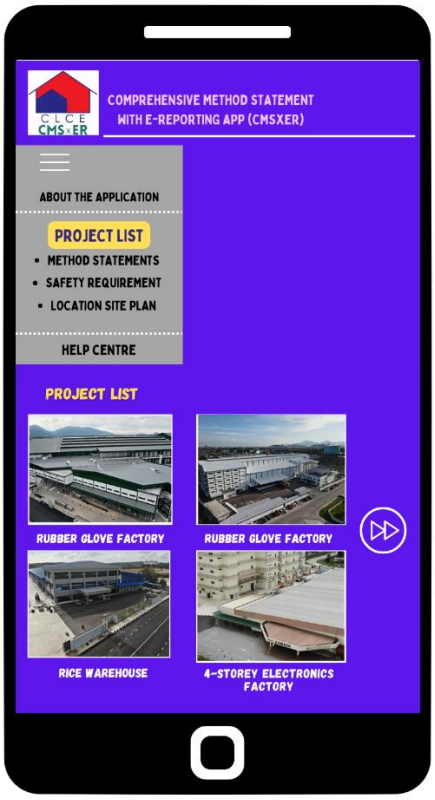
3.4.2 System Development

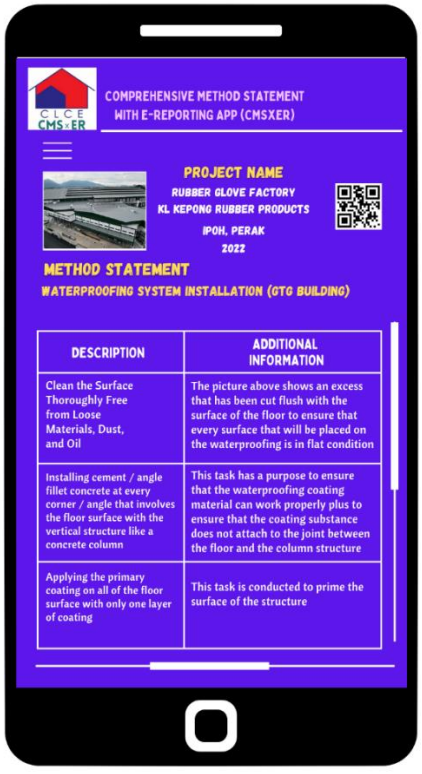
The next part is more focused on main objective of the research project which is to present the production system or system development which will show all the complete tutorials on how this application namely "Comprehensive Method Statement with E-Reporting (CMSxER) can be used by users which is to the workforce which consists of construction site supervisors, site engineers, operation engineers can even be used by interns of CLCE Construction & Engineering Sdn Bhd. It is hoped that every lesson given can make it easier for staff to take advantage of this application when they want to make a report in the form of a method statement.

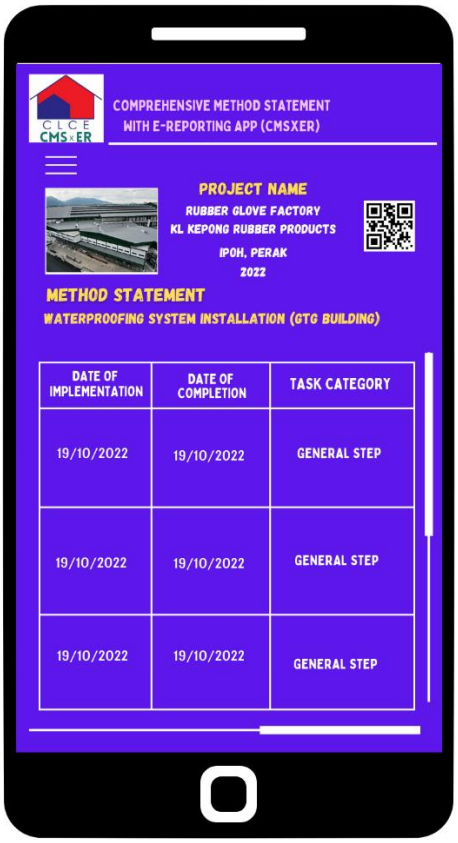
Figure 3.3: Comprehensive Method Statement with E-Reporting (CMSxER) Logo

Table 3.1: The Employees Interface for the Comprehensive Method Statement with E-Reporting Application (CMSxER)

Prototype	Explanation
	The first page is a page to allow users consisting of employees and employers to log in and set a password in the space provided before entering the CMSxER application.
	The second page is a section that shows the main screen of the CMSxER application to show what certain features are available in the application

Prototype	Explanation
	The next page is to see what the list of projects is implemented by the company as a main contractor to a specific client and it is arranged by year from the most recent to the oldest
	After clicking the project button, then a list of method statements is displayed. This list is a method statement that has been updated by company employees

Prototype	Explanation
	The next page is an example of a selected method statement, and the layout of this method statement is built in the form of a table to facilitate users and make reference easier. The first three columns consist of the step, diagram, and name of the task being performed. QR code image are also available for readers to scan through their smart phones to directly enter the constructed method statement page
	The second 2 columns show a brief description column for the steps in question as well as an additional information column to provide information related to the purpose of the task carried out with a clear explanation

Prototype	Explanation
	Then, for the last 3 columns displaying the date the task started to be implemented, the date the task was successfully completed as well as the category of the task performed whether it is a main step or a precautionary measure against possible danger and damage to the project that wants to be implemented
	This next column shows that the steps for the implemented project reach the latest target. And the column clicks a new row to add other inputs such as new steps, pictures, descriptions and so on available to be updated by employees. The column below aims to allow the reader to download the method statement created as well as a link to share the method statement to other applications.

Prototype	Explanation
	The next column is the same as on the seventh page and the additional button below is to display pages such as safety requirements as well as materials and machinery used for the project being carried out.
	The next column is the safety requirements required in the project being implemented such as the correct use of Personal Protective Equipment (PPE) for work on the construction site as well as the instructions imposed to ensure that workers comply with safety measures on the construction site

Prototype	Explanation
	The next page is a section to display the materials, equipment and machinery rented where it consists of sub-contractors selected by the company in the project being implemented. This column allows the reader to know the total price involved in this project
	The last column is a column to show the location or placement of the construction site project and the address used for the proposed project in question and the name of the client or owner is also displayed in this column

3.5 Testing of product

The innovative idea of producing a software application called “Comprehensive Method Statement with E-Reporting (CMSxER)” aims to facilitate the company’s staff in providing a report in the form of a method statement in the implementation of e-work so that modifications, uploading inputs, checking data, and data collection can be easily and quickly accessed. This application will be tested for its effectiveness by giving a trial period to the company’s staff, especially after all the features mentioned have reached the target. After that, respondents will be given a virtual form, which is a questionnaire to collect data obtained from testing the innovation. The main target of this innovation is none other than to get as many respondents who agree and are satisfied with the results of the innovation according to the aspects that are seen to be very effective in solving the problems that arise in the company.

3.6 Data Collection and Analysis

Below Figure 3.4 shows the framework research of the methodology for this project. In the evaluation of the Comprehensive Method Statement with E-Reporting (CMSxER) Application, data was collected from 30 CLCE Construction Sdn Bhd employees who participated in the testing. The questionnaire used in the data collection was adapted from the Technology Acceptance Model (TAM) by Davis (1988), which focuses on perceived usability and simplicity of use as key factors influencing the intention to utilize new technology. TAM is a widely used theoretical framework that explains and predicts individuals' acceptance and adoption of new technologies based on their perceived usefulness and perceived ease of use. The questionnaire assessed the following key components of TAM:

i) Perceived Usefulness (PU): The degree to which individuals believe that using the technology will enhance their performance or improve productivity.
ii) Perceived Ease of Use (PEOU): The degree to which individuals believe that using the technology will be free of effort.

iii) Attitude toward Using (ATU): Individuals' overall positive or negative evaluation of using the technology, influenced by perceived usefulness and perceived ease of use.

iv) Behavioral Intention to Use (BI): Individuals' intention to adopt and use the technology, influenced by attitude toward using the technology.

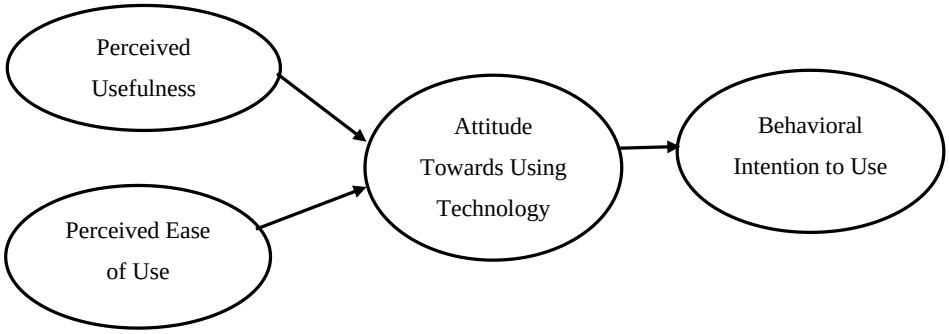


Figure 3.4: Technology Acceptance Model (TAM) Theory

To determine the sample size, the researchers followed the Krejcie and Morgan Table (1970), which suggested that a sample size of 28 would be sufficient for a population of 30 respondents. Data was collected through a Google form, providing a convenient and user-friendly method for the respondents to complete the questionnaire. The collected data was then extracted from Microsoft Excel for analysis. The researchers utilized Paired T-test software, a statistical analysis tool available online, to analyze the data and derive insights. The analysis process involved several steps, including extracting the data from Microsoft Excel and performing the Paired T-test analysis using the designated software. The paired t-test is a statistical test used to compare the means of two related or dependent groups. It is often applied when the same subjects are measured or observed under two different conditions or at two different time points. The paired t-test allows researchers to determine if there is a statistically significant difference between the two sets of measurements or observations. Here are the key steps involved in performing a paired t-test:

i) Hypothesis formulation: Start by stating the null hypothesis (H0) and alternative hypothesis (Ha) based on the research question. The null hypothesis assumes that there is no significant difference between the means of the two groups, while the alternative hypothesis suggests that there is a significant difference.

ii) Data collection: Gather data from the related groups or conditions. Each subject or item in the study should have measurements or observations for both conditions.

iii) Calculation of differences: Calculate the differences between the paired measurements or observations. These differences represent the change or effect between the two conditions for each subject.

iv) Mean and standard deviation of differences: Calculate the mean and standard deviation of the differences. These values provide a summary of the central tendency and variability of the observed differences.

v) Test statistic calculation: Compute the paired t-test statistic using the formula: t = (mean of differences) / (standard deviation of differences / sqrt(n)). Where n is the number of pairs or subjects in the study.

vi) Degrees of freedom: Determine the degrees of freedom (df) for the test. In a paired t-test, df is equal to the number of pairs minus one (df = n - 1).

vii) Critical value determination: Choose the desired significance level (e.g., $\alpha = 0.05$) to determine the critical value from the t-distribution table or use statistical software.

viii) Comparison and interpretation: Compare the calculated t-value with the critical value. If the calculated t-value is greater than the critical value, it suggests a statistically significant difference between the means of the two groups. If the calculated t-value is not greater than the critical value, there is no significant difference.

ix) Reporting results: Report the calculated t-value, degrees of freedom, p-value (probability value), and the conclusion about the statistical significance of the results.

The paired t-test is commonly used in various fields, such as medical research, psychology, and social sciences, where repeated measurements or related samples are involved. It allows researchers to determine if there is a significant difference between two conditions or time points within the same group of subjects. This analysis aimed to provide a comprehensive assessment of the application's effectiveness by comparing responses before and after the implementation of the Comprehensive Method Statement with E-Reporting Application. The questionnaire served as a crucial instrument for data collection, capturing participants' perceptions and acceptance of the new technology. Overall, this research methodology allows the researchers to gather valuable data on the usability and effectiveness of the application, enabling them to assess user acceptance and make informed decisions for further improvements. Figure 3. Shows the example of questionnaire used in this study.

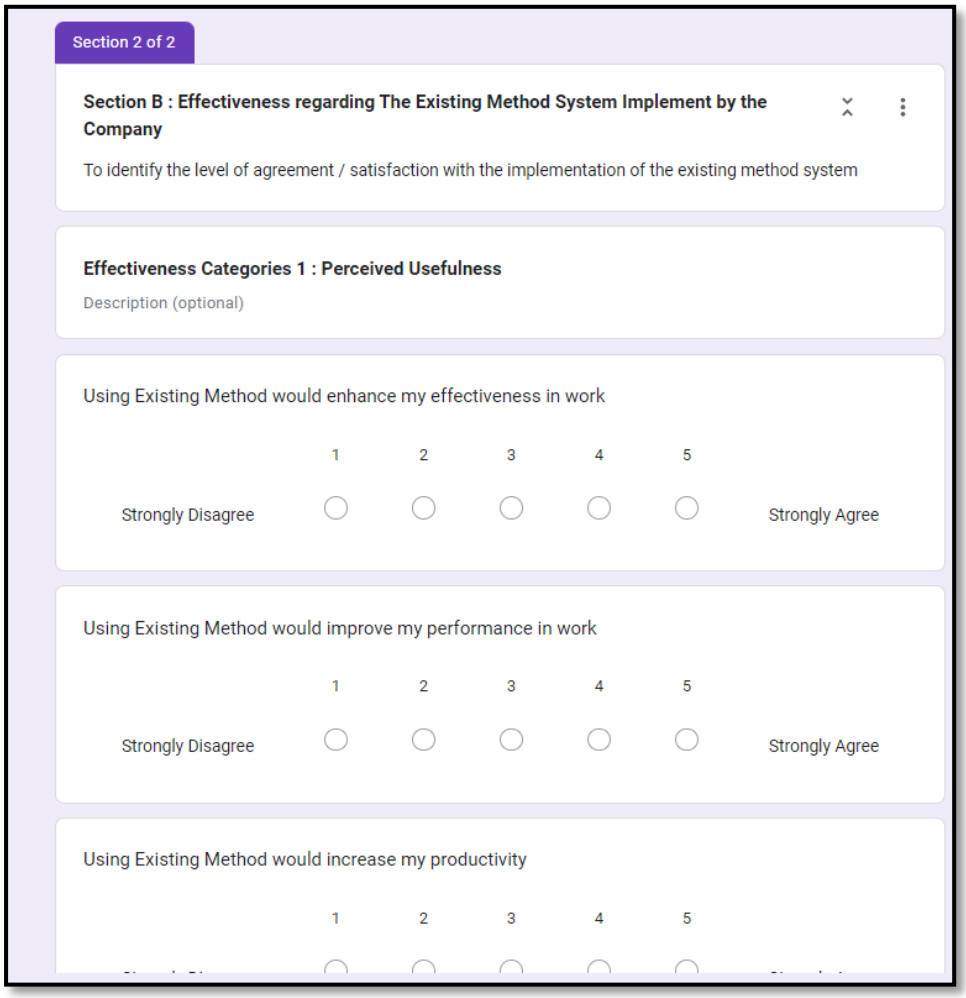


Figure 3.5: An example of the survey to be carried out as well as an example of the questions that were asked to the company's staff.

3.7 Conclusion

The justifications for your methodological choices should be made explicit in the methodology section of your work. The reader needs to know if the data was developed or acquired in a manner compatible with approved research methodology. The readers should be aware, for instance, that if you used a multiple-choice questionnaire, it gave respondents respectable selection of options. A research approach how far is the study credibility and yields reliable scientific results. Additionally, it offers a thorough plan that is in keeping researchers on course, facilitating a simple, efficient, and manageable approach. The reader can comprehend the strategy and procedures utilize to arrive at results by understanding the researchers' methodology.

In conclusion, the methodology used in any research or project is crucial for ensuring the accuracy, reliability, and validity of the results obtained. It serves as a roadmap that guides the entire research process, from defining the research problem to collecting and analyzing data, and drawing meaningful conclusions. In summary, a well-developed methodology is essential for conducting rigorous and valid research. It ensures that the research objectives are met, the data is collected and analyzed appropriately, and the findings can be relied upon for making informed decisions or contributing to the existing body of knowledge in the field.

CHAPTER 4

RESULTS

4.1 Introduction

Information about data analysis, result interpretation, and some comments are covered in this chapter. This initiative was designed to help construction professionals by integrating innovation and technology into their daily tasks, particularly in the implementing of construction site reporting. The following goals were listed as ones that the Comprehensive Method Statement with E-Reporting was thought to have achieved:

a. To design the "Comprehensive Method Statement with E-Reporting" application to improvise the reporting system used by the construction site staffs in accordance with I.R 4.0.

b. To develop the "Comprehensive Method Statement with E-Reporting" application using MIT App Inventor.

c. To test the effectiveness of "Comprehensive Method Statement with E-Reporting" application towards facilitating the site staffs in producing the method statements.

4.2 Design The "Comprehensive Method Statement With E-Reporting" Application to Improvise the Reporting System Used by The Construction Site Staffs in Accordance with I.R 4.0.

A new plan needs to be made to curb the weaknesses of the original system which is less productive and effective for the interests of a company. An innovation especially in the era of IR 4.0 is very concerned with the use of technology has made most industrial sectors and jobs easier. In order to generate an application, there must be a platform that triggers the elements contained in it and immediately makes it important for users.

Through observation as an intern hired by the company, there are some shortcomings that need to be improved according to certain rules, but the issue that often comes to the writer's attention is related to the reporting system used by the company that seems less productive and effective. If seen from the existing system now, the reporting tasks carried out only use smartphone software communication applications, namely the WhatsApp application, where reporting work such as notifications and alerts about work progress and activities on the construction site are only recorded in the form of pictures and short descriptions for staff reference only at the headquarters for claim work for clients and contractors involved. This generally shows that this system needs to be developed in a more conducive and systematic way. The I.R 4.0 revolution highlights new solutions and ideas in such as curbing problems in any job sector with innovation through the use of advanced technology.

Therefore, statistics for the preparation of a new innovation which is a comprehensive reporting application needs to be done to show the proposed ideology as well as what filling can benefit users for the product to be produced.

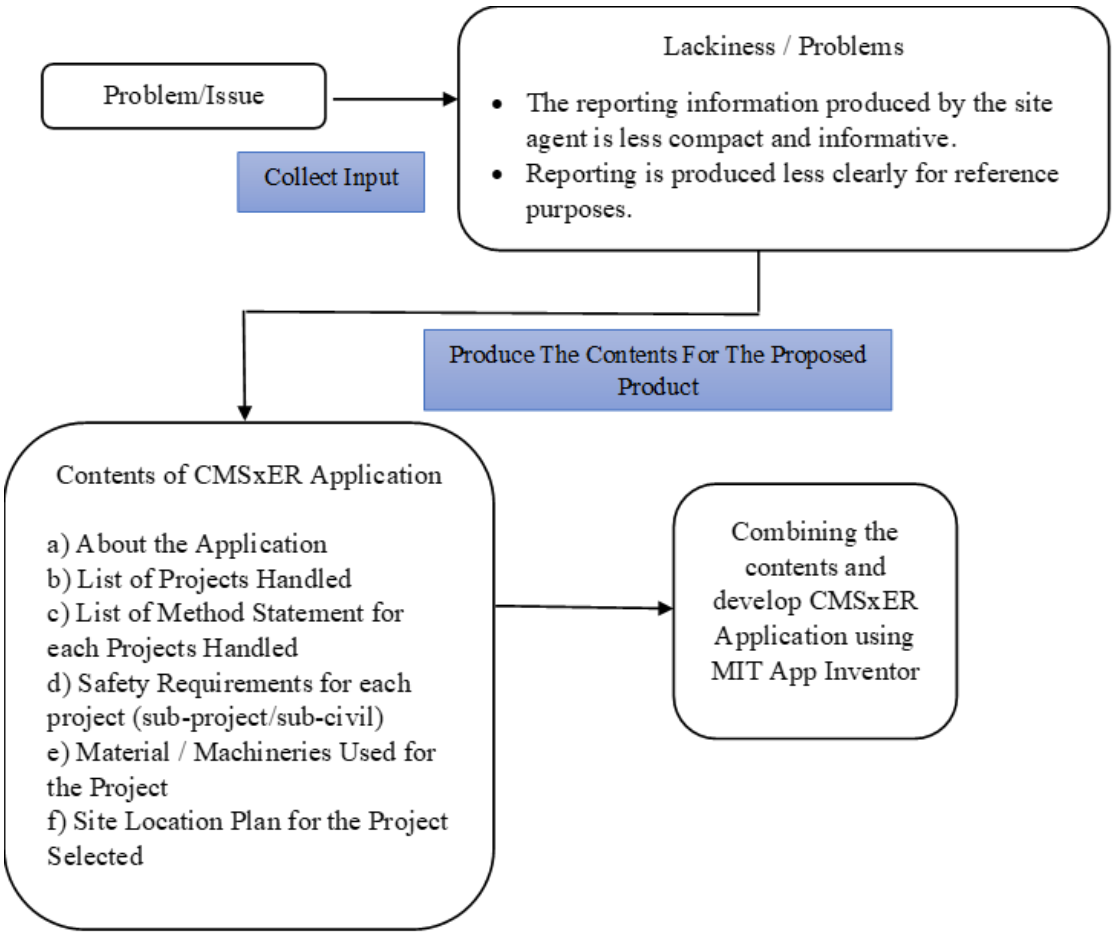


Figure 4.1: Flowchart of Design for Comprehensive Method Statement with E-Reporting Application (CMSxER)

This Comprehensive Method Statement with E-Reporting (CMSxER) application is an innovation that can solve and improve the existing system in a more comprehensive reporting work. From this application, various benefits can be used for the company, especially for directors, managers, admins, engineers and even site supervisors. Comprehensive reporting can benefit the office staff in their understanding of the projects carried out on the construction site in more depth so that the office staff can record all the issues and fillings for the purpose of producing other projects in the future.

4.3 Development Of “Comprehensive Method Statement With E-Reporting” Using MIT App Inventor

The development of the "Comprehensive Method Statement with E-Reporting" using MIT App Inventor involves creating a mobile application that allows users to generate and submit method statements electronically. Here is an overview of the development process using MIT App Inventor:

i) Define the Application Requirements: Clearly define the requirements and functionalities of the mobile application. Determine the specific features and capabilities that the app should have, such as creating and editing method statements, capturing photos, and generating reports.

ii) Design the User Interface: Use the MIT App Inventor's visual drag-and-drop interface to design the user interface of the application. Arrange and customize various components, such as buttons, text fields, and image upload functionality, to create an intuitive and user-friendly interface.

iii) Implement Data Input and Storage: Set up data input fields to capture relevant information for method statements, such as project details, task descriptions, risk assessments, and control measures. Utilize appropriate data storage options provided by MIT App Inventor, such as local storage or cloud-based databases, to store the collected data.

iv) Incorporate Multimedia Functionality: Integrate multimedia features to enhance the application's capabilities. Allow users to capture and attach photos or videos to the method statements using the device's camera or photo library.

v) Implement Reporting Functionality: Develop the functionality to generate comprehensive reports based on the submitted method statements. This may involve creating templates or predefined formats for the reports, merging the collected data, and generating PDF or HTML reports that can be easily shared or printed.

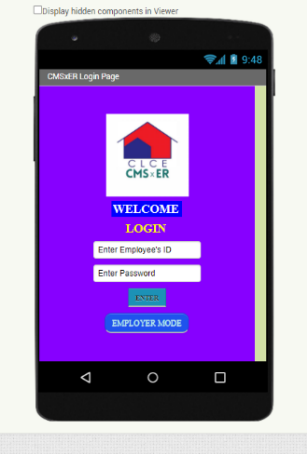
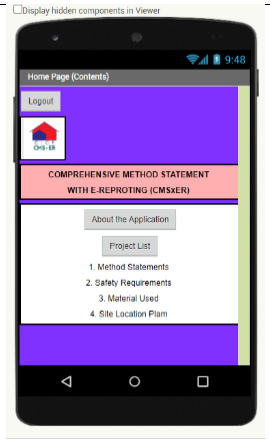
vi) Test and Debug: Conduct thorough testing of the application to ensure its functionality, usability, and reliability. Test different scenarios and user interactions to identify and fix any bugs or issues.

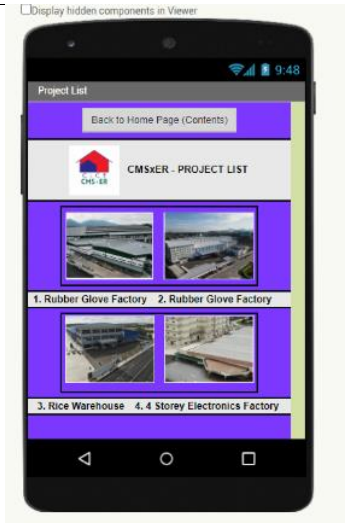
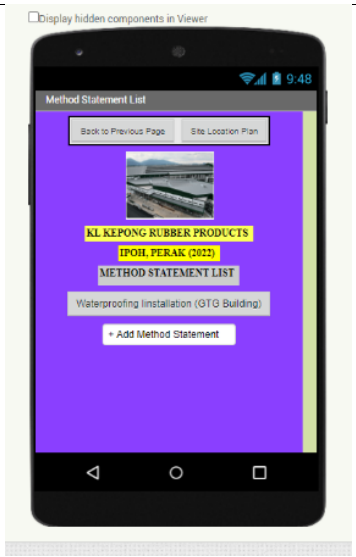
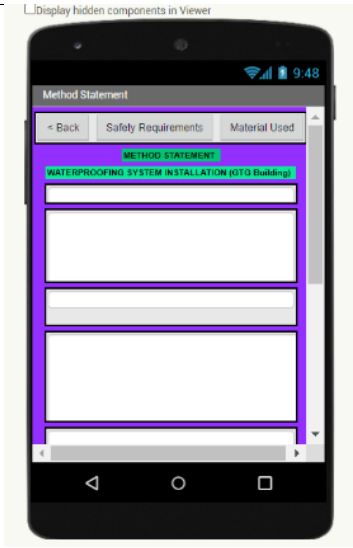
vii) Deploy and Distribute the Application: Once the application has been tested and deemed stable, deploy it to the desired platforms, such as Android or iOS. Distribute the application through relevant app stores or enterprise distribution channels, depending on the intended users.

viii) Gather User Feedback and Iterate: Encourage users to provide feedback on the application's performance and usability. Collect their suggestions for improvements or additional features and iterate on the application based on user feedback to enhance its effectiveness.

MIT App Inventor provides a visual development environment that simplifies the creation of mobile applications, making it accessible even for individuals without extensive programming experience. By following the steps outlined above and utilizing the features and capabilities offered by MIT App Inventor, "Comprehensive Method Statement with E-Reporting" application was develpo efficiently and effectively. Table 4.1 showed Development of Comprehensive Method Statement with E-Reporting (CMSxER) using MIT App Inventor.

Table 4.1: Development of Comprehensive Method Statement with E-Reporting (CMSxER) using MIT App Inventor

No	Dashboard	Work Explanation
1		The first screen generated is the login section for the application's users who are staff members of the CLCE company. For this, there are two text box elements placed for the user to enter their ID and password and two buttons to enter in the next screen.
2		The second screen is the CMSxER application content list page which displays some important content including "about the application, project list, method statement list, safety requirements, materials and project site location"
3		The third screen is a description of the CMSxER application and what its uses and benefits are for users. From this screen, both users and referrers can understand the purpose of this application.

No	Dashboard	Work Explanation
4		The next screen is a list of projects involved by the CLCE company; this screen is made to make it easier for users to upload projects carried out by the company over time. Each picture on the screen is clickable and leads to the next screen
5		After selecting one of the projects listed in the previous screen, the user can upload a list of method statements involved in any sub project involved in the main project
6		The next screen is the user's field to fill in what content to include in the method statement according to the criteria provided. And the result will be generated into a neat reporting table

No	Dashboard	Work Explanation
7		Users can view and upload the safety requirements for each sub project carried out by the company by providing information on proper work ethics to avoid any accidents at work
8		The next screen is that the user can also refer to and upload what equipment, materials, machinery are involved and can even upload the price and rental rates for each item on this screen
9		Finally, the screen related to the construction site location plan is also a page that makes it easy for users to refer to the site location map as well as the construction site address for related projects.

4.4 Test the Effectiveness Of Comprehensive Method Statement With E-Reporting (CMSxER)

The next process after producing a product or innovation, then begins the process of collecting feedback among users, that is the company's own staff as an important mechanism in obtaining validation of the innovation produced. The preparation of this survey form is carried out face-to-face (Distributing the form in paper form) and online using Google Forms. The questionnaire consists of two parts. Part A represents the respondent's background information while part B contains questions about the respondents' acceptance of the existing method statement reporting method and also their acceptance of the Comprehensive Method Statement with E-Reporting (CMSxER) application. The questionnaire was answered by the Director / Project Manager 20% (6), Executive / Administrative / Quantity Survey 36.7% (11), Site Supervisor / Site Safety Supervisor / Project Engineer 40% (12), Others (Interns / Human Resources) 3.3% (1).

Nineteen (19) respondents, or 63.3% of the total, are men, according to the demographics of the respondents in table 4.2 below. They predominate in construction endeavors. A total of eleven (11) respondents or 37.7% of the total were women in the company. According to the statistical breakdown of employees at the company by gender, it is obvious that there are more men than women working there.

Further analysis of the data reveals that three (3) respondents, or over 10%, are under the age of 25. Seven (7) respondents, or roughly 23.3%, are between the ages of 26 and 35. Most respondents, or fifteen (15) out of the total respondents, are between the ages of 36 and 45. Five (5) respondents, or 16.7% of all respondents, are over the age of 46.

Finally, based on the data gathered, only 13.3% (4) of respondents have less than two years' worth of experience in the construction industry. The same number of respondents 30%, or nine (9) for each level of work experience were polled for experience levels between 2 and 5 years and 6 and 10 years. Finally, 26.7% of the respondents had worked in the construction business for more than 10 years. This demonstrates that you need a tonne of experience to work on large construction projects.

Table 4.2: Respondents Background

	Gender	**No of respondents**	**Percentage (%)**
1	Male	19	63.3 %
2	Female	11	36.7 %
	Age	**No of respondents**	**Percentage (%)**
1	< 25	3	10 %
2	26 - 35	7	23.3 %
3	36 – 45	15	50 %
4	> 46	5	16.7 %
	Work Experience	**No of respondents**	**Percentage (%)**
1	< 2 years	4	13.3 %
2	2 – 5 years	9	30 %
3	6 – 10 years	9	30 %
4	> 10 years	8	26.7 %
	Position / Post	**No of respondents**	**Percentage (%)**
1	Director / Manager	6	20%
2	Executive / Admin / QS	11	36.7 %
3	Supervisor / SSS / Engineer	12	40 %
4	Others (Intern / HR)	1	3.3%

For the second part of this survey, it is related to research on conventional systems or existing systems. Respondents will give marks according to the set marking scale by marking (/) in the blank space provided in the table. The following is the intended scoring scale:

Opinion Scale	Marking Scale
Strongly Agree	5
Agree	4
Slightly Agree	3
Disagree	2
Strongly Disagree	1

Table 4.3: Set Marking Scale in Questionnaire Development

For section B of the Pre- FYP questionnaire consisted of questions regarding the respondents acceptance towards the conventional method of method statement reporting implementation. The data for Section B of the Pre-FYP questionnaire can be obtained from table 4.3 below. Questions 1(a) to 1(d) provided data on the Perceived usefulness of the current conventional method. From the data, it can be seen that majority of respondents feel that the current conventional method is not suitable. For question 1(a), 20% of respondents disagree with the current conventional method, 53.3% slightly agree and 26.7% only agree. For question 1(b), 3.4% are strongly disagree whereby 20.7% of respondents disagree. While 48.3% are slightly agree and 27.6% are agree. For question 1(c), 10.0% of respondents strongly disagree, 13.3% disagree, 53.3% are slightly agree and 23.3% of them are agree. Lastly for question 1(d), 6.7% of respondents are strongly disagree whereby 36.7% are agree while the others 43.3% are slightly agree with the statement. This shows that the conventional method doesn't quite useful for some of the staffs.

Questions 2(a) to 2(d) provided data on the Perceived ease of use for the current conventional method. From the data, it can be seen that overall respondents in average feels that the conventional method is not quite easy to be used. For question 2(a),43.3% of respondents agree with the current conventional method, 23.3% disagree and 33.3% are slightly agree. For question 2(b), 6.7% strongly disagree whereby 3.3% of are strongly

agree. The others chose slightly agree. For question 2(c), 3.3% of respondents strongly agree, 50% agree, 23.3% are slightly agree, 20% chose disagree and 3.3% of them chose strongly disagree. Lastly for question 2(d), 36.7% of respondents chose to agree and slightly agree whereby 3.3% are strongly agree. This proves that the current conventional method is not quite easy to be use and there must be another way on how to overcome and facilitate the worker's job.

Questions 3(a) to 3(c) provided data on the intention to use for the current conventional method. From the data, it can be seen that majority of respondents feel that the current conventional method doesn't use quite often. For question 3(a), 33.3% of respondents are agree while 36.7% of them are slightly agree with the current conventional method. Others, 23.3% disagree and only 3.3% are strongly agree. For question 3(b), 6.7% strongly disagree whereby 20% of respondents disagree. Lastly, for question 3(c), 6.7% of respondents disagree whereby 33.3% of them are agree. But it still doesn't show that the conventional method is quite usable among the staffs. This proves that users have very least intention to use the current conventional method due to the sophistication and are looking for alternative solutions.

Questions 4(a) to 4(d) provided data on the Actual use for the current conventional method. From the data, it can be seen that majority of respondents feel that the current conventional method doesn't reach the good level of the actual use. For question 4(a), 3.3% of respondents strongly agree with the current conventional method, 43.3% agree, 20% are disagree, 6.7% are strongly disagree while 26.7% are slightly agree. For question 4(b) recorded that the respondent's feedback is more less than the previous question 4(a) where 40% agree whereby 23.3% of respondents disagree. For question 4(c), 33.3% of respondents chose to agree and slightly agree with the statement while 20% of them are disagree and 6.7% of them strongly disagree. Lastly for question 4(d), 40% of respondents chose strongly to agree and agree whereby 60% chose between disagree and slightly agree with the statement. This proves that the staffs from the company doesn't quite look the current conventional method suitable for actual use and an alternative is required to manage the reporting system in an advance way.

Table 4.4: Existing Method survey data

No.	Survey to identify effectiveness of Existing Method on Project Management at a construction site	Strongly Agree (5)	Agree (4)	Slightly Agree (3)	Disagree (2)	Strongly Disagree (1)
1(a)	Using existing method would enhance my effectiveness in work (P.U 1)	0.0%	26.7%	53.3%	20.0%	0.0%
1(b)	Using the existing method would improve my performance in work (P.U 2)	0.0%	27.6%	48.3%	20.7%	3.4%
1(c)	Using existing method would increase my productivity (P.U 3)	0.0%	23.3%	53.3%	13.3%	10.0%
1 (d)	I found the existing method useful (P.U 4)	0.0%	36.7%	43.3%	13.3%	6.7%
2 (a)	I found existing method easy to use (P.E 1)	0.0%	43.3%	33.3%	23.3%	0.0%
2 (b)	Learning to use Existing method would be easy for me (P.E 2)	3.3%	36.7%	36.7%	16.7%	6.7%
2 (c)	My interaction with Existing method was clear and understandable (P.E 3)	3.3%	50.0%	23.3%	20.0%	3.3%
2 (d)	It would be easy for me to manage my project using Existing method (P.E 4)	3.3%	36.7%	36.7%	23.3%	0.0%

No.	Survey to identify effectiveness of Existing Method on Project Management at a construction site	Strongly Agree (5)	Agree (4)	Slightly Agree (3)	Disagree (2)	Strongly Disagree (1)
3 (a)	I intend to use Existing method during my work (I.U 1)	3.3%	33.3%	36.7%	23.3%	3.3%
3 (b)	I will use Existing method often. (I.U 2)	3.3%	43.3%	26.7%	20.0%	6.7%
3 (c)	I intend to use Existing Method frequently. (I.U 3)	3.3%	33.3%	40.0%	16.7%	6.7%
4 (a)	Existing method makes work more interesting (A.U 1)	3.3%	43.3%	26.7%	20.0%	6.7%
4 (b)	Working with Existing method is fun. (A.U 2)	0.0%	40.0%	20.0%	23.3%	16.7%
4 (c)	I feel comfortable using Existing method (A.U 3)	6.7%	33.3%	33.3%	20.0%	6.7%
4 (d)	I look forward to those aspects of my job that require me to use existing method (A.U 4)	3.3%	36.7%	26.7%	26.7%	6.7%

For the next survey which is called Post-FYP survey is related to the research of the new invention from the current system and the survey is to collect the data from the respondents after using the products that has been created. Same with the previous survey, the respondents will give marks according to the set marking scale by marking (/) in the blank space provided in the table. The following is the intended scoring scale:

Opinion Scale	Marking Scale
Strongly Agree	5
Agree	4
Slightly Agree	3
Disagree	2
Strongly Disagree	1

Table 4.5: Set Marking Scale in Questionnaire Development

For section B of the Post- FYP questionnaire consisted of questions regarding the respondent's acceptance towards the Comprehensive Method Statement with E-Reporting Application that has been created. The data for Section B of the Post-FYP questionnaire can be obtained from table 4.4 below. For question 1(a), the data shows that the 50% of the respondents chose to strongly agree while the other 50% only chose agree and there's no respondents chose to disagree with the statement. For question 1(b), there are 60% of the respondents strongly agree while 40% of them chose agree. Next, for question 1(c), 53.3% of the respondents chose strongly agree whereby 43.3% agree and 3.3% chose slightly agree. For question 1(d), there got 46.7% of the respondents chose strongly agree and 53.3% are agree with the statement. From the data, it is clear that the use of Comprehensive Method Statement with E-Reporting Application (CMSxER) can enhance the effectiveness and productivity of the works for the company.

Secondly, for the next section is about the Perceive Ease of Use. Question 2(a), 53.3% of the respondents are strongly agree while 46.7% of them are agree. For question 2(b), there got 60% are strongly agree whereby 40% of the respondents chose agree with the statement. Then, for question 2(c), recorded that 56.7% of the respondents are strongly agree and 43.3% are agree. For question 2(d), 63.3% of the respondents are strongly agree and 36.7% only chose to agree.

For question 3(a), there got 56.7% of the respondents chose strongly agree whereby 43.3% are agree. Next, for question 3(b), 51.7% are strongly agree whereby the other 48.3% are agree with the statement. Another context, for question 3(c), the data recorded that 46.7% are strongly agree while the percentage of the respondents who chose agree is a little higher that is 53.3% respondents. This shows that majority of the

respondents will prefer to use CMSxER Application frequently for the reporting of the method statements work.

The last section is to collect data on the attitude of use among the workers regarding the implementation of a new system namely Comprehensive Method Statement with E-Reporting (CMSxER). The first question which is question 4(a), the data shows that the half of the respondents which 50% of them chose to strongly agree while the other chose agree. For question 4(b), there got 40% of the respondents chose strongly agree while the other 60% chose agree. From question 4(a) and 4(b), it is clear that most the respondents feels that the invention is quite interesting and fun to be use. For question 4(c), 46.7% of the respondents chose strongly agree whereby 53.3% of them chose agree. The last question which is question 4(d), the data recorded that 50% of the respondents are strongly agree and another 50% of them chose agree. This shows that the most of the respondents are looking forward in any aspects that involving work with the use of this application and there got zero respondents are disagree with any questions that provided.

Table 4.6: Survey after using CMSxER Application

No.	Survey to identify effectiveness of CMSxER Application on Project Management at a construction site	Strongly Agree (5)	Agree (4)	Slightly Agree (3)	Disagree (2)	Strongly Disagree (1)
1(a)	Using Comprehensive Method Statement with E-Reporting (CMSxER) would enhance my effectiveness in work (P.U 1)	50.0%	50.0%	0.0%	0.0%	0.0%
1(b)	Using the Comprehensive Method Statement with E-Reporting (CMSxER) would improve. my performance in work (P.U 2)	60.0%	40.0%	0.0%	0.0%	0.0%
1(c)	Using Comprehensive Method Statement with E-Reporting (CMSxER) would increase my productivity (P.U 3)	53.3%	43.3%	3.3%	0.0%	0.0%
1(d)	I found the Comprehensive Method Statement with E-Reporting (CMSxER) useful (P.U 4)	46.7%	53.3%	0.0%	0.0%	0.0%

No.	Survey to identify effectiveness of CMSxER Application on Project Management at a construction site	Strongly Agree (5)	Agree (4)	Slightly Agree (3)	Disagree (2)	Strongly Disagree (1)
2(a)	I found Comprehensive Method Statement with E-Reporting (CMSxER) easy to use (P.E 1)	53.3%	46.7%	0.0%	0.0%	0.0%
2(b)	Learning to use Comprehensive Method Statement with E-Reporting (CMSxER) would be easy for me (P.E 2)	60.0%	40.0%	0.0%	0.0%	0.0%
2(c)	My interaction with Comprehensive Method Statement with E-Reporting (CMSxER) was clear and understandable (P.E 3)	56.7%	43.3%	0.0%	0.0%	0.0%
2(d)	It would be easy for me to manage my project using Comprehensive Method Statement with E-Reporting (CMSxER) (P.E 4)	63.3%	36.7%	0.0%	0.0%	0.0%
3(a)	I intend to use Comprehensive Method Statement with E-Reporting (CMSxER) during my work (I.U 1)	56.7%	43.3%	0.0%	0.0%	0.0%

No.	Survey to identify effectiveness of CMSxER Application on Project Management at a construction site	Strongly Agree (5)	Agree (4)	Slightly Agree (3)	Disagree (2)	Strongly Disagree (1)
3(b)	I will use Comprehensive Method Statement with E-Reporting (CMSxER) often. (I.U 2)	51.7%	48.3%	0.0%	0.0%	0.0%
3(c)	I intend to use Comprehensive Method Statement with E-Reporting (CMSxER) frequently. (I.U 3)	46.7%	53.3%	0.0%	0.0%	0.0%
4(a)	Comprehensive Method Statement with E-Reporting (CMSxER) makes work more interesting (A.U 1)	50.0%	50.0%	0.0%	0.0%	0.0%
4(b)	Working with Comprehensive Method Statement with E-Reporting (CMSxER) is fun. (A.U 2)	40.0%	60.0%	0.0%	0.0%	0.0%
4(c)	I feel comfortable using Comprehensive Method Statement with E-Reporting (CMSxER) (A.U 3)	46.7%	53.3%	0.0%	0.0%	0.0%
4(d)	I look forward to those aspects of my job that require me to use Comprehensive Method Statement with E-Reporting (CMSxER) (A.U 4)	50.0%	50.0%	0.0%	0.0%	0.0%

4.4.1 Usability Level of Comprehensive Method Statement with E-Reporting (CMSxER)

Table 4.5 shows respondent level of usability toward using existing method whereby analysis shows for all variables tested the mean score were less than 3.50 meaning that the usability level of existing method was low. While Table 4.6 shows respondent level of usability toward using CMSxER whereby analysis shows for all variables tested the mean score were more than 4.00 meaning that the usage of CMSxER much easier compare with the existing method.

Table 4.7: Usability Level of existing method among respondents

Variables	Mean	Interpretation
Perceived Ease of Use	3.00	Low
Perceived Usefulness	3.20	Low
Attitude Towards Using Technology	3.10	Low
Behavioral Intention to Use	3.00	Low

Table 4.8: Usability Level of CMSxER among respondents

Variables	Mean	Interpretation
Perceived Ease of Use	4.50	High
Perceived Usefulness	4.60	High
Attitude Towards Using Technology	4.50	High
Behavioral Intention to Use	4.50	High

4.4.2 Significance differences between CMSxER compared with the existing method.

In order to evaluate the effectiveness of CMSxER in the project, a paired sample t test was performed. Results as shown in Table 4.7, respondent preferred using CMSxER whereby all variable measured, Perceived Ease of Use (Mean = 4.50), Perceived Usefulness (Mean = 4.60), Attitude Towards Using Technology (Mean = 4.50) and Behavioral Intention to Use (Mean = 4.50) were more higher compared with existing method, Perceived Ease of Use (Mean = 3.00), Perceived Usefulness (Mean = 3.20), Attitude Towards Using Technology (Mean = 3.10) and Behavioral Intention to Use (Mean = 3.00). A paired sample t-test found this difference to be significant for all variables being measured, The value of *t of* Perceived Ease of Use is 11.23 and the value of *p* is < .00001. The result is significant at p < .05. The value of *t of* Perceived Usefulness is 8.53 and value of *p* is < .00001. The result is significant at p < .05. The value of *t of* Attitude Towards Using Technology is 8.21 and the value of *p* is < .00001. The result is significant at p < .05. The value of *t* of Behavioral Intention to Use is 7.45 and the value of *p* is < .00001. The result is significant at p < .05. This suggests that using CMSxER was much easier and resourceful compared with existing method. This mean that CMSxER was more effective compare with the existing method.

Table 4.9: Paired sample t-test

Pair	Paired Different	t	Significant (two tailed)
	Mean		
Perceived Ease of Use - Existing Method	1.50	11.23	.000
Perceived Usefulness - Existing Method	1.40	8.53	.000
Attitude Towards Using Technology- Existing Method	1.40	8.21	.000
Behavioral Intention to Use- Existing Method	1.50	7.45	.000

4.5 Conclusion

The ability to analyze the data gathered during a test or trial phase depends on the data gathering technologies used. A wide range of data will be available to consider when using a combination of quantitative and qualitative measurements. The chosen tools will determine a continuous metric result on their own for spot inspection. Identifying the resources required is essential to the success of any initiative to gradually enhance an organization's procedures. During the test's data collection and analysis phase, developing and choosing tools with the data in mind will be very beneficial.

Despite being one of the oldest industries, construction had struggled to implement excellent and fundamental technology. The sector had long been plagued by antiquated procedures and disconnected communications, which rendered initiatives ineffective. At this point, technology's worth becomes crucial for boosting industry quality and production. Project managers are aware that implementing the appropriate technologies can help to foster a more productive workplace. However, if the site team makes use of the Comprehensive Method Statement with E-Reporting application, productivity can be increased. It was therefore essential that the application was simple to use and that the project team was knowledgeable on how to make the most of it. To help the staff members of the organization, particularly the staff members on the building sites, a Comprehensive Method Statement with E-Reporting application was established. The defined goals were accomplished, which gave the business motivation to employ the technology going forward. Construction professionals were able to work more intelligently, efficiently, on a real-time basis, and even better save the environment thanks to technology.

CHAPTER 5

DISCUSSION, RECOMMENDATION AND CONCLUSION

5.1 Introduction

In the fifth chapter (discussion, recommendation and conclusion) this will discuss the conclusion from the entire chapter. Like the information that has been obtained from the previous chapters, the analysis that can be made related to the product produced, which is the Comprehensive Method Statement with E-Reporting (CMSxER) has received good attention and support among the staff of the CLCE Construction & Engineering company. The use of conventional systems practiced by companies is seen as no longer relevant as an advanced system that uses I.R 4.0 technology as used by most companies today. Furthermore, the existing system needs to highlight the importance of using technology because it is very significant to society and easy to operate. Not only can it help simplify the work of doing reporting, but it can also save time and money. The filling and internal features loaded provide a variety of useful uses for workers such as construction project checklists as well as method statement lists for each project carried out. In the list of method statements produced, you can also obtain additional information such as information related to safety priorities and also the equipment, materials and machinery involved in the work of the project produced. This clearly proves that with the technological sophistication of the current era, it is very profitable if we can take advantage of it by bringing profit to the industry itself.

5.2 Discussion

In the observations and studies made on all the problems that arise, some of the efforts that have been implemented include referring to a concept called the design thinking method. This concept is a mechanism that discusses all the important elements in each innovation produced into a compact chart. In the initial phase, each proposed idea needs to go through the empathy process, which is the process of interviewing individuals (staff) of the company to obtain what are the problems and shortcomings that are still seen as not having a good impact and need to be developed or made modifications to the issue. Through this work, brainstorming work can be produced such as obtaining suggestions and encouragement from individuals involved in the production of the newest product to be produced. Every feedback from them are very important as an early step before creating the products. When the product has developed, then the next process is to give a test to the user which is the company staff. In the meantime, there got two questionnaires should be develop as a sample of data analysis where it consists of pre-implementation and post-implementation of the proposed product to identify its usability level among the workers.

The development of questionnaires was centred on two ideal phases: before and after application use. In order to get their views and opinions on the current, outdated approach for keeping track of method statement implementation, Questionnaire 1 (one) had a few questions. Questionnaire two (2), on the other hand, asked for opinions and suggestions about the Comprehensive Method Statement with E-Reporting application.

The application contains details on the equipment's current location and the work that is being done. The method statement will appear more informative and include information about the material utilised and the safety requirements. The programme, which offers access to any progress information and specifics about the completed project, makes it simple to deploy reporting. The programme also has a feature that lets users view the application method statement by scanning a QR code. Because of this feature, the employer or referrer may find it easier to refer the report in greater detail.

For the discussion on chapter 4 where it explains the findings and results of the data obtained from the implementation of the system to collect questionnaire records in relation to the system currently used by the company as well as the new system introduced to the company according to their respective views. The first process before doing the job of collecting this analysis data is to design the product that wants to be produced according to the level of need for the company. Once the combination of ideas was achieved, the creation of the CMSxER application began using MIT App Inventor. The next focus is the collection of information from the respondents and the value of the respondents received is a total of 30 staff members. Part A consists of several questions about the respondent's personal profile where questions arise such as gender, age, years of work experience, and the position held by the respondent in the company. Part B consists of 4 types of questions that need to be answered and filled in by respondents related to the level of effectiveness, productivity, importance of use, convenience and advantages of the system used by the company as well as evaluating the differences between the existing system and the new system or innovation introduced.

After all the following data is collected and organized in the form of a table loaded in Microsoft Excel to calculate and obtain the value of 2 dependent means using the Social Science Statistics website, then the process to obtain data on the level of usability between the existing system and the CMSxER system. This aims to obtain the interpretation level of the system which is higher and better for the company's use. And based on the results from the calculated data, the level of usability for the CMSxER system is recorded as having a higher interpretation than the existing system. Indirectly making the CMSxER system a trusted system for its effectiveness and usability to the company's staff. In addition, significant differences between the CMSxER system and the existing system were also obtained through the Paired Sample T-Test. Based on this test, on average each section of this question has obtained $p<0.00001$ and a high t value. In conclusion, the CMSxER application is categorized as a system that is easier and has more useful resources compared to conventional systems. This shows that the CMSxER application is more effective when compared to existing methods.

5.3 Recommendation

The researcher would like to provide some recommendations based on the aforementioned findings that can be used as a guide or as a result of further research to enhance the use of the Comprehensive Method Statement with E-Reporting Application. Consequently, this application can only predict the management of writing method statements for this project and nowhere else. Therefore, it would be extremely helpful to many parties if the application could also cover other projects that the company is currently working on.

Moving on, numerous additional departments and different functions can use this programme. The project department now uses this application to administer the reporting system that will be utilised by the workers on the construction site. Perhaps additional departments like QAQC, Administration, Procurement, and Quantity Surveyor can use this application as a reference and record-keeping tool for the company.

Additionally, a variety of other programmes, besides MIT App Inventor, can be used to create the Comprehensive Method Statement with E-Reporting application, including Kodular, Appy Builder, and Thunkable. Using the aforementioned platforms, users can create applications. Users on all platforms can access all features for free, and all platforms are user-friendly. While developing the application, users can also learn new skills like coding and blockchain.

Technology in the construction business is essential to producing the best quality and output for the project. Time can be saved and the management of reporting implementation on construction sites can be improved with a thorough method statement and e-reporting. The technology of a business can therefore convinces more clients to use its services. Malaysia might be able to compete favourably with other industrialised countries by integrating this technology into its industry. Technology in the construction industry can boost a nation's economy.

Based on his experience in using the MIT App Inventor software, the author is able to raise some suggestions that can be highlighted to make improvements to the system used. In the author's opinion, the first suggestion that can be highlighted is about the coding system used as widgets to generate responses in the application to users where the system used seems less helpful in facilitating the application designer, especially for those who are new to using MIT App Inventor. Application designers who are just starting to learn MIT App Inventor will be confused and difficult because they are not good at using the coding found in the software. Therefore, it is very important for the manager of MIT App Inventor to re-investigate the shortcomings of this software and provide the best solution to application designers such as providing short and easy-to-understand video tutorials for each of the features contained in MIT software App Inventor.

In the meantime, among other shortcomings of the MIT App Inventor software is that there are too many errors, and it is difficult to find a solution. Errors that can be found in this software are due to mistakenly entering coding, incorrect coding layout and even the creator's mistake of entering other elements obtained from external sources. The party assigned to manage the problems found by the designers by making it easier for them to access the best solution to each existing problem, for example, such as providing a video demonstration of how to solve the error in the software.

Finally, the job of designing an application is not an easy job, in fact it requires expertise in producing a good design. Therefore, the learning process must be obtained from any source to increase the knowledge possessed.

5.4 Conclusion

The construction industry is constantly changing, making it impractical and less methodical to prepare method statement reports using traditional approaches. This is made abundantly evident by looking at the results of the questionnaire given to the respondents, the majority of whom agreed that traditional methods are less effective and have less of an impact on the creation of sound method statements. Additionally, the site agents (site supervisors and engineers) can only post a few key pieces of information using the traditional way, such as a picture and a brief explanation for the staff. Lack of knowledge would make it challenging for the office personnel to keep track of all the actions performed on the building site, which will cost time and energy.

Therefore, the construction of the Comprehensive Method Statement with E-Reporting (CMSxER) mobile application has been done to facilitate the task of preparing a method statement, even uploading all the important information such as pictures of assignments, start and completion dates, additional descriptions, materials and machinery used in the project and can upload pictures and the location address of the project site being worked on.

Once the application has been tested, it is ready to be issued to potential respondents who may use this application to facilitate their work in making reports. A total of 30 respondents answered pre and post questionnaires to achieve objective 3, which is to study the usability of the Comprehensive Method Statement with E-Reporting (CMSxER) application to staff, especially to company employers. The results of the Social Science Statistics website to calculate 2 dependent means for the pre- and post-questionnaire study (paired sample t-test) were conducted to obtain the effective level of the project study and found that the p value was less than 0.00001, thus making the result significant with a p value < .05. In the usability test, it shows that the post study (CMSxER) received a higher interpretation than the pre study (conventional method) with a mean score of more than 4.00 compared to the conventional method which only got a score of less than 3.5. This suggests that using CMSxER was much easier and more resourceful compared with the existing method. This means that CMSxER was more effective compared with the existing method.

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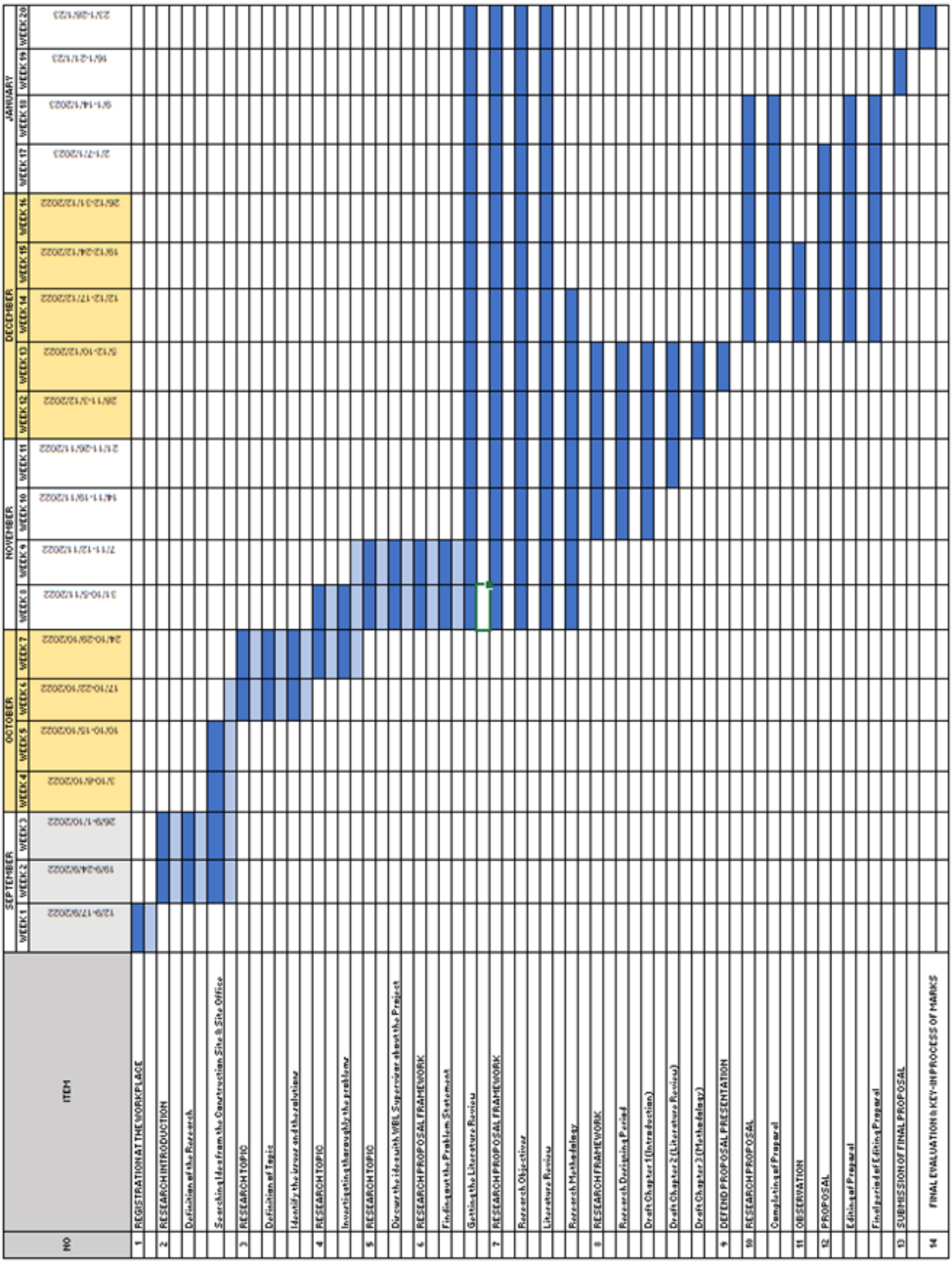
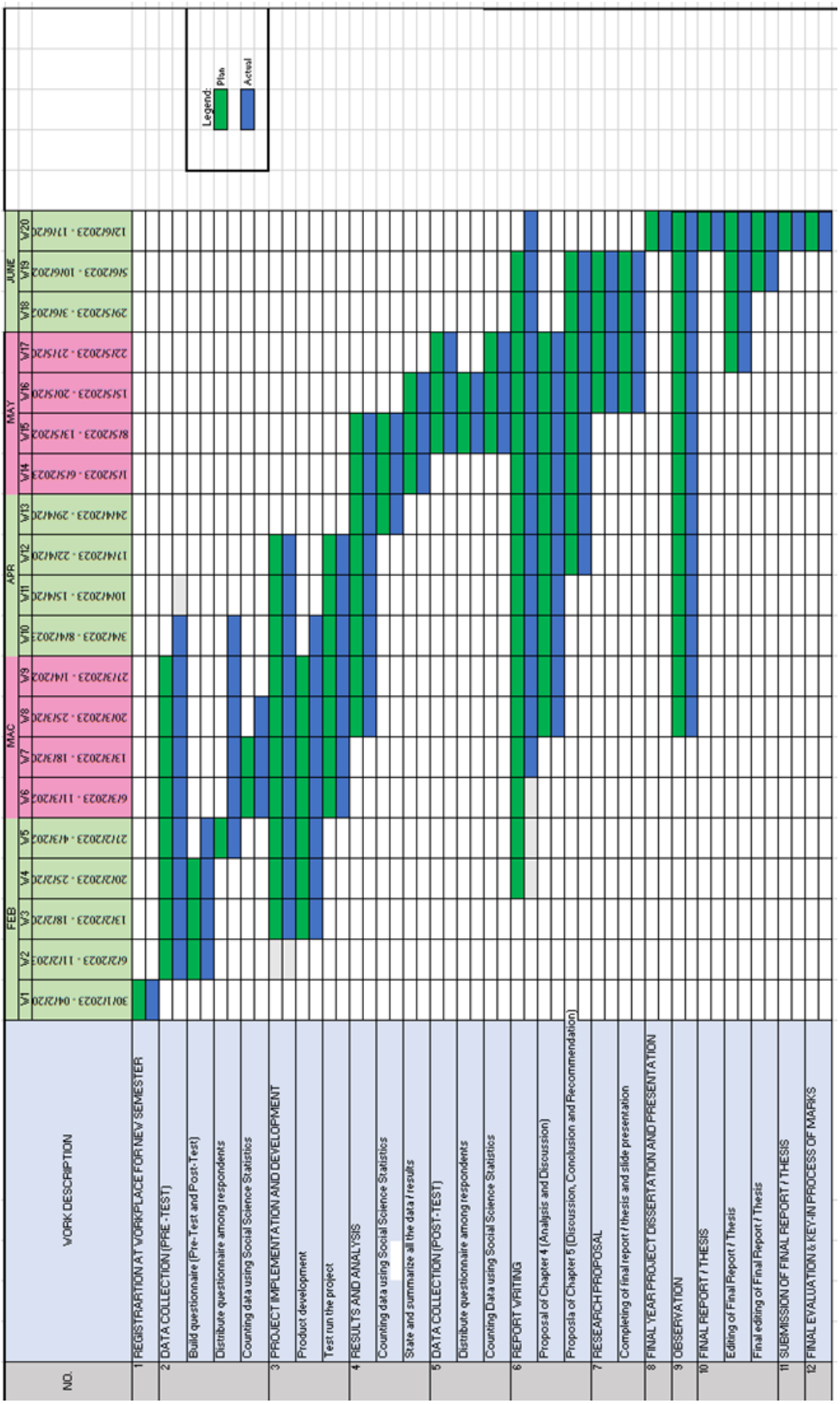
APPENDIX 1:
GANTT CHART

SEMESTER 7



NO	ITEM	SEPTEMBER WEEK 1	WEEK 2	WEEK 3	OCTOBER WEEK 4	WEEK 5	WEEK 6	WEEK 7	NOVEMBER WEEK 8	WEEK 9	WEEK 10	WEEK 11	WEEK 12	DECEMBER WEEK 13	WEEK 14	WEEK 15	WEEK 16	JANUARY WEEK 17	WEEK 18	WEEK 19	WEEK 20
		12/9-17/9/2022	19/9-24/9/2022	26/9-1/10/2022	3/10-8/10/2022	10/10-15/10/2022	17/10-22/10/2022	24/10-29/10/2022	31/10-5/11/2022	7/11-12/11/2022	14/11-19/11/2022	21/11-26/11/2022	28/11-3/12/2022	5/12-10/12/2022	12/12-17/12/2022	19/12-24/12/2022	26/12-31/12/2022	2/1-7/1/2023	9/1-14/1/2023	16/1-21/1/23	23/1-28/1/23
1	REGISTRATION AT THE WORK PLACE																				
2	RESEARCH INTRODUCTION																				
	Definition of the Research																				
	Searching Idea from the Construction Site & Site Office																				
3	RESEARCH TOPIC																				
	Definition of Topic																				
	Identify the issue and the solution																				
4	RESEARCH TOPIC																				
	Investigating thoroughly the problem																				
5	RESEARCH TOPIC																				
	Discuss the idea with WBL Supervisor about the Project																				
6	RESEARCH PROPOSAL FRAMEWORK																				
	Finding out the Problem Statement																				
	Getting the Literature Review																				
7	RESEARCH PROPOSAL FRAMEWORK																				
	Research Objective																				
	Literature Review																				
	Research Methodology																				
8	RESEARCH FRAMEWORK																				
	Research Designing Period																				
	Draft Chapter 1 (Introduction)																				
	Draft Chapter 2 (Literature Review)																				
	Draft Chapter 3 (Methodology)																				
9	DEFEND PROPOSAL PRESENTATION																				
10	RESEARCH PROPOSAL																				
	Completing of Proposal																				
	Draft Chapter 3 (Methodology)																				
11	OBSERVATION																				
12	PROPOSAL																				
	Editing of Proposal																				
	Final period of Editing Proposal																				
13	SUBMISSION OF FINAL PROPOSAL																				
14	FINAL EVALUATION & KEY-IN PROCESS OF MARKS																				

SEMESTER 8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WORK DESCRIPTION
FEB
MAC
APR
MAY
JUNE
W1
W2
W3
W4
W5
W6
W7
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W10
W11
W12
W13
W14
W15
W16
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W18
W19
W20
30/1/2023 - 04/2/20
6/2/2023 - 11/2/203
13/2/2023 - 18/2/20
20/2/2023 - 25/2/20
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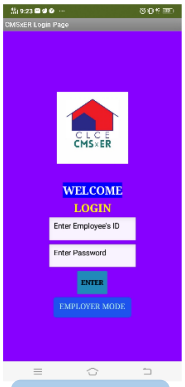
1/5/2023 - 6/5/2023
8/5/2023 - 13/5/202
15/5/2023 - 20/5/20
22/5/2023 - 27/5/20
29/5/2023 - 3/6/202
5/6/2023 - 10/6/202
12/6/2023 - 17/6/20
Legend:
Plan
Actual
1 REGISTRARTION AT WORKPLACE FOR NEW SEMESTER
2 DATA COLLECTION (PRE-TEST)
Build questionnaire (Pre-Test and Post-Test)
Distribute questionnaire among respondents
Counting data using Social Science Statistics
3 PROJECT IMPLEMENTATION AND DEVELOPMENT
Product development
Test run the project
4 RESULTS AND ANALYSIS
Counting data using Social Science Statistics
State and summarize all the data / results
5 DATA COLLECTION (POST-TEST)
Distribute questionnaire among respondents
Counting Data using Social Science Statistics
6 REPORT WRITING
Proposal of Chapter 4 (Analysis and Discussion)
Proposla of Chapter 5 (Discussion, Conclusion and Recommendation)
7 RESEARCH PROPOSAL
Completing of final report / thesis and slide presentation
8 FINAL YEAR PROJECT DISSERTATION AND PRESENTATION
9 OBSERVATION
10 FINAL REPORT / THESIS
Editing of Final Report / Thesis
Final editing of Final Report / Thesis
11 SUBMISSION OF FINAL REPORT / THESIS
12 FINAL EVALUATION & KEY-IN PROCESS OF MARKS

APPENDIX 2:

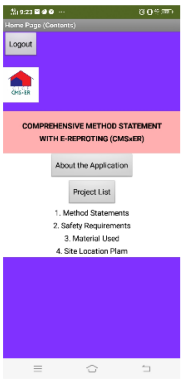
OUTCOME OF CMSxER (END PRODUCT)

1



LOGIN

2



MAIN MENU

3

APP BACKGROUND

4

PROJECT LIST

5

LIST OF METHOD STATEMENT

6

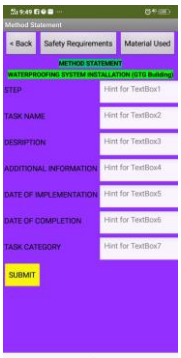


TABLE OF METHOD STATEMENT

7

SAFETY REQUIREMENTS

8

MATERIALS & MACHINERY USED

9

SITE LOCATION PLAN

APPENDIX 3:
QUESTIONNAIRE

QUESTIONNAIRE 1 (PRE-QUESTIONNAIRE)

CIVIL ENGINEERING DEPARTMENT
POLITEKNIK UNGKU OMAR
SURVEY FORM FOR FINAL YEAR PROJECT
BCT 83010 – FINAL YEAR PROJECT
COMPREHENSIVE METHOD STATEMENT WITH E-REPORTING APPLICATION
QUESTIONNAIRE 2: USING COMPREHENSIVE METHOD STATEMENT WITH E-REPORTING FOR SITE SUB-PROJECTS AT CONSTRUCTION SITE

Questionnaire Research: The Respondent Point of View Regarding the Issues Related to Method Statement Preparation for Site Sub-Projects at the Construction Site

A part of my study of Final Year Project for Bachelor of Civil Engineering Technology (BCT) at Politeknik Ungku Omar (PUO), Ipoh, Perak, my name is Raimi Imran bin Mohamed Nasir (01BCT19F3031) and I am conducting a survey to identify effectiveness of the Existing Method on method statement preparation for site sub-projects at the construction site

---

Please tick [/] the box that applies on each questions below.

SECTION A

a) Gender

Male	
Female	

b) Age

≤ 25	
26 – 35	
36 – 45	
≥ 46	

c) Work Experience

< 2 years	
2 – 5 years	
6 – 10 years	
> 10 years	

d) Position / Post

Director / Manager	
Executive / Administrative / Quantity Survey	
Site Supervisor / SSS / Site Engineer	
Others	

SECTION B

Questions 1 to Question 4 are outlined in the table below: -

No	Effectiveness Categories	Issues Related to Existing Method	Level of Agreement				
			Strongly Disagree	Disagree	Slightly Agree	Agree	Strongly Agree
			1	2	3	4	5
1.	Perceived Usefulness	Using Existing Method would enhance my effectiveness in work.					
		Using Existing Method would improve my performance in work					
		Using Existing Method would increase my productivity.					
		I found Existing Method useful.					
2.	Perceived Ease of Use	I found Existing Method easy to use.					
		Learning to use Existing Method would be easy for me.					
		My interaction with Existing Method was clear and understandable.					
		It would be easy for me to manage my project using Existing Method.					

No	Effectiveness Categories	Issues Related to Existing Method	Level of Agreement				
			Strongly Disagree	Disagree	Slightly Agree	Agree	Strongly Agree
			1	2	3	4	5
3.	Intention to Use	I intend to use Existing Method during my work					
		I will use Existing Method often.					
		I intend to use Existing Method frequently.					
4.	Attitude Toward Using	Existing Method makes work more interesting.					
		Working with Existing Method is fun.					
		I feel comfortable using Existing Method.					
		I look forward to those aspects of my job that require me to use Existing Method.					

QUESTIONNAIRE 2 (POST-QUESTIONNAIRE)

CIVIL ENGINEERING DEPARTMENT
POLITEKNIK UNGKU OMAR
SURVEY FORM FOR FINAL YEAR PROJECT
BCT 83010 – FINAL YEAR PROJECT
COMPREHENSIVE METHOD STATEMENT WITH E-REPORTING APPLICATION
QUESTIONNAIRE 2: USING COMPREHENSIVE METHOD STATEMENT WITH E-REPORTING FOR SITE SUB-PROJECTS AT CONSTRUCTION SITE

Questionnaire Research: The Respondent Point of View Regarding the Issues Related to Method Statement Preparation for Site Sub-Projects at the Construction Site

A part of my study of Final Year Project for Bachelor of Civil Engineering Technology (BCT) at Politeknik Ungku Omar (PUO), Ipoh, Perak, my name is Raimi Imran bin Mohamed Nasir (01BCT19F3031) and I am conducting a survey to identify effectiveness of the Comprehensive Method Statement with E-Reporting (CMSxER) on method statement preparation for site sub-projects at the construction site

---

Please tick [/] the box that applies on each questions below.

SECTION A

a) Gender

Male	☐
Female	☐

b) Age

≤ 25	☐
26 – 35	☐
36 – 45	☐
≥ 46	☐

c) Work Experience

< 2 years	☐
2 – 5 years	☐
6 – 10 years	☐
> 10 years	☐

d) Position / Post

Director / Manager	
Executive / Administrative / Quantity Survey	
Site Supervisor / SSS / Site Engineer	
Others	

SECTION B

Questions 1 to Question 4 are outlined in the table below: -

No	Effectiveness Categories	Issues Related to Existing Method	Level of Agreement				
			Strongly Disagree	Disagree	Slightly Agree	Agree	Strongly Agree
			1	2	3	4	5
1.	Perceived Usefulness	Using Comprehensive Method Statement with E-Reporting would enhance my effectiveness in work.					
		Using Comprehensive Method Statement with E-Reporting would improve my performance in work					
		Using Comprehensive Method Statement with E-Reporting would increase my productivity.					
		I found Comprehensive Method Statement with E-Reporting useful.					
2.	Perceived Ease of Use	I found Comprehensive Method Statement with E-Reporting easy to use.					
		Learning to use Comprehensive Method Statement with E-Reporting would be easy for me.					
		My interaction with Comprehensive Method Statement with E-Reporting was clear and understandable.					
		It would be easy for me to manage my project using Comprehensive Method Statement with E-Reporting.					

No	Effectiveness Categories	Issues Related to Existing Method	Level of Agreement				
			Strongly Disagree	Disagree	Slightly Agree	Agree	Strongly Agree
			1	2	3	4	5
3.	Intention to Use	I intend to use Comprehensive Method Statement with E-Reporting during my work					
		I will use Comprehensive Method Statement with E-Reporting often.					
		I intend to use Comprehensive Method Statement with E-Reporting frequently.					
4.	Attitude Toward Using	Comprehensive Method Statement with E-Reporting makes work more interesting.					
		Working with Comprehensive Method Statement with E-Reporting is fun.					
		I feel comfortable using Comprehensive Method Statement with E-Reporting.					
		I look forward to those aspects of my job that require me to use Comprehensive Method Statement with E-Reporting.					

APPENDIX 4:
INDUSTRY APPRECIATION LETTER FOR PRODUCTION OF CMSxER INNOVATION PRODUCT

CLCE CONSTRUCTION SDN. BHD.
Company No. 199401000418 (286096-W)
42, Medan Istana 1, Bandar Ipoh Raya, 30000 Ipoh, Perak.
Tel : 05-255 9468 / 05-246 0750 Fax : 05-255 3150
Email : cheeleong2118@yahoo.com

Ruj. Kami :

Tarikh : 03 June 2023

Kepada pegawai yang berkenaan,

Tuan/Puan,

PENGHARGAAN ATAS PENGHASILAN PRODUK INOVASI COMPREHENSIVE METHOD STATEMENT WITH E-REPORTING (CMSxER) UNTUK KEGUNAAN SYARIKAT CLCE CONSTRUCTION & ENGINEERING SDN BHD

Dengan segala hormatnya saya merujuk kepada perkara di atas.

2. Sekalung tahniah saya ucapkan kepada tuan/puan kerana dapat mewujudkan produk inovasi **COMPREHENSIVE METHOD STATEMENT WITH E-REPORTING (CMSxER).** 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 pensyarah Politeknik Ungku Omar seperti berikut :

Nama produk inovasi : **COMPREHENSIVE METHOD STATEMENT WITH E-REPORTING (CMSxER)**

Nama pegawai : 1. CHONG CHEE LEONG (Managing Director)
2. KHAIRON RIJAL B. TERMIZI (Site Safety Supervisor)
3.

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,

(CHONG CHEE LEONG)

Managing Director
CLCE Construction Sdn Bhd
42, Medan Istana 1, Bandar Ipoh Raya, 3000 Ipoh, Perak

(AKAN DIGANTI DENGAN YANG ORIGINAL)