POLITEKNIK UNGKU OMAR

THE APPLICATION OF EASY-SITE MANAGEMENT (EASY-SM) IN SITE MANAGEMENT

MUHAMMAD BADRUL AMIN BIN ROSMAN

(01BCT21F3014)

CIVIL ENGINEERING DEPARTMENT

SESSION II 2023/2024

POLITEKNIK UNGKU OMAR

THE APPLICATION OF EASY-SITE MANAGEMENT (EASY-SM) IN SITE MANAGEMENT

MUHAMMAD BADRUL AMIN BIN ROSMAN

(01BCT21F3014)

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

CIVIL ENGINEERING DEPARTMENT

SESSION II 2023/2024

STATEMENT OF AUTHENTICITY AND PROPRIETARY RIGHTS

THE APPLICATION OF EASY SITE MANAGEMENT (EASY-SM) IN SITE MANAGEMENT

1. I, **MUHAMMAD BADRUL AMIN BIN ROSMAN (NO KP: 991007115557)**, am a student of **Bachelor's Degree of Civil Engineering Technology**, in **Politeknik Ungku Omar**, at the address, **Jalan Raja Musha Mahadi, 31400 Ipoh, Perak**.

2. I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duty acknowledged.

3. I hereby agree to let go the intellectual property ownership of this project to Ungku Omar Polytechnic in partial of the requirement for the award of the **Bachelor's Degree in Civil Engineering Technology.**

Made and truly acknowledged by the said:

A. MUHAMMAD BADRUL
    AMIN BIN ROSMAN   …………………
    (IC NUMBER: 991007-11-557)   (MUHAMMAD
                                             BADRUL AMIN
                                             BIN ROSMAN)

B. in front of me, PN MAZZIYATOL
FARIZZA BINTI MAT as project supervisor   ………………..
on date:………………………...   (PN MAZZIYATOL
                                             BINTI MAT)

APPRECIATION

ABSTRACT

The researcher was tasked with handling architectural aspects of the Sunway South Quay Square construction site in Sunway City, where this study is being conducted. Moreover, due to wide spread of implementation of Construction IR 4.0 technology, the construction industry in Malaysia is presently undergoing a massive transformation. This has led to the usage of technological track progress practices and a significant inquiry into the revolutionary impact of these technologies. Occasionally, at the researcher site construction, architectural changes resulted in drawings that were altered, which caused numerous issues that cost money, time, and man labor. This study's goals are to define the issue, develop a solution application, and assess the solution's efficacy at the conclusion. The created application which is named Easy-Site Management (Easy-SM) is an easy on-going application and suggested to being used by the Sunway Construction professional workers and with the business partner who are involving in the site construction. The application will be used at Sunway South Quay Square as its main function to improve the site progress as to enhance the workability of progress, time and cost as the site need continuation progress to achieve the planned milestone. Standardised questionnaires based on the effectiveness of Easy-SM will be distributed among the site construction professionals as part of the data collection technique. Nonetheless, important participant feedback regarding the Easy-SM usage are among the anticipated results. The anticipated outcome should be that the identified architectural and structural site progress issue will be resolved and give benefit to the operation team.

Keywords: Application, Easy-Site Management (Easy-SM), Architectural, Structural

ABSTRAK

Pengkaji ditugaskan untuk mengurus kerja di tapak pembinaan di Sunway South Quay .Pengkaji telah ditugaskan untuk mengendalikan aspek seni bina tapak pembinaan di Dataran Sunway South Quay di Bandar Sunway dimana tempat kajian ini dijalankan. Selain itu, disebabkan penyebaran luas pelaksanaan teknologi IR 4.0 Pembinaan, industri pembinaan di Malaysia kini sedang mengalami transformasi besar-besaran. Ini telah membawa kepada penggunaan kemajuan landasan teknologi dan siasatan penting terhadap kesan revolusioner teknologi ini. Kadangkala, pada pembinaan tapak penyelidik, perubahan seni bina mengakibatkan lukisan yang diubah, yang menyebabkan banyak isu yang memerlukan wang, masa dan tenaga kerja manusia. Matlamat kajian ini adalah untuk mentakrifkan isu, membangunkan aplikasi penyelesaian, dan menilai keberkesanan penyelesaian pada kesimpulan. Aplikasi yang dicipta yang dinamakan Easy-Site Management (Easy-SM) adalah aplikasi yang berterusan dan dicadangkan untuk digunakan oleh pekerja profesional Sunway Construction dan dengan rakan kongsi perniagaan yang terlibat dalam pembinaan tapak. Aplikasi ini akan digunakan di Dataran Sunway South Quay sebagai fungsi utamanya untuk menambah baik kemajuan tapak bagi meningkatkan kebolehkerjaan kemajuan, masa dan kos kerana tapak memerlukan kemajuan berterusan untuk mencapai pencapaian yang dirancang. Soal selidik dijalankan berdasarkan keberkesanan Easy-SM akan diedarkan di kalangan profesional pembinaan tapak sebagai sebahagian daripada teknik pengumpulan data. Namun begitu, maklum balas penting peserta mengenai penggunaan Easy-SM adalah antara hasil yang dijangkakan. Hasil yang dijangkakan ialah isu kemajuan tapak seni bina dan struktur yang dikenal pasti akan diselesaikan dan memberi manfaat kepada pasukan operasi.

Kata kunci: Aplikasi, Easy-Site Management (Easy-SM), Senibina, Struktur

LIST OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATION

SQS	South Quay Square
COW	Clock of Work
EASY-SM	Easy Site Management
QS	Quantity Surveyor
SPSS	Statistical Package for the Social Sciences
2D	2 Dimensional
3D	3 Dimensional
BIM	Building Information Modeling
VR	Virtual Reality
AR	Augmented Reality
AI	Artificial Intelligent
TAM	Technology Acceptance Model
PU	Perceived Usefulness
PEU	Perceived Ease of Use
PBC	Perceived Behavior Control
BI	Behavior Intention

CHAPTER 1

INTRODUCTION

1.1   Research Background

The design, planning, and administration of diverse infrastructure projects are all part of civil engineering in the construction industry. It involves designing infrastructure such as roads, bridges, buildings, and more that are sustainable, safe, and useful. Civil engineers are in charge of everything, from designing concepts to making sure construction follows safety and quality guidelines. Moreover, the successful project required a good site management practices because all work will be done in good flow according to the planning time so that no such delay of work will occur that could cost time, money and manpower. The majority of the project's success was attributed to its effective project management, planning, monitoring, and control (Mufleh, 2022). The researcher had been assigned by the assistant manager to take care of architectural and structural of Zone D and C at Sunway South Quay Square construction site. Numerous issues had emerged as a result of the architect's constant revisions and changes to the drawing, which caused other issues. Hence, making some of the trade items such as structural and architectural need to be rectify as soon as possible just to make sure the continuity of work progress in track. Thus, after observing the circumstances at the project site, the researcher identified the issue and developed an application that can be use by operation team that can help them to keep tracking progress on the problem.

1.2   Problem Statement

Researcher had done the observation during the first month of internship at zone C and had choose some of the hard crucial problem that lead to poor management of the site such as delay of work, cost and time. In Malaysia, one of the main causes of building project delays is ineffective site management and need some creative solution to address the problem effectively (Aftab Hameed Memon, 2014). So the researcher had talk with the operation regarding why these kind of problem can occur even the planning had already planned in initial phase.

In order for site engineers to efficiently manage construction resources, the system should also give them access to information about work tasks. Moreover, real-time information sharing should be a feature of the system to enable effective communication between construction participants The main contractor and the client should have excellent communication in order to

avoid construction delays and maintain the project's quality of work (Memon, 2014). The implementation of this project is being made to going a research and to evaluate the effectiveness of the current site management practises. The main problem is that, the lack of understanding on how these tactics affect project deadlines, budget compliance, safety procedures, and overall project quality. So, by overcome some of these aspects, will provide the solution and valuable information that can give a boost towards the outcome of construction progress at site.

Firstly, the changes and revise in architectural drawing make some item in architectural plan were changed and required some of time to make the final check especially for the order of door frame. This changes could lead some problems such as, pending order of door frame, sequences of architectural work been hold and wasting time of actual and plan, double order or wrong side of door frame could be order. All of this will give a big impact to Quantity Surveyor (QS) team and planner team, surely the operation team will be responsible for all the waste money and time.

Secondly, the current onsite progress, the lack of a customised and effective site management system presents a major challenge in the field of construction project management. Lack of a dedicated system makes it difficult to coordinate and optimise operations on construction sites, which can lead to delays, overspending, and a compromise in safety and quality standards. It is because, some study showed that advance technologies in smart system can increase construction engineer productivity and efficiency on-site construction management (Changyoon, 2013). Moreover, the progress need to update daily and weekly for the overall site just to make sure the working progress are ongoing.

Lastly, the responsibility of back charges due to any mistake or changes in drawing. Moreover, in the construction industry, back charges are invoices for work completed or expenses paid by the owner that, according to the contract, should have been completed by the contractor but weren't delivered. It may be an adjustment made in error or a collection of an expense incurred by the owner for which billing was delayed owing to scheduling conflicts.

1.3 Objective

The objectives of this study is as the following:
  i. To identify lack of tracking progress at Sunway South Quay Square construction project.
  ii. To create an application as a job tracking device for Sunway South Quay Square.
  iii. To evaluate the effectiveness of the Easy-SM

1.4 Scope of Study

The changes and revise of architectural drawing make some work progress at some sub-zone become halt or delay. For example, the changes of brick wall width for emergency escape route at UST2 and UST 1 by architect make the plaster work halt for a few weeks already, even the inspection of plaster peg already done by clock of work and the time to hack the wall require a lot of time and need to reply with good reason to quantity surveyor. Moreover, the door frame also has a lot of changes in different zone, varies in the type door, location of installation and, changes of left and right for single door, all of this need to check one by one at tagging door and drawing layout and both of it need to be in tally. All this happened at Zone C L1-L3 and will be continue until L8 while zone D still at B2 and will continue until L8. Moreover, the onsite progress need to be update on daily and weekly for the staff meeting. This required a lot of time since the site is huge and need to check every progress ongoing every level. This is very crucial because need to plan every consequences of work so the work ongoing all the time without idle.

The idea behind system creation is to create the apps or system according to our desired outcome. Thus, the researcher can access it anywhere at any time by making it simple and straightforward to use on phones. The application developed by using MIT Inventor based on designed platform. Moreover, the design of application will be create based on how to the data been collected during the observation. Just to be sure to be clear and provide information based on the desired system to start. The prototype invented in the MIT inventor will be created solely to capture the real situation happened on-site, including zone, picture and reasons of rectification. The usage of this application can be use as one of item that can be insert into report for Quantity Surveyor as a reference in case need to claim or back charges the other party.

The operation team of Sunway Construction and the other business partner will use this recently developed system to test its efficiency on site basely for the rectification work and the researcher will evaluate the effectiveness by using SPSS. This should allow researcher to determine the system's effectiveness and will entirely know whether this new implementation of technology better than the existing method.

1.5   Significance of Study

The goal of the study is to identify areas for improvement in the effectiveness of current site management practices because even the initial site management already was there, but there are still lacking features that still need to patch up the void. As a result, the operation team was having a difficult time finishing their work, which was delaying some progress and preventing them from meeting the weekly goal. The researcher had come up with an idea to lesser the problem by creating an application as a helper to increase the quality of site management. Then, implementation of new technology system into the management of construction sites is a significant innovation presented in this study. Moreover, society adjusts to the changes in

technology an unconscious awareness of design, indicating a desire for visually appealing goods, intuitive user interfaces, and clear, concise communication (Kat Lord, 2019). The new system's design and implementation aim to modernise the construction industry by utilising technology breakthroughs.

Furthermore, the importance of this extends to potential financial savings, decrease in mistakes, and improved communication throughout the entire duration of the project. The merging of comprehensive Easy-SM data with the interactive and contextual insights gained from research conducted throughout his tenure with the operations team has the potential to transform the way construction professionals strategize, implement, and oversee projects. This research ultimately helps to the continuous development of the construction industry by providing useful insights into a transformational strategy that has the potential to significantly improve the efficiency and effectiveness of construction project management to an unprecedented level.

CHAPTER 2
LITERATURE REVIEW

2.1   Introduction

Technological breakthroughs are driving a radical change in the educational landscape. Teachers and researchers must investigate how technology affects student learning outcomes because of the growing dependence on digital tools and online resources. The goal of this evaluation of the literature is to help readers understand the complicated issue that occasionally arose on the building site where the researcher was assigned to work. After seeing the issue, the researcher developed a problem statement and the concept to create a system that would help the operation team tackle the issue.

The term newly developed system in this review refers to the incorporation of software, digital tools, and online platforms in educational settings and the use of that important platform to help researchers solve problems and accomplish their goals. All of these, researcher can get for free from the internet which consist variety of knowledge and that is why it's called internet of things. With the internet of things, gadgets are becoming smarter, processing is becoming more intelligent, and communication is becoming more informational on a daily basis. Even though the Internet of Things is still developing, its effects have already begun to show promise as a universal media solution for networked scenarios. During these modern days right now, internet should be one of our component in our basic life because Internet of Thing (IoT) is booming these days and is being applied to a wide range of situations whether in work situation or daily life (Ray, P. P.,2018).

A literature review is a comprehensive and rigorous analysis of the existing knowledge related to a certain topic or research question. The major purpose of this is to provide a basic foundation for any research project by giving a comprehensive overview of the existing knowledge in a certain academic field. The primary aim of a literature review is to identify and highlight areas of deficiency, inconsistencies, and ongoing debates within the current collection of scholarly literature. This enables researchers to situate their own studies within the wider context of academic discussion.

An effectively executed literature review requires a methodical examination, careful selection, critical evaluation, and integration of relevant academic sources, such as books, journal articles, conference papers, and other scholarly resources. It goes beyond just summarizing current literature by doing a thoughtful study of the methods, results, and arguments given in these sources.

This rigorous examination not only highlights the merits and flaws of previous research but also assists researchers in formulating research inquiries, hypotheses, or goals for their own investigations.

Essentially, a literature review is an essential component of academic research that serves as a thorough examination of the current literature on a specific topic. Its function goes beyond improving comprehension of the existing body of knowledge, including the detection of deficiencies and opportunities for further investigation. A thorough and precise literature evaluation not only helps in developing strong research questions, hypotheses, or objectives but also provides a solid foundation for increasing knowledge in a particular topic.

2.2   Site Management

Site management in building sites is a complex process that encompasses labour productivity, waste reduction, safety oversight, material handling, environmental impact, and logistical coordination. Efficient project management procedures are crucial for guaranteeing the success, longevity, and effectiveness of a project.

The construction industry places significant attention on labor productivity, with research highlighting the crucial role of efficient on-site management strategies in maximizing performance and minimizing rework (Hwang & Tan, 2012). Waste minimization is an important component of site management, involving specific methods that target the reduction of waste production in building projects (Ajayi et al., 2017). Ensuring worker well-being and preventing accidents are of utmost importance in safety management on construction sites. Recent research has investigated the potential benefits of employing automated sensing systems and real-time safety management tools to enhance decision-making and improve safety practices (Yu et al., 2018). Material management strategies are essential for construction site operations as they have a significant impact on material conservation and resource management (Edike, 2021). The significance of environmental performance and green construction techniques is increasing, as studies are specifically examining their influence on project economics and sustainability (Yu et al., 2018). Logistics management in construction encompasses a range of operations, including material procurement, schedule monitoring, site infrastructure administration, and information dissemination. These activities are crucial for ensuring the timely completion of projects and maintaining quality standards (Bankvall et al., 2010).

Moreover, the incorporation of sustainability into construction projects has been emphasized as a crucial element of project management. Various studies have emphasized the importance of implementing sustainable project planning and evaluation systems to encourage environmentally conscious practices throughout the entire project lifecycle (Fesenko, 2022; Onubi et al., 2019). Research has demonstrated that incorporating environmentally-friendly building

methods and taking into account the level of difficulty of a project can affect the overall health, safety, and economic outcomes of construction projects (Onubi et al., 2020; Amusan et al., 2021).

Project management in construction sites involves a diverse array of procedures and factors that are crucial for achieving project success, sustainability, and efficiency. Construction professionals can optimize on-site operations and fulfill project objectives efficiently by using best practices in labor productivity, waste minimization, safety management, material conservation, environmental performance, and logistics management.

2.3   Structural and Architectural Drawing

Structural and architectural drawings play a vital role in the construction industry, serving as essential instruments for expressing design intentions, facilitating communication among project participants, and directing the construction process. Traditional architectural drawings have served as crucial intermediaries between architects and the physical world in the architectural design process (Marcos, 2022). The drawings have progressed from preliminary sketches to intricate construction drawings, constituting a vital component of the creative process in architectural design (Григорьева, 2024). Within the field of construction production management, the ability to understand and analyze architectural drawings and requirements is considered a crucial skill for successful building production management in the construction industry (Obaju et al., 2022). Comprehending and efficiently using architectural drawings are crucial to guarantee that construction projects comply with design criteria and industry standards. In addition, the arrangement of different types of buildings and the assembly of various components depend on precise interpretation of architectural plans (Obaju et al., 2022). The integration of digital technologies has revolutionized architectural drawing methods, facilitating the development of three-dimensional virtual models and improving the depiction of building construction scenes (Li, 2022). Autodesk Revit Structure and similar software tools have made it easier to transfer building structure data to analysis programs. This has resulted in more efficient structural design processes and increased precision in construction drawings (Sirimaha & Kaewlex, 2021). In addition, the use of Building Information Modeling (BIM) software has transformed the construction sector by offering a dynamic and comprehensive source of information that surpasses conventional static drawings.

Architectural drawings serve as both visual depictions of design principles and important tools for ensuring safety on construction sites. Revised illustrations that incorporate safety protocols can effectively communicate safety information to workers at the construction site, fostering a culture of heightened safety awareness and minimizing the risk of potential risks and accidents. By integrating safety protocols into architectural blueprints, project managers can improve on-site safety measures and reduce potential hazards during construction operations.

7

Moreover, the examination of architectural drawings has played a crucial role in the process of recreating buildings in three dimensions and investigating the architectural shapes and connections within structures (Dosch et al., 2000; Budiman et al., 2021). An in-depth analysis of architectural drawings enables a thorough comprehension of building components and their interconnections, hence facilitating well-informed decision-making throughout the construction phase. In addition, the study by Budiman et al. (2021) has examined the utilization of freehand drawing as a means of architectural expression, with a focus on its significance in analyzing building elements and architectural connections.

Structural and architectural drawings are essential in the construction sector since they enable effective design communication, provide guidance for building activities, and ensure project correctness and safety. Architectural drawings play a crucial role in influencing the built environment and promoting innovation in building processes. This is due to the evolution of drawing methods, integration of digital technology, and increased attention on safety issues. To conclude, construction drawing in Sunway Construction South Quay Square always getting a new revision based on the new approved drawing by consultant. The new drawing revision should be updated to all people who are involved in the job progress to make sure follow the current details.

2.4 Changes in Construction Drawing

On-site drawing modifications are vital in the construction business to ensure project success and optimize productivity. Historically, workers on building sites relied on static construction documentation such as 2D paper designs (Disney, 2023). Nevertheless, technological improvements have revolutionized this particular area of construction. Mobile visualization tools and applications have been created to improve collaboration on construction sites, facilitate the sharing and clarification of drawings, handle design modifications, address construction feasibility problems, and monitor construction progress in real-time (Koseoglu & Bouchlaghem, 2008). These advancements have greatly enhanced the effectiveness and precision of making modifications in on-site construction.

Modifications in designs have a dual effect, as they not only affect the necessary adjustments on paper but also have an impact on the actual construction process. This influence extends to material wastage, the need for rework, and the overall efficiency of the project (Bekr, 2014). Gaining insight into the factors and magnitude of material loss in building sites is crucial for maximizing resource efficiency and minimizing avoidable costs. Through the examination of the consequences of making alterations to drawings on material management, construction participants can improve efficiency and simplify project schedules (Ghanem et al., 2018). Modifications made to drawings also have consequences for the safety of the site, influencing the behaviours and practices of workers on-site. Integrating safety protocols into updated designs can

enhance the communication of safety information among workers, hence promoting a safer work environment (Huang & Yang, 2019). By including safety protocols into updated building blueprints, project managers can foster a culture of safety awareness among on-site staff, thereby mitigating possible risks and minimizing accidents.

Moreover, the notion of incorporating sustainable innovation in construction projects emphasizes the significance of adjusting to the progressing co-evolutionary processes (Kemp, 2023). This method emphasizes the importance of integrating sustainable practices into on-site design modifications to foster environmental accountability and ensure the long-term sustainability of construction projects. Furthermore, the incorporation of 3D printing technology in on-site construction has resulted in substantial consequences for architectural working drawings, building implementation stages, and overall architectural output (Hanna, 2019). This technology has optimized the process of making drawing modifications on-site, resulting in enhanced efficiency and accuracy in construction operations.

Ultimately, the process of making alterations to site construction has undergone substantial transformation as a result of technological progress and an increasing focus on sustainability. The incorporation of mobile visualization tools, sustainable innovation techniques, and 3D printing technology has revolutionized the handling of drawing modifications on building sites, improving cooperation, productivity, and overall project results. These advancements highlight the significance of using technical breakthroughs and sustainable methods in contemporary construction operations. To conclude,

2.5   Rectification

Rectification is essential in construction sites to guarantee project quality, safety, and adherence to rules. Multiple studies have shown the need of promptly implementing corrective actions to resolve problems and maintain the integrity of a project.

Li (2022) examined the application of BIM Smart Site Integrated Construction Technology in the construction of sizable medical structures. The study emphasized the significance of swiftly providing rectification notices whenever safety issues are identified, in order to enable construction professionals to efficiently address problems. By using a proactive approach, construction issues are swiftly dealt with, leading to an improvement in overall project safety. Xiao et al. (2023) performed a case study on the correction of deviations in a tall structure with a piled raft base. The study validated the efficacy of soil extraction for building rectification by examining long-term monitoring data. This study clarified the rectification process for tall buildings that are supported by piled raft foundations, emphasizing the significance of monitoring and rectification in guaranteeing structural stability.

Shi et al. (2013) investigated the tilt of bridge piers caused by nearby embankment development and the corresponding methods for correcting it. The study demonstrated favourable results with the rectification procedures implemented, as determined through on-site inspection. This emphasizes the significance of employing suitable remedial measures to efficiently tackle structural problems. Zhang (2023) examined the utilization of satellite remote sensing for the management of unanticipated building activities related to electricity transmission lines. The study highlighted the importance of implementing advanced control technologies to monitor unexpected activities, carry out random inspections, and promote prompt resolution of issues and safety management. This technique guarantees that construction activities comply with legislation and safety standards.

Duan et al. (2022) concentrated on creating a sophisticated fire inspection system specifically designed for building engineering. The study emphasized the importance of remote rectification engagement and risk assessment reminders for fire acceptance staff in on-site circumstances. This technology facilitates the effective correction of fire safety risks, consequently improving the overall safety in construction projects. Rectification in building sites is crucial for promptly addressing safety hazards, structural irregularities, and compliance issues. Construction projects can maintain quality standards, assure safety, and achieve successful outcomes by applying efficient rectification processes through comprehensive monitoring and analysis.

2.6 Construction Technology

Construction technology plays a crucial role in the construction sector, promoting innovation, productivity, and environmental responsibility. Multiple studies have examined the effects of technology adoption on different aspects of construction practices, safety, project management, and efficiency.

In their study, Bilal et al. (2016) did a comprehensive analysis of the use of Big Data in the construction sector. They specifically highlighted the significant role that Big Data and sensing technologies may play in enhancing the monitoring of building progress. This study emphasizes the profound influence of data-driven technologies on improving construction monitoring procedures. Sepasgozar & Davis (2018) examined the implementation of construction technology using the Construction Technology Adoption Cube framework, emphasizing the importance of modern technology in improving construction procedures. Their study provides valuable insights into the various elements, obstacles, and motivators that influence the adoption of technology in the construction industry.

Duan & Yangliu (2021) examined the utilization of Building Information Modeling (BIM) in building construction, emphasizing the significance of BIM technology in enhancing project management procedures. This study highlights the significance of Building Information Modeling

(BIM) in improving the management of time, cost, and quality control in construction projects. Gürgün et al. (2022) investigated the application of technology to address delays in building projects, emphasizing the significance of cutting-edge technologies in reducing project delays. Their analysis highlights the need of utilizing technology to improve project efficiency and punctuality.

In their study, Hou et al. (2020) performed a comprehensive analysis of the use of Digital Twins in promoting safety in the construction sector. They particularly highlighted the significance of visualization technology in improving safety measures. This study highlights the capacity of Digital Twins technology to enhance safety management in building projects. Liu et al. (2022) conducted a comprehensive analysis of the progress made in the fields of structure, construction automation, and monitoring of intelligent construction. Their research highlights how new technologies have the power to significantly modify and modernize construction methods. Their research highlights the significance of technology in improving construction efficiency and performance. In a study conducted by Ahmed (2019), an examination was carried out on the potential applications of Augmented Reality (AR) and Virtual Reality (VR) in the field of construction project management. The study specifically emphasized the advantages of AR technologies in terms of teaching construction workers and improving safety protocols. This study highlights the capacity of augmented reality (AR) and virtual reality (VR) technology to enhance construction project management.

Ultimately, technology in the construction industry is crucial for fostering innovation, expanding productivity, and bolstering safety protocols. Construction professionals can enhance project management, expedite procedures, and promote sustainable construction practices by using sophisticated technologies such as BIM, Big Data, AR, and VR.

2.7   MIT Apps Inventor

MIT App Inventor has positioned itself as a prominent platform for bringing users, particularly novices, to the realm of mobile application development. This web-based platform offers a block-based programming language that greatly lowers the obstacles to developing mobile applications for Android devices, making it especially accessible to those in Africa with less or no programming background (Africa, 2019). The platform's graphical programming language enables those with limited programming experience and non-technical backgrounds to engage in the creation of applications for mobile devices, thereby promoting equal access to computing and nurturing innovation in app development (Wolber et al., 2015). MIT App Inventor is characterized by its user-friendly drag-and-drop interface, which allows users to effortlessly create and build fully operational Android applications (Bougheloum, 2024).

The educational merit of MIT App Inventor has been extensively recognized, with study specifically examining its efficacy in instructing core programming principles and computational thinking concepts. Research has examined the impact of the platform on students' perceptions and skill growth, emphasizing its ability to engage students in intricate computational tasks while providing a user-friendly setting for creating apps (Panselinas et al., 2018; Xie & Abelson, 2016). In addition, MIT App Inventor has been incorporated into other educational environments, such as online graduate courses, where educators have commended it as a valuable instrument for developing fully operational mobile applications and enhancing the educational experience (Hsu & Ching, 2013).

In addition to conventional educational settings, MIT App Inventor has been utilized in diverse domains including soil health preservation, motor control frequency computations, and real-time positioning for individuals with visual impairments. The platform's versatility has been showcased in gathering field data for soil resource research, showcasing its capacity to adapt to individual needs and software development requirements (Cioruța & Coman, 2022). Moreover, MIT App Inventor has been utilized to create Android applications for a wide range of functions, including controlling mobile robots using Bluetooth and collecting GIS data. This demonstrates its applicability in various sectors and for users with varying backgrounds (TOP & Gökbulut, 2021; Ndebele & Mazhindu, 2023).

The platform's progress and improvements have garnered attention, particularly due to recent features such as a chatbot/imagebot feature designed to accelerate mobile app development and facilitate generative AI education (Kim, 2024). The unique features of MIT App Inventor demonstrate its dedication to staying at the forefront of app development tools and technologies. Furthermore, the platform's intuitive design and emphasis on gamification have been examined in the context of higher education, revealing its capacity to captivate students and enable dynamic learning encounters (Pérez-Jorge & Martínez-Murciano, 2022).

To summarize, MIT App Inventor is a flexible and intuitive framework for developing applications, providing educational prospects and a wide range of uses in different domains. The significance of mobile app creation lies in its ability to enhance programming education, foster skill development, and facilitate real-world problem-solving, so empowering individuals to pursue this field.

2.8   Data Collection

Questionnaires are a commonly employed and efficient method for collecting data in research across diverse fields of study. The design of questionnaires plays a critical role in guaranteeing the quality and dependability of the gathered data. Researchers have emphasized the significance of meticulously designing, organizing, and formulating survey content in order to carry out efficient

market research. "Questionnaire design: how to plan, structure, and write survey material for effective market research" was published in 2013. Another publication with a similar title, "Questionnaire design: how to plan, structure and write survey material for effective market research", was released in 2005. Questionnaires have been used in various studies to evaluate the knowledge, attitudes, and behaviors of the general public regarding sun exposure and protection (AlGhamdi et al., 2016), as well as to examine the connection between sexual disorders and the quality of life in women with multiple sclerosis (Kołtuniuk et al., 2020).

Questionnaires have been important in monitoring high-risk pregnancies, avoiding primary tooth caries in youngsters, and developing sustainable enterprises among university students in the healthcare area (Ayatollahi et al., 2019; Kabiri et al., 2021; Waris et al., 2021). Questionnaires have been employed in educational research to evaluate teachers' epistemological beliefs (Munfaridah, 2023), investigate students' attention levels during teaching and learning (Yuliani et al., 2023), and comprehend the perspectives of mathematics tutors in Ghana (Alhassan & Agyei, 2020).

Moreover, questionnaires have been employed in research examining user satisfaction in multi-tenant offices (Hartog et al., 2017), the influence of personality on user satisfaction (Hartog et al., 2017), and assessing knowledge, behavior, and sun protection practices among health services vocational school students (Yurtseven et al., 2012). Researchers have utilized questionnaires to evaluate how industrial engineering students perceive academic plagiarism (Morán, 2022), enhance knowledge retention in higher education (Wamundila & Ngulube, 2011), and investigate the conceptions of mathematics tutors in colleges of education in Ghana (Alhassan & Agyei, 2020).

The flexibility and adaptability of questionnaires have been proven in different research methodologies, such as investigations on the advancement of Android-based mobile learning (Hakim & Sujarwo, 2022), the impact of personality on user contentment (Hartog et al., 2017), and the evaluation of customer satisfaction in online shopping from a security standpoint (Ali et al., 2018). Questionnaires have been employed in both quantitative and qualitative methodologies, obtaining data through organized surveys, Likert scales, and computerized data capture systems, demonstrating their versatility in acquiring significant insights in various research settings. To summarize, questionnaires are an invaluable instrument for gathering data in research, allowing researchers to collect information, evaluate attitudes and behaviours, and investigate diverse phenomena across different fields of study. The likert scale been used in the questionnaire to evaluate Easy-SM:

i. 1 – Strongly Disagrees
ii. 2 – Disagrees
iii. 3 – Somewhat Disagree
iv. 4 – Somewhat Agree

v.   5 – Agree

vi.   6 – Strongly Agree

2.9   SPSS

SPSS, often known as the Statistical Package for the Social Sciences, is a highly popular software package utilized for data analysis in a wide range of subjects, with a special emphasis on research in the social sciences. Researchers have utilized SPSS to do statistical studies, evaluate data, and derive significant conclusions. The software's functionality has played a crucial role in managing numerical data and executing intricate statistical operations.

Research has emphasized the significance of SPSS in various research settings. SPSS is considered an essential tool in social science research for evaluating quantitative data sets and extracting insights (Rahman & Muktadir, 2021). SPSS, a software program, has been used in the medical profession for statistical analysis in research involving public health initiatives and clinical audits (Fittipaldi et al., 2020). Furthermore, SPSS has been utilized in educational research to appraise student learning outcomes and evaluate the influence of teaching initiatives (Herlina, 2021).

Various research has emphasized the efficacy of SPSS in data analysis. Guadie (2024) has demonstrated the utilization of SPSS by researchers for the purposes of data cleaning, coding, and analysis. This software plays a crucial role in maintaining the quality of data and enabling rigorous statistical analysis. Furthermore, SPSS has been utilized in research that examines various aspects that impact organizational performance, such as information security management and business process enhancement, demonstrating its adaptability in diverse fields (Stewart & Jürjens, 2017; Queiroz et al., 2020). The software's capacity to manage extensive datasets and conduct sophisticated statistical analyses has played a vital role in investigating intricate research inquiries and producing significant outcomes (Yang et al., 2018).

In addition, SPSS has been used into research procedures to improve the analysis and presentation of data. study studies have employed SPSS for graphical representations, statistical modeling, and assessments of dependability, highlighting its significance in facilitating evidence-based decision-making and study results (As, 2020; Nuzzo et al., 2019). The software's intuitive interface and powerful analytical features have positioned it as the top choice for academics aiming to do quantitative studies and derive evidence-based conclusions from their data (Salus et al., 2023).

To conclude SPSS is a potent instrument that empowers researchers from different fields to analyze data, test hypotheses, and extract significant insights. The extensive utilization of this tool in research highlights its importance in expanding knowledge and enabling evidence-based decision-making in several sectors.

2.10   Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) has played a crucial role in comprehending user acceptance of novel technology. Venkatesh and his colleagues performed a meta-analysis of the literature on Technology Acceptance Model (TAM), where they identified 32 different concepts across eight models that were designed to explain the acceptance of technology (King & He, 2006). The analysis resulted in the formulation of a Unified Theory of Acceptance and Use of Technology (UTAUT), which sought to offer a more thorough comprehension of technology acceptance. In addition, Yousafzai et al. (2007) made a substantial contribution by performing a meta-analysis of TAM, examining 145 papers to highlight areas that need further research and offering recommendations for future studies. They focused on the use of TAM as a fundamental framework to direct research and application in the acceptance of technology. The study conducted a comprehensive literature analysis of 120 papers to determine the important external elements that influence the adoption of e-learning within the Technology adoption Model (TAM) framework (Salloum et al., 2019). This study emphasised the versatility of the Technology Acceptance Model (TAM) in many situations, such as e-learning, demonstrating its capacity to be applied as a theoretical framework. In the same vein, Kusuma et al. (2021) conducted a comprehensive literature study of TAM starting from 1986. Their focus was on highlighting the long-lasting significance and practicality of TAM in comprehending user behaviour towards technology. These studies jointly emphasise the strength and durability of the Technology Acceptance Model (TAM) as a theoretical framework that goes beyond individual technological fields.

The study conducted by Bellan et al. (2019) investigated the function of the Gas6/TAM system in regulating the interaction between inflammation and fibrosis in the healthcare field. This study focused on a particular biological environment, but also emphasised the importance of the TAM framework in understanding intricate connections within biological systems. In addition, the study investigated the impact of instructional programming language components on learning inside the TAM framework, demonstrating the model's adaptability outside conventional technology acceptance areas (Perera et al., 2021). This interdisciplinary application highlights the wide range of uses of TAM in several domains beyond its initial premise. According to Lee et al. (2003), the comparison between TAM and the Theory of Planned Behaviour (TPB) showed that TAM has a minor empirical edge and is a more straightforward and effective model for explaining technological uptake. This investigation comparing several factors confirmed that the Technology Acceptance Model (TAM) is a strong and reliable theoretical framework. Furthermore, a study was conducted to examine the factors that influence university students' acceptance of e-learning using a Structural Equation Modelling (SEM) technique based on the Technology Acceptance Model (TAM) as proposed by Kurdi et al. in 2020. Their investigation confirmed the suitability of

TAM in comprehending user behaviour in educational environments, demonstrating its versatility in many situations.

The systematic study emphasised the significance of the Technology Acceptance Model (TAM) as a prominent conceptual framework for understanding the adoption of mobile financial services (Gupta & Dhingra, 2022). This study classified the factors that influence the adoption of Mobile Financial Services (MFS) into distinct categories, with a particular focus on the usefulness of the Technology Acceptance Model (TAM) in comprehending consumer behaviour in the financial industry. In addition, a systematic review was undertaken on the adoption of mobile banking, with TAM being identified as the key conceptual framework utilised to explain consumers' acceptance of mobile banking (Souiden et al., 2020). The fact that TAM is widely used in various technological fields highlights its universal significance in comprehending user acceptance behaviour.

To conclude, the Technology Acceptance Model (TAM) has established itself as a fundamental framework for comprehending user adoption of technology in several fields. Researchers have continuously shown the adaptability, robustness, and usefulness of TAM in many contexts through meta-analyses, literature reviews, and practical experiments. TAM is a fundamental tool in understanding how users behave and accept technology in various industries such as e-learning, healthcare, and financial services. It demonstrates its ongoing importance and usefulness in the always changing technological environment.

2.11   Perceived Usefulness (PU)

Perceived Usefulness (PU) is a key concept in the Technology Acceptance Model (TAM), which suggests that consumers' acceptance of technology is impacted by their impression of its utility to them (Venkatesh et al., 2003). According to the TAM theory, PU and perceived ease of use (PEU) are crucial determinants that influence users' attitudes and intentions when it comes to adopting new technologies (Venkatesh & Davis, 2000). Research has indicated that PU (perceived usefulness), PEU (perceived ease of use), and attitude towards computer use are important factors that influence users' behavioural intentions (Teo & Schaik, 2009). Moreover, empirical data suggests that Perceived Usefulness (PU) is a robust indicator of users' inclination to utilise technology, elucidating a significant percentage of the variability in technology usage patterns (Fahiraningrum & Richard, 2020).

The Technology Acceptance Model (TAM) highlights the significant influence of Perceived Usefulness (PU) on users' behavioural intentions and their actual usage of technology (Deng et al., 2008). According to Venkatesh and Davis (2000), the major factors that determine users' behavioural intentions are PU (perceived usefulness), which refers to the belief that utilising a system will improve performance, and PEU (perceived ease of use), which refers to the

assumption that using the system will be effortless. Moreover, according to the model, both perceived usefulness (PU) and attitude have a direct impact on technology use. In particular, perceived usefulness tends to have the most significant influence on behavioural intentions, as seen by Tong (2010).

To summarise, the Technology Acceptance Model continually emphasises the importance of Perceived Usefulness (PU) as a crucial component that influences users' attitudes, intentions, and actual usage behaviour when it comes to adopting technology. Perceived usefulness (PU), in conjunction with perceived ease of use, serves as the fundamental basis for users' acceptance of new technologies, as outlined by the Technology Acceptance Model (TAM).

2.12 Perceived Ease of Use (PEU)

Perceived Ease of Use (PEU) is a key concept in the Technology adoption Model (TAM), along with Perceived Usefulness (PU), which plays a crucial role in shaping consumers' attitudes and adoption of technology, as stated by Pertiwi et al. (2021). The TAM theory proposes that Perceived Ease of Use (PEU), which refers to the extent to which a user anticipates a system to be effortless to operate, is a crucial determinant affecting users' behavioural intentions and actual adoption of technology (Sehat et al., 2023). Studies have demonstrated that Perceived Ease of Use (PEU), in conjunction with Perceived Usefulness (PU), has a substantial influence on users' attitudes and intentions about the utilisation of technology (Teo, 2009).

Research has shown that the Perceived Ease of Use (PEU) has an indirect impact on users' behavioural intentions by affecting their attitudes towards technology use and their perception of usefulness (Ursavaş & Reisoğlu, 2017). The Technology Acceptance Model (TAM) highlights the importance of Perceived Ease of Use (PEU) in combination with Perceived Usefulness (PU) in influencing users' acceptance of technology (Muljo et al., 2020). In addition, the original Technology Acceptance Model (TAM) incorporates Perceived Ease of Use (PEU) as one of the four factors used to assess an information system. This emphasises the significance of PEU in comprehending users' behavioural intentions and attitudes towards technology utilisation (Zacharis, 2012). Perceived Ease of Use (PEU) is a crucial component of the Technology Acceptance Model (TAM) that greatly influences users' attitudes, intentions, and actual adoption of technology. PEU, along with Perceived Usefulness (PU), is a fundamental component in comprehending consumers' adoption of new technologies within the TAM paradigm.

2.13 Perceived Behaviour Control (PBC)

Perceived Behavioural Control (PBC) is a crucial element in the Technology Acceptance Model (TAM) that has a direct impact on users' attitudes and intentions when it comes to adopting

technology. Perceived Behavioural Control (PBC) refers to an individual's subjective assessment of how easy or difficult it is to engage in a particular behaviour. The study conducted by Phan et al. in 2019. The Theory of Planned Behaviour (TPB) expands upon the Theory of Reasoned Action (TRA) by incorporating Perceived Behavioural Control (PBC) as a factor that influences behavioural intention, in addition to attitude and subjective norm (Suki et al., 2011). The Technology Acceptance Model (TAM) examines how users' attitudes are influenced by their perception of usefulness (PU) and ease of use (PEU) (Suki et al., 2011). The inclusion of Perceived Behavioural Control (PBC) in the Technology Acceptance Model (TAM) has enhanced the model by taking into account users' perception of their ability to control their behaviour (Çelik, 2008). Research has indicated that Perceived Behavioural Control (PBC), as well as Perceived Usefulness (PU) and Perceived Ease of Use (PEU), are highly influential in determining users' willingness to adopt technology (Nguyễn et al., 2020). Preference for Behavioural Control (PBC) is especially applicable in circumstances when individuals may have little influence over the desired behaviour. PBC aids in forecasting both the intention to use and the actual usage behaviour (Nguyễn et al., 2020).

In addition, PBC has been integrated into numerous research studies to forecast user intents and behaviour, in conjunction with attitudes and subjective norms (Zhang et al., 2022). The incorporation of Perceived Behavioural Control (PBC) as a supplementary determinant of intention and behaviour has augmented the prognostic capability of models such as the Technology Acceptance Model (TAM) (Okoro et al., 2022). Moreover, PBC is seen as a moderating factor that affects the influence of attitudes and subjective norms on intentions (Ajzen, 2020). Perceived Behavioural Control (PBC) is an essential element in comprehending users' behavioural intentions and actual technology usage within the TAM framework. PBC, by incorporating users' perceived power over their activities, boosts the predictive capability of models such as TAM in relation to user behaviour.

2.14   Behaviour Intention (BI)

Behavioural Intention (BI) is a crucial component of the Technology Acceptance Model (TAM) that indicates users' inclination and preparedness to embrace and utilise a particular technology. As per the original Technology Acceptance Model (TAM), behavioural intention is impacted by two main factors: perceived usefulness (PU) and perceived ease of use (PEOU) (Zubaidi & Al-Alnsari, 2010). Users' attitudes and intentions towards technology adoption are influenced by these aspects, emphasising the importance of users' judgements of the usefulness and simplicity of utilising a system (Teo & Schaik, 2009). Studies repeatedly show that users' behavioural intentions are highly influenced by their perception of usefulness, perception of ease of use, and attitude towards technology use (Chan & Teo, 2007). The TAM model posits that users'

attitudes are directly impacted by their perception of the system's usefulness and ease of use, which in turn influences their behavioural intentions to use the system (Teo & Schaik, 2009). Moreover, behavioural intention is regarded as a crucial factor in determining the actual utilisation of technology, as users' intents frequently manifest in their behaviour (Palvia, 2009).

Furthermore, the incorporation of behavioural intention into the TAM framework has been demonstrated to augment the model's capacity to forecast technological acceptance, as evidenced by Kartal et al. (2022). Behavioural intention serves as a vital connection between users' attitudes and their actual usage behaviour, highlighting the significance of users' intents in shaping the adoption of technology (Bamasoud et al., 2014). Furthermore, users' behavioural intention is shaped by their judgements of the system's usability, utility, and their general attitude towards the usage of technology (Sangkot, 2020). To summarise, Behavioural Intention (BI) is a key factor in the Technology Acceptance Model (TAM) as it indicates consumers' preparedness and eagerness to embrace technology. The views of users regarding the system's usefulness and simplicity of use have a substantial impact on their attitudes and intentions. Ultimately, these perceptions shape their actual behaviour in using the technology within the TAM framework.

2.15   Compare Means

The paired sample t-test is a statistical technique employed to compare the means of two correlated groups or conditions. Researchers frequently depend on software such as SPSS to do data analysis in a streamlined manner. The paired sample t-test was used to evaluate the relationship between two variables, with data analysis conducted using SPSS Version 26 (Agung, 2023). Arsana et al. (2020) illustrated the use of the paired t-test to compare the means of two variables within a single group. This is particularly useful when one sample undergoes treatment and its average is compared before and after the intervention. The versatility and applicability of the paired sample t-test in many research contexts are emphasised by these works. The authors of Derrick et al. (2017) underscored the similarity between the paired samples t-test and the one sample t-test conducted on paired differences. They emphasised the strength and extensive application of this statistical test. The paired sample t-test was employed to analyse data obtained from pre-tests and post-tests, demonstrating the utilisation of this method in evaluating changes prior to and following an intervention (Adam, 2021). In addition, the researchers Heibati et al. (2021) employed the paired samples t-test to validate an integrated model in environmental science study. This statistical tool played a crucial role in confirming the accuracy of the model.

In addition, Guo and Yuan (2015) conducted a comprehensive analysis of several statistical methods for comparing means using partially paired data. They emphasised the significance of choosing suitable methodologies to analyse complicated data structures, such as the paired t-test. In addition, the paired sample t-test was employed to examine the impact of different playing

tactics on the dribbling skills of football players, demonstrating the practicality of this method in sports-related studies (Karo et al., 2020). Subsequently, the paired sample t-test was utilised to conduct a comparative examination of the financial performance of local governments before and during budget refocusing. This analysis effectively demonstrated the usefulness of the method in evaluating changes over a period of time (Sulistianingtyas, 2023). The study by Hamatani (2019) focused on the application of the paired sample t-test to analyse the academic progress of student athletes by analysing their time management skills. The study emphasised the significance of this statistical test in evaluating the impact of therapy within the same group of participants.

To summarise, the paired sample t-test in SPSS is a useful statistical method for comparing means within related groups or circumstances. This method is widely used by researchers in several fields to evaluate changes, treatment outcomes, and disparities before and after interventions, demonstrating its flexibility and relevance in numerous study settings.

2.16   Summary

A literature review is a thorough analysis of existing knowledge related to a specific topic or research question, aiming to identify deficiencies, inconsistencies, and ongoing debates within the current collection of scholarly literature. It is an essential component of academic research, providing a foundation for developing strong research questions, hypotheses, and objectives.

In construction, project management involves various procedures and factors for success, sustainability, and efficiency. Technological progress and a focus on sustainability have transformed the process of making changes to site construction. Structural and architectural drawings are crucial in the construction sector, enabling effective design communication, guidance, and project correctness. Technological advancements like BIM, Big Data, AR, and VR can enhance project management and promote sustainable practices.

Mobile apps, questionnaires, and SPSS are essential tools for gathering data in research, enabling evidence-based decision-making in various sectors. Overall, this literature review consists of how the workflow for this project from beginning to the end. The identifying problem identified by fully observation on site and to achieve the objective, the researcher had to come out with some application that need to use to create the Easy-SM. Finally, SPSS being used to evaluate the effectiveness of Easy-SM by using data collection gathered from questionnaire based on TAM.

CHAPTER 3
METHODOLOGY

3.1   Introduction

In this initial chapter will compromise all the selected detail for the incoming steps for the methodology to design the system by using some tools provided. An extensive examination of the selected analytical strategy and the data collection methodology is given in this section. Direct observations made while the tasks are being carried out will be used to assess the device's efficiency. This chapter will outline a methodical process route that was specially designed for this project, including its design and implementation on-site. The process route of the project will be intricately connected to and incorporated into the on-site workplace. Any easily implemented improvements found during this integration stage will be quickly added to improve the prototype. The comprehensive results of important research components which include questionnaire responses and other important factors serve as the basis for these adjustments.

The newly designed system will be shown how the system was created by phase and will thoroughly get explanation to show what this system can do to help solve the problem occasionally happened at the site. At this phase, this system will be run and tested by the operation team whether this system can be an aid for the team which are consisted of engineer, supervisor and intern. So the performance of this system can be observe during usage on site. To evaluate the effectiveness of this system, an IT admin will be required to evaluate this system.

Moreover, to make sure this project got recognition by the others, another studies which are primary data and secondary data will be run just to make sure all the data can be collected. Using the primary data, questions were administered and observations by using questionnaire, but the secondary data included the gathering and examination of data. So, by using this, the researcher can know the opinion of the user and know what to improve about the system.

3.2   Research Design

The research design is an essential element of every research project as it provides a comprehensive framework that directs the researcher in the collection, analysis, and interpretation of data. It functions as a comprehensive plan for the entire research process, guaranteeing that the study is carried out in a methodical and thorough manner to properly address the research questions or hypotheses. This response will explore the concept of research design, emphasizing its

significance, essential components, various varieties, and factors to consider when choosing an acceptable research design. The study design is crucial in guaranteeing the accuracy and consistency of research results. It facilitates the organization of the investigation in a manner that reduces bias, enhances the internal and external validity of the findings, and enables other researchers to replicate the study. An intricately planned study design also aids in selecting the suitable techniques for gathering, analyzing, and interpreting data, therefore improving the overall excellence of the research.

In this stage, there are some method that being used to carry out to dig out the proper design consisting of multiple methodologies. It offers a framework for gathering, examining, and interpreting data, acting as a guide for the entire research process. When deciding on the study's methodology, techniques, and structure, the researcher follows the guidelines provided by the research design. It can be started with the observation during the initial stage where the researcher went to observe the surrounding and selected out a few problem statement after having a discussion with the whole team. In the end, the research design acts as a fundamental framework that determines the validity and trustworthiness of the study's conclusions and guarantees that the research procedure is transparent, methodical, and in line with the goals of the study.

To summarize, the research design is a crucial element of the research technique that influences the entirety of the research process. Through meticulous planning and the deliberate selection of a suitable study design, researchers can augment the validity, reliability, and generalizability of their findings, thus fostering the progression of knowledge in their respective domains.

Figure 3.1: Research Design

3.3   Development of Research

The progression of research is a complex undertaking that encompasses multiple phases and factors with the goal of enhancing understanding, filling research voids, and augmenting the current corpus of scholarly work. This response will thoroughly examine the essential components of research development, which encompass identifying research gaps, formulating research questions, conducting a literature review, designing the research, collecting and analysing data, interpreting the results, and disseminating the findings.

The process of research development usually commences by identifying deficiencies in the current literature or expertise within a specific field or area of interest. After identifying the research gaps, researchers develop research questions or hypotheses to direct the study. An essential aspect of research development is the literature review, which entails the synthesis and analysis of existing research papers, theoretical frameworks, and empirical evidence pertaining to the research issue. The research design is a crucial element in the development of research as it provides a comprehensive plan for carrying out the investigation. Researchers choose a suitable study design by considering the characteristics of the research problem, objectives, and techniques of data collecting. After establishing the research design, researchers begin with data collection, which entails acquiring information or data to meet the research questions. Data collection methods encompass a range of techniques such as surveys, interviews, observations, experiments, or archival research. The specific method chosen depends on the research design and aims.

In this flowchart shown the base of research framework that need to follow for the whole project to design the system. This diagram fully illustrates the procedure that involved for this project need to be done. Firstly, it started with try to list out the potential problem statement and goes to literature review then use the provided tools to design n create the prototype before finally getting the new system to be tested.

The problem statement is a fundamental component in the methodology chart of study design. The paragraph effectively delineates the problem that the research will investigate, offering the essential background information and importance. By including the problem statement into the technique chart, researchers guarantee that their study is concentrated, pertinent, and in line with the overall research goals. Ensuring this congruence is essential for designing a cohesive and efficient research strategy capable of generating significant and practical findings. For this study, the researcher visited the building site at Sunway South Quay Square and conducted several weeks of observation to identify the recurring issues that occur on-site. Among the several challenges, the researcher needed to select the most appropriate one that aligns with their objectives and develop a solution that may contribute to Sunway Construction.

Next, a literature review is an essential element of the research technique in academic assignments. It conducts a comprehensive analysis and integration of previous research that is relevant to researcher topic, aiding in the establishment of the theoretical basis and informing researcher research design. This essay explores the significance, function, and procedure of completing a literature review in the methodology of a final year project, with a comprehensive explanation of each stage. At this point, researchers will receive assistance in refining their own research design by examining a literature review that offers valuable information on the methodologies employed by other publications. Furthermore, researchers can develop credibility by demonstrating a comprehensive understanding of the area through rigorous literature review, thereby establishing their own credibility. In addition, researchers utilise pertinent material to conduct a thorough search through academic databases, journals, books, and other reputable sources, such as Google Scholar. Data collecting is a vital phase in conducting a literature review, as it has a substantial influence on the study's results. The literature review is an essential component of the approach in every research effort. It not only places your study in the larger academic field, but also helps shape your research design, aids in developing hypotheses, and directs your methodological decisions. To conduct a comprehensive and efficient literature review, it is necessary to methodically establish the boundaries, conduct a thorough search for relevant literature, assess the credibility of sources, arrange the gathered information, and integrate the findings. This procedure finally enhances the robustness of your research, guaranteeing that it is firmly based on pre-existing information and brings forward novel perspectives to your field.

There exist two fundamental categories of data: primary data and secondary data. Both categories, namely, play a significant role in the process of conducting a literature review, serving distinct aims and offering diverse insights. This aims to examine the definitions, qualities, advantages, and roles of primary and secondary data within the context of a literature review. Primary data refers to the raw data that is gathered first-hand by the researcher for the explicit goal of their study. This data is collected through first-hand engagement with the research topic and is exclusive to the specific research endeavour. Furthermore, it is essential that the research directly addresses the topic at hand and is both contemporary and reflective of the present status. Researchers employ observation as the principal method of data collection, documenting events and behaviours during the study to facilitate site development. Next is the secondary data, secondary data refers to information that has been previously gathered and made available by other individuals or organisations. The data is not collected just for the current research, but it can be adapted for usage in different research settings. Both primary and secondary data are essential components of the literature review process in research technique. Primary data yields novel and targeted insights that directly pertain to the research inquiries, but secondary data gives a wider framework that aids in identifying deficiencies and situating the new research within the current pool of knowledge. By seamlessly incorporating both types of data, researchers can construct a

complete and well-informed literature evaluation that establishes a strong basis for their research topic.

In the context of research methodology, a design platform refers to a systematic strategy and tools utilised to strategize, create, and execute the many elements of a research project. The systematic framework ensures that each phase of the research process is cohesive, efficient, and linked with the research objectives. Researchers do online research to identify the most straightforward and efficient equipment to serve as the primary tools for designing a systematic platform for the application. Subsequently, the researcher will utilise the collected data to formulate the platform, ensuring that the data effectively provides information to the user. This will imbue the platform with the characteristics of an informative application. Subsequently, the researcher will develop a prototype using the design platform which are by using MIT Apps Inventor that are provide fully free of usage setup for creating an application based on researcher desires. Within the prototype, the researcher will construct a main menu that allows the user to select the desired zone location. Next, the researcher will arrange the required items in the next part to provide the user with a clear view of the on-site activities, facilitated by the detailed information in the menu box. Consequently, this application emerges as a user-friendly and informative application. Once the design is fully completed and prepared for operation, the researcher will hand over the application by sharing the Apk of Easy-SM to a colleague for testing at the current site. The purpose of this testing is to obtain feedback and identify areas where the application may be further improved.

Subsequently, the researcher will assess the efficacy of the application following a few weeks of operation. The researcher will generate a questionnaire using Google Forms, incorporating the Technology Acceptance Model (TAM) as the basis. This questionnaire will then be disseminated among the users to collect data. Subsequently, all of this data will be utilised in SPSS for data analysis, enabling the researcher to assess the efficacy of the application and determine whether it provides any benefits to the individuals on site.
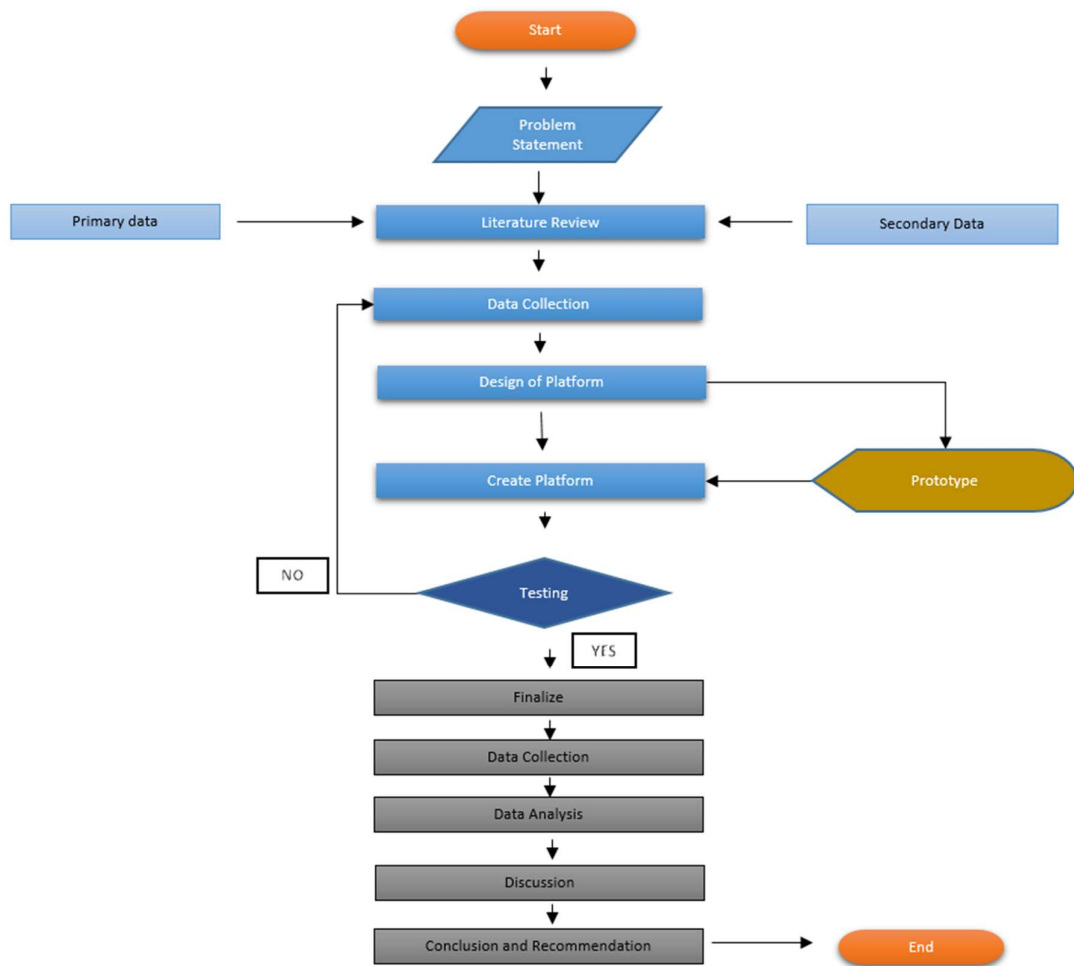
Figure 3.2: Methodology Chart

3.4   System Design and Development

System design and development in methodology encompass the systematic approach of creating, executing, and assessing systems to effectively resolve certain requirements or issues within an organization or technical environment. This entails employing a methodical methodology to examine requirements, devise solutions, construct the system, verify its functionality, and implement it for practical use. This scholarly answer will explore the topic of system design and development, including its fundamental elements, methodology, and recommended approaches. Ultimately, the process of system design and development in methodology entails a methodical approach to creating, executing, and assessing systems in order to fulfil particular criteria. Organizations may create resilient and easy-to-use systems that meet business requirements, improve efficiency, and foster creativity by adhering to established guidelines and approaches.

At this section, we will go through how the Easy-SM will work and the usage of the new developed system. Initially, process starts with identifying issues that arise on the construction site and continues with a thorough examination of existing procedures. Firstly, we will start will problem statement by the researcher will going do the observation at the SQS construction site and identify all the crucial problem that lead to delay of work progress and contribute to cost, time and money. Then, the researcher will start to do the data collection by seeking what is the root cause of the problem such as changes in drawing too many times.

Thus, to solve the problem, the researcher will design the prototype by using the MIT Apps Inventor because it is fully free and provide a lot of essential thing required. The researcher will start by making a selected menu for sub-zone because the site is massive. Then, in the sub-zone, there will be an updated rectification work based on the reason for rectification, trade items, gridlines and completion of work. All of this essential things are required to put into the Easy-SM because the researcher want to the application to become user friendly and easy to use, so everybody can use this application easily.

Lastly, researcher will do the testing. The testing should be use by the Sunway Construction operation team and the other party who are involved in the job progress. Lastly, we will finalize the usage of Easy-SM application by collecting the data to evaluate the effectiveness of the application by using SPSS and researcher will use some method to determine whether the employee support the Easy-SM or still prefer the existing method.

3.5   Device Used

The introduction of smartphones has greatly altered the technological environment, with substantial effects on different aspects of daily existence. Smartphones are versatile gadgets that combine communication, computing, and media features, making them essential tools in today's society. Smartphones have made a substantial impact by completely transforming the way people communicate. Smartphones have progressed from rudimentary mobile phones to sophisticated gadgets capable of managing various communication modalities. Smartphones have made access to information more accessible to a wider range of people, acting as portable portals to the extensive resources available on the internet. Users may easily access news, scholarly publications, and real-time statistics with unparalleled convenience thanks to the inclusion of web browsers and a wide range of applications. Learning has become more accessible due to the availability of educational software and e-books, which offer chances for self-education and remote learning. Furthermore, smartphones empower users to remain updated on worldwide events and trends, cultivating a society that is more knowledgeable and interconnected. With the continuous advancement of technology, cell phones are anticipated to have a greater impact on modern

society, becoming more deeply integrated and continuing to influence our lifestyle and interactions.

Figure 3.3: Smartphone

Laptops have become essential and adaptable devices in the field of technology, providing powerful processing capabilities and the ability to be easily transported, which meet a wide range of needs in different industries. Laptops are a notable advancement in computing technology, enabling users to carry out intricate operations that were typically done on desktop computers in a compact and portable design. Laptops have brought about a significant transformation in teaching and learning approaches within the realm of education. They enable easy access to digital learning resources, online courses, and educational tools that improve the classroom experience and assist remote learning initiatives. Researchers and academics heavily depend on computers for tasks such as data analysis, literature review, drafting research papers, and collaborating with colleagues worldwide. Laptops are capable of running sophisticated software tools and simulation applications that are utilised in scientific research, engineering, and medical studies. They offer a venue for conducting experiments, analysing outcomes, and sharing findings through scholarly papers and conferences. Laptops promote interdisciplinary research and innovation by facilitating cross-disciplinary collaboration and knowledge sharing among researchers globally. Ultimately, laptops have become indispensable in driving technological progress in diverse fields, encompassing education, business, research, creativity, and daily activities. In an ever-changing technological landscape, laptops are anticipated to remain indispensable instruments that enhance efficiency, innovation, and interconnectivity in a more digitalized society.

Figure 3.4: Laptop

3.6   Software Used

WhatsApp has become a crucial application in the field of technology, completely transforming communication and social interaction worldwide. WhatsApp's widespread appeal extends beyond geographical borders, facilitating relationships among individuals, families, communities, and enterprises worldwide. The tool enables instantaneous communication through one-on-one chats and group discussions, promoting immediate updates, conversations, and collaborations. The encryption protocols employed by the system guarantee privacy and security, instilling confidence in users regarding the secrecy of their communications. WhatsApp is frequently used in educational settings to provide communication among students, teachers, and educational organisations. Teachers utilise WhatsApp groups as a means to conveniently provide class materials, assignments, and notifications to students. In addition, educational institutions utilise WhatsApp to facilitate communication between parents and teachers, hence improving transparency and involvement in students' academic development. Ultimately, WhatsApp serves as a clear example of how technology can greatly improve communication, networking, and social engagement. The tool's intuitive interface, extensive worldwide reach, and wide range of features have established it as an essential tool for personal communication, business operations, educational pursuits, and cultural interchange.

Figure 3.5: WhatsApp

MIT App Inventor is an innovative platform that enables anybody, particularly those lacking programming expertise, to develop mobile applications for Android devices. MIT App Inventor offers a graphical, block-based programming interface that streamlines the app creation process. Users can construct applications by utilising a drag-and-drop interface to manipulate visual components, such as buttons, text boxes, and media assets, and then connecting them with blocks that represent the underlying coding logic. This method eliminates the necessity for conventional text-based programming, so making application development available to a wider range of individuals, including educators, students, hobbyists, and entrepreneurs. MIT App Inventor is primarily utilised in the field of education. This resource is an invaluable tool for acquainting students with the core principles of computer science, computational thinking, and the creation of mobile applications. Through active participation in the development of applications, students can acquire programming principles, problem-solving abilities, and logical thinking in a practical and dynamic way. MIT App Inventor facilitates instructors in instructing STEM (Science, Technology, Engineering, and Mathematics) disciplines through project-based learning, cultivating creativity and innovation among learners.

In addition to instructional environments, MIT App Inventor has been utilised to develop a diverse array of practical applications. These encompass educational applications designed for acquiring knowledge in languages, mathematics, and science; efficient tools like task managers and note-taking applications; social networking applications; recreational games; and practical utilities for daily activities. The platform's adaptability and intuitive interface empower individuals and organisations to tackle unique needs and difficulties within their communities, showcasing the tangible influence of technology on enhancing everyday lives. MIT App Inventor facilitates the democratisation of mobile app development by offering a user-friendly platform that enables users to create unique applications without the need for prior programming skills. The educational advantages, quick prototyping ability, support from the community, and practical uses of this technology highlight its importance in promoting digital literacy, creativity, and problem-solving skills for people of all ages and backgrounds. MIT App Inventor continues to drive innovation as technology advances, motivating aspiring app developers and entrepreneurs to transform their ideas into tangible products.
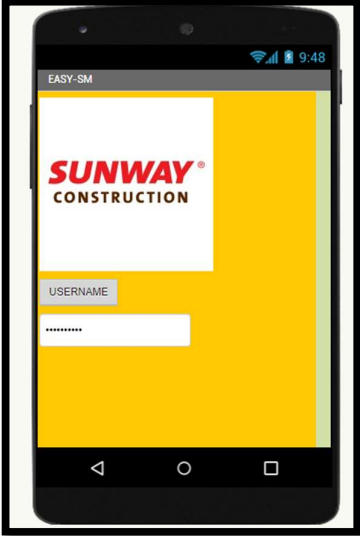

Figure 3.6: MIT App Inventor

3.7 Prototype

In methodology, a prototype is an initial version or model of a system, product, or design that is created to assess and confirm concepts, features, and user interactions prior to complete execution. Prototyping is a widely used method in different domains such as software development, product design, and engineering. It is employed to collect input, improve requirements, and reduce risks during the early stages of development. This academic essay will examine the notion of prototyping, including its advantages, many forms, recommended methods, and factors to consider for successful prototyping.

This is the phase where concepts become practical solutions. It's not intended for prototypes to be flawless. The purpose of a prototype is to swiftly develop a tangible representation of the concept and gauge consumer acceptance. A landing page to gauge consumer interest in a product or a movie showcasing efficient logistics procedures are two examples of prototypes. In the framework of design thinking, the test phase is a crucial stage wherein prototypes created in earlier phases are assessed and input is collected to enhance and polish the proposed solutions. During this adaptive phase, designers can evaluate how well their prototypes work in a real-world environment. Consumers are asked to provide feedback on the prototype, including aspects like usability, functionality, and overall happiness. According to the study, participants used prototypes extensively during the design process. They also used them to show form and function and get user feedback, which had an impact on design choices. The purpose of this process is to ascertain how well the solution meets user expectations and pinpoint areas that should be improved.

Table 3.1: Easy-SM Application

INTERFACE	DESCRIPTION
1. 	In the first page of the Easy-SM, the main menu was created for user where there will be username and also password for each user will key in.
2. 	In this menu, the sunway-university is divided into two zone which are zone C and zone D. User can select which zone to observe since the two zone are constructed by different sub-contractor.

3.	At this section, the zone divided into sub-zone based on the construction joint in the initial work. User can select which sub-zone they want to see.
	ZONE C
	SUBZONE ZONE C
	C1 GL 11-20
	C2 GL 1-10
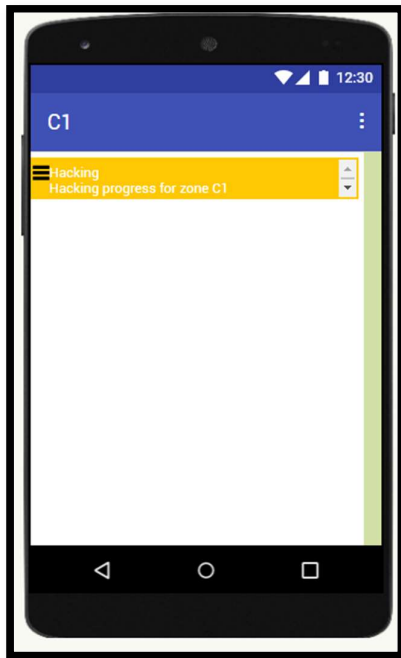
4.	In this menu, the cuurent rectification progress is listed. For example, hacking works was updated. So, user can know at this sub-zone, there is a rectification ongoing.
	C1
	Hacking Hacking progress for zone C1
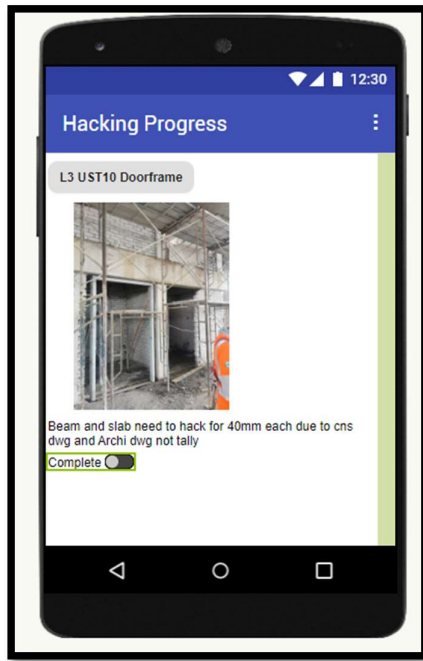
5.	At this menu, researcher create an item which is ongoing progress. All of these rectification works were labelled as trade items, reason and gridline. As a result, user can information from this application.
6.	To finalize the completion of work, green button can be push into green as an information that indicate the rectification work is done.
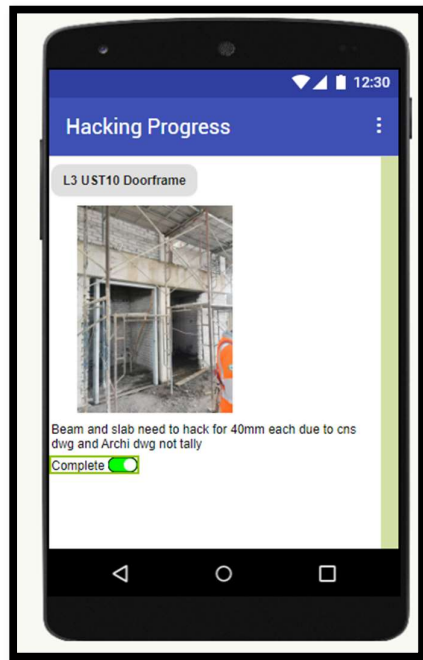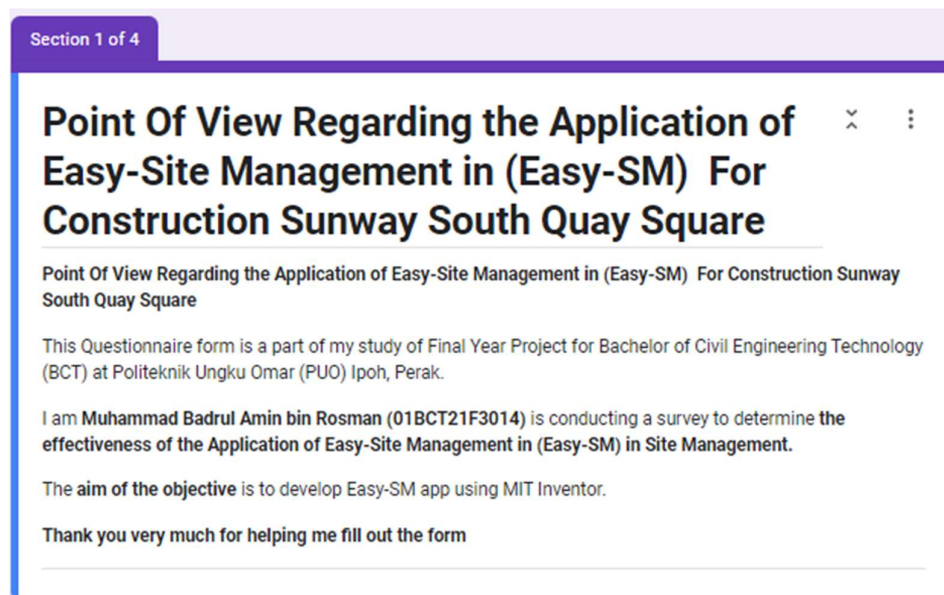
3.8   Product Testing

To make sure this system is being effective after being tested by the user, there will be a way to evaluate the result. Thus, to determine and evaluate the needs of the users and make improvement proposals based on their input, we are giving out a questionnaire by using WhatsApp that easy to share the link for the questionnaire. The purpose of the questionnaire is to gather

information for analysis related to the Easy-SM's implementation. This will allow us to gain important insights for enhancing the system. Then, the effectiveness of this application will be evaluate by SPSS by running some data analysis using the collection of data.

A structured method for obtaining data from project participants is the questionnaire. Its primary goal is to gather precise information, viewpoints, and comments regarding various project elements. In order to match the engineering solution with the expectations of users or clients, it first helps to understand their specific needs. In order to make changes before the final version of the product, we use questionnaires to get feedback on design concepts or early iterations. Moreover, for the guide design improvements, questionnaires are essential for assessing the usability and effectiveness of engineering products. They also collect information on dependability and efficiency by evaluating how well solutions work in actual circumstances. Through the use of feedback over time to improve processes, products, and adapt to new technology and user needs, questionnaires help with continuous improvement.

Figure 3.7: Google Form

Figure 3.7 above shown that google forms is used as the platform of choice for administering the questionnaire. Respondents can use the google forms interface to electronically access the questionnaire and submit their answers. This method provides a practical and effective way to collect data, enabling quick distribution, instantaneous responses, and simplified organisation and processing of the data inside the google forms.

Questionnaire data analysis is critical to understanding the meaning and implications of the information gathered. Once we have all of the questionnaire responses, we need to carefully examine the data, determine what it is telling us, and make inferences. To do this, various tools such as graphs and charts are used to look for patterns or connections in the data. Finding important information that can guide our decisions, make things better, and deepen our understanding of the

subject is the aim. Through a thorough analysis of the questionnaire data, we are able to identify pertinent patterns, validate hypotheses, and provide well-informed recommendations based on the information gleaned from respondents' responses.

3.9 Questionnaire Content

The survey content of a questionnaire pertains to the precise questions and items incorporated in the survey with the intention of gathering data from respondents. The content of the survey can differ greatly depending on its aim, target audience, and data type. Table 3.2 is the ultimate questionnaire for assessing PU (Perceived Usefulness), Table 3.3 PBC (Perceived Behavioural Control), Table 3.4 BI (Behavioural Intention) and lastly table 3.5 PEU (Perceived Ease of Use)

Table 3.2 Questionnaire for PU

Question	Likert Scale
Updating progress using Easy-SM enable me to shorten the completion of project.	6 Point Likert Scale
Updating progress using Easy-SM surely improve the job quality	6 Point Likert Scale
Updating progress using Easy-SM make it easier to track progress within site	6 Point Likert Scale
Updating progress using Easy-SM improved the reporting productivity	6 Point Likert Scale
Updating progress using Easy-SM increased the effectiveness of performing tasks.	6 Point Likert Scale

Table 3.3 Questionnaire for PBC

Question	Likert Scale
I am confidently to use Easy-SM for job tracking progress	6 Point Likert Scale
I have the knowledge to use Easy-SM for job tracking progress	6 Point Likert Scale
I have control over usage of Easy-SM for job tracking progress	6 Point Likert Scale

Question	Likert Scale
I have the resources to use Easy-SM for job tracking progress	6 Point Likert Scale

Table 3.4 Questionnaire for BI

Question	Likert Scale
I intend to use Easy-SM for job tracking progress	6 Point Likert Scale
I intend to frequently use Easy-SM to perform job tracking progress	6 Point Likert Scale
Assuming i have access to Easy-SM for job tracking progress, i intend to use it.	6 Point Likert Scale
Given that i have access to Easy-SM for job tracking progress, i predict that i would adopt it	6 Point Likert Scale

Table 3.5 Questionnaire for PEU

Question	Likert Scale
Learning to utilize Easy-SM is simple for me	6 Point Likert Scale
My communication with Easy-SM is transparent and intelligible.	6 Point Likert Scale
I can easily get to Easy-SM to accomplish my job.	6 Point Likert Scale
I can obtain more accurate information by using Easy-SM.	6 Point Likert Scale
Navigating Easy-SM is simple	6 Point Likert Scale

3.10   Reliability Test

Reliability testing in SPSS is a vital statistical study that evaluates the coherence and durability of measuring scales or instruments utilized in research projects. It aids researchers in assessing the degree to which a group of items or questions consistently evaluates the same underlying concept. Reliability testing in SPSS is typically conducted using several statistical techniques, including Cronbach's alpha, split-half reliability, and test-retest reliability. Here is a comprehensive guide on how to perform reliability testing in SPSS, using Cronbach's alpha as a specific example. Cronbach's alpha is a commonly employed metric for assessing the degree of internal consistency reliability, which measures the extent to which a group of items are closely associated with each other. The scale spans from 0 to 1, with higher numbers denoting increased reliability.

According to Table 3.5, a reliability level is considered excellent if the Cronbach's alpha value is more than 0.90 followed by good if over 0.90 – 0.89 and acceptable if within range 0.70

– 0.70 and questionable if 0.60 – 0.69 and poor if Cronbach Alpha value is 0.50 – 0.69. lastly, it is stated as unacceptable if the value is less than 0.59.

Table 3.6 Cronbach'Alpha Table

No	Coefficient of Cronbach'Alpha	Reliability Level
1	More than 0.90	Excellent
2	0.80-0.89	Good
3	0.70-0.79	Acceptable
4	0.6-0.69	Questionable
5	0.5-0.69	Poor
6	Less than 0.59	Unacceptable

3.11   Mean

In statistical analysis utilising SPSS (Statistical Package for the Social Sciences), the idea of mean functions as a key measure of central tendency. It offers valuable information on the mean value of a dataset and is crucial for summarising numerical data in diverse domains, ranging from social sciences to business analytics. This essay examines the complexities of calculating and interpreting the mean in SPSS, as well as its practical uses in research and data analysis. The mean is a statistical measure that quantifies the central tendency of a dataset. It is responsive to the magnitude of each observation and accurately represents the general distribution of the data. Researchers utilise the mean as a tool to compare various groups or circumstances within a study, evaluating disparities or resemblances in average values. Additionally, researchers employ the mean to succinctly summarise survey data, analyse patterns, and quantify replies. In this project, researchers utilise the mean as a summary measure to compare the average values of two variables. When there is a substantial disparity in means between two variables, researchers can proceed to conduct a paired samples test to assess the efficacy of the application.

To summarise, having a comprehensive understanding of the mean in SPSS is crucial for researchers and analysts who aim to extract valuable insights from numerical data. The statistic acts as a fundamental measure in descriptive analysis, providing a concise summary of the dataset's average value and assisting in decision-making processes in many fields. By utilising SPSS's computational and interpretive abilities to calculate the average, researchers can discover patterns, trends, and correlations in their data, thus enhancing understanding and enabling informed decision-making based on statistical proof.

3.12 Significance (2-Tailed Test)

The Sig 2-tailed value in statistical analysis, specifically in the context of research reports, denotes the significance level linked to a statistical test. During hypothesis testing, researchers commonly establish a significance level, represented as α (alpha), which is typically set at 0.05. The Sig 2-tailed value determines the statistical significance of the results obtained from a statistical test. If the p-value (Sig 2-tailed value) is smaller than the selected significance level (often 0.05), it indicates a statistically significant difference or relationship in the analysed data. Difference in means: In the context of a 2-tailed significance test, the mean is used to determine if the observed sample mean substantially deviates from the hypothesised population mean. A lower p-value signifies more compelling evidence against the null hypothesis, indicating a substantial disparity between the sample mean and the assumed mean. Researchers employ 2-tailed significance tests to examine experimental data, compare means of different groups, and assess the impact of treatments in studies spanning multiple fields such as psychology, medicine, and social sciences. Additionally, 2-tailed tests offer a comprehensive method for hypothesis testing by considering both possible directions of the difference between sample and population means.

Comprehending the concept of the mean within the framework of a 2-tailed significance test is crucial for making well-informed decisions relying on statistical information. The process entails computing the sample mean, contrasting it with a hypothesised population mean, and evaluating the significance level to ascertain if the observed difference is statistically significant. Researchers and analysts can contribute to evidence-based decision-making in their domains by using rigorous statistical approaches and accurately interpreting results, which allows them to reach reliable conclusions.

3.13 Summary

This chapter discusses the importance of research design in the research process, highlighting its role in enhancing the validity, reliability, and generalizability of findings. It also discusses the systematic approach to system design and development, which involves creating, executing, and assessing systems to resolve specific requirements or issues within an organization or technical environment. The Easy-SM application uses various platforms to achieve its goals, including a structured questionnaire for data collection from participants. The Cronbach's alpha coefficient, which indicates good reliability, is over 0.80, indicating the study's data suggests the stability of Easy-SM. The chapter emphasizes the need for careful planning and careful selection of suitable study designs to enhance the validity and reliability of findings.

CHAPTER 4

DATA ANALYSIS

4.1   Data Analysis

Data analysis is an essential element of research in several fields, offering a methodical way to evaluating and comprehending data. Data analysis in the realm of academic research entails the utilization of statistical and mathematical methodologies to discern patterns, trends, and connections within a given dataset. This technique enables researchers to derive significant findings, make well-informed judgments, and experimentally validate hypotheses using empirical evidence. To summarize, data analysis is a methodical procedure that has a crucial impact on research by converting unprocessed data into practical insights. By adhering to a systematic methodology for analyzing data, researchers can discover useful insights, validate hypotheses, and make informed judgments based on evidence to further the understanding in their specific areas of study.

4.2   Data Collection

This study presents the results of a quantitative pre-test questionnaire that was distributed to a varied set of participants, including project managers, engineers, site supervisors, assistant managers, quantity surveyors, and other professionals in the construction industry. The questionnaire was given using Google Forms. The main goal was to evaluate the need for Easy-SM in the construction sector. The survey was disseminated to a total of 38 participants through a Google Forms link, facilitating rapid gathering and examination of data. This survey aims to collect insights from industry professionals about their current needs and perceptions on the deployment of Easy-SM technologies in their processes.

4.3   Demographic Data

To analyse the demographic data of this study, frequency tables were created using the software programme SPSS. The subsequent paragraph presents an examination of the demographic data from the study. To determine the ratio of male and female participants, the frequency of each gender was computed (see Figure 4.1). The frequency data indicates that the

vast majority of respondents are male (97.4%), while a small minority of respondents are female (2.6%).
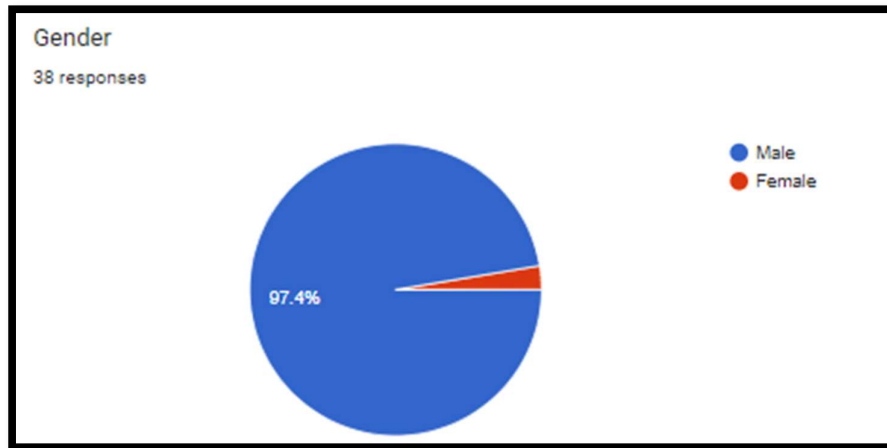
Figure 4.1: Gender

Figure 4.2 shown the respondent's age within different age categories. Majority of respondent 31 to 40 years old and 21 to 30 years old have the same (44.7%) followed by 41 to 50 years old (10.5%). Lastly, 18 to 20 years old and 51 years old and above does not have any respondent
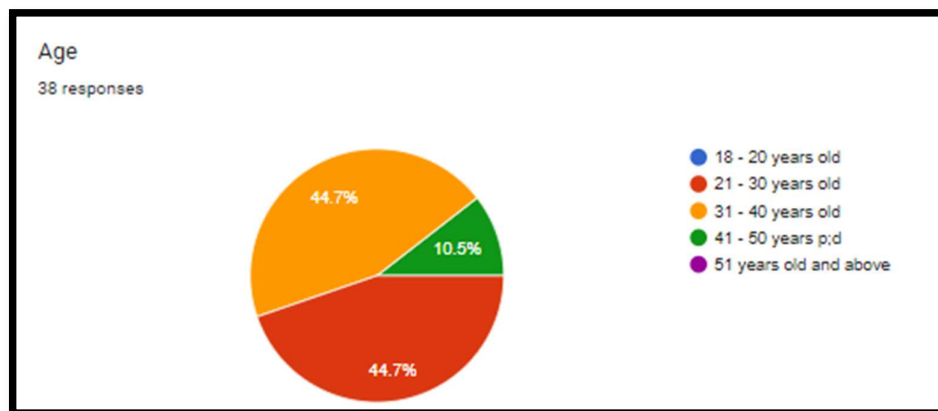
Figure 4.2: Respondent Age

Figure 4.3 illustrated that majority of the respondent by position are site supervisor (39.5%) followed by the second majority project engineer (36.8%) and followed by site agent (18.4%). Thus, the minority is from project manager with (5.3%).
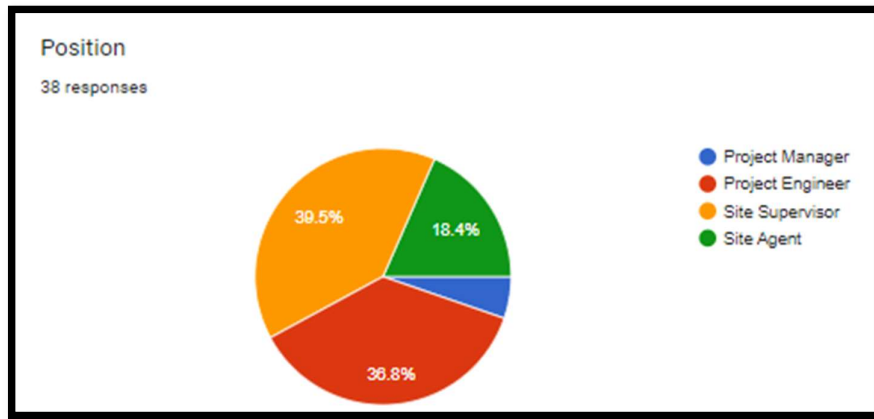
Figure 4.3: Position of respondent

4.4 Reliability Test

Table 4.1: Overview of Cronbach's Alpha

Concept	Cronbach'Alpha	Number of Items
Perceived Usefulness (PU)	0.845	5
Perceived Behavior Control (PBC)	0.798	4
Behavior Intention (BI)	0.821	4
Perceived Ease of Use (PEU)	0.838	5

Cronbach's alpha is used to calculate the internal reliability of a concept. According to the information provided in chapter 3 and table 3.4, a number within the range of 0.80 to 0.89 is considered to be a reliable measure of internal consistency. Table 4.1 displays the values of Cronbach's alpha for the three concepts that were assessed. The internal consistency of PU is the greatest, with a value of 0.845.PEU follows closely behind with a value of 0.838 and BI with 0.821. Thus, three of these values fall into the category of "good". Although the idea PBC (0.798) has the lowest Cronbach's alpha, its internal reliability is nevertheless considered good.

4.5 Paired Samples T-Test

The paired samples t-test, sometimes referred to as the dependent samples t-test, is a statistical test utilized to compare the means of two groups or conditions that are connected. Performing a paired samples t-test in SPSS entails evaluating data in which each subject or case is tested twice, under distinct conditions or at two separate time points. This test is frequently

employed in research to ascertain if there is a substantial disparity between the averages of paired data.

Analyzing the outcomes of a paired samples t-test in SPSS entails evaluating the statistical significance (p-value) linked to the test. A p-value below the threshold of 0.05 indicates a statistically significant difference in the means of the paired observations. Researchers can analyze the confidence intervals and effect size measurements to gain a deeper understanding of the extent and practical importance of the observed changes.

The paired samples t-test in SPSS is frequently utilized by researchers to compare pre-test and post-test scores, as well as before and after measurements or paired observations from related groups. This test is particularly useful in experimental and longitudinal studies, where patients are assessed under various settings or treatments to determine the effectiveness of interventions or to analyze changes over a period of time.

To summarize, the paired samples t-test in SPSS is a robust statistical technique used to compare the means of paired observations or circumstances. Through the use of a paired samples t-test, researchers can ascertain the presence of a noteworthy disparity between interconnected groups or circumstances, so yielding valuable insights into the efficacy of interventions, therapies, or experimental manipulations.

This method which is paired samples T-Test was done by using SPSS just to determine the effectiveness of the Easy-SM at Sunway South Quay Square site:

Table 4.2: Paired Samples Statistics

Paired Sample	Mean	Std. Deviation	N
Existing Method	3.89	0.649	38
Easy-SM	4.42	0.722	38

The condensed statistics Table 4.2 has one row and three columns for each of the two test variables. Following the first column with the names of each variable, we can observe that the Easy-SM variable mean is 4.42 and the Existing Method variable mean is 3.89. The paired samples t-test will now be used to determine whether the difference is statistically significant for each variable, with the Easy-SM variable having the higher mean. Hence, we will look for the next column, which has 38 examples of reliable observations for both variables.

Table 4.3: Paired Samples Test

Paired Sample	Mean	Std. Deviation	Std. Error Mean	t	Sig.(2-tailed)
Existing Method – Easy SM	-0.526	0.862	0.140	-3.765	<.001

The Table 4.3 above shown the paired of t test and the first column of the mean indicated the value is -0.526. This can be calculated by subtracting one mean from the other based on the Table 5 mean which are 4.42 - 3.89. Next, the standard deviation of the differences, which is located next to the mean, has a value of 0.862. If we have two variables that are positively associated, the standard deviation of their combined values will generally be smaller than the standard deviations of the individual variables. Next up is the standard error of the mean (of the differences). This here has the value 0.140 and is simply the standard deviation divided by the square root of the sample size. Moving forwards, the column entitled t is the statistic used in the t test and t is a standard statistical distribution. The t statistic is calculated by dividing the mean difference by its standard error so -0.526 / 0.140 = -3.76.

Next, is the column labelled as Sig.(2-tailed) has a test for the null hyphotesis that the means of the two variable has a significantly differences and this null hyphotesis kindly rejected. Hence, the reason is $p < 0.05$ and the sig.(2-tailed value) is 0.001 smaller than 0.05. In conclusion, researcher can report this analysis as follow: Mean values were compared for 2 variables with sample size 38. The mean was higher for variable Easy-SM (Mean = 4.42, Std Deviation = 0.722) than for variable existing method (Mean = 3.89, Std Deviation = 0.649)

Table 4.4: Paired Samples for PU, PEU, PBC and BI

Paired Sample	Mean	Std. Deviation	Sig.(2-tailed)
Perceived Behaviour Control (PBC)	0.342	0.640	<.001
Perceived Usefulness (PU)	0.373	0.751	<.001
Perceived Ease of Use (PEU)	0.355	0.679	<.001
Behaviour Intention (BI)	0.294	0.538	<.001

Based on table 4.4, another paired samples was tested based on the respondents courage to use the Easy-SM which can be seen by the mean of PU (0.373) folllowed by PBC (0.342) and by PEU got (0.355) and lastly BI (0.294). Next is the column labelled as Sig.(2-tailed) has a test for the null hyphotesis which are for all the four variables $p < 0.05$, can derive as 0.001 smaller than 0.05.

Lastly, all of this indicates that compared to the prior way, Easy-SM implementation was significantly more straightforward and have more efficiency. This suggests that Easy-SM outperformed the existing method approach in terms of effectiveness.

4.6 Testing of Hypotheses

The hierarchical linear regression method can be used to determine which hypotheses can be accepted and which ones need to be rejected. Each and every hypothesis is shown in Table 4.5. Furthermore, the significance level and beta are mentioned since they support the choice of whether to accept or reject a hypothesis.

Table 4.5: Testing of Hypotheses

Hypotheses	Description	Beta	Significance	Accept/Reject
PU	Updating progress using Easy-SM make it easier to track progress within site	0.043	0.00	Accept
PEU	I can easily get to Easy-SM to accomplish my job	0.076	0.00	Accept
PBC	I am confidently to use Easy-SM for job tracking progress	0.093	0.00	Accept
BI	Assuming I have access to Easy-SM for job tracking progress, im intend to u	0.063	0.00	Accept

Using hierarchical linear regression, three of the four hypotheses from PU, PEU, PBC, and BI can be accepted. The impact of BI, the three of concept PEU, PBC and BI was examined, as well as the correlation between the three variables on a single variable. Given that all significance levels have a p-value of 0.000, this indicates a strong correlation between The conclusions obtained by interpreting the significance p are supported by the high beta values (standardised coefficients) of beta PU = 0.043, beta PEU = 0.076, beta PBC = 0.093, and beta BI = 0.063.

4.7 Summary

This chapter focuses on the analysis of data obtained from a questionnaire specifically created to assess the practicality of Easy-SM technologies in the construction industry. The primary objective was to evaluate the possible benefits and challenges of implementing these technologies by examining the existing level of knowledge, rate of acceptance, and opinions among professionals

in the industry. The study utilized a range of charts and graphs to visually convey the data, making it easier to identify important insights and patterns.

Data analysis is a crucial method in research, converting unprocessed data into practical insights. It helps researchers validate hypotheses and make informed judgments. The paired samples t-test in SPSS is a robust statistical technique used to compare means of paired observations or circumstances. It helps identify significant disparities between interconnected groups or circumstances, providing valuable insights into the efficacy of interventions, therapies, or experimental manipulations. The Easy-SM implementation was more straightforward and efficient, suggesting that it outperformed the existing method approach in terms of effectiveness.

To summarize, the study offered suggestions for effectively incorporating Easy-SM, resolving recognized obstacles, and encouraging its acceptance. These ideas seek to facilitate the adoption of more streamlined and technologically sophisticated construction methods, ultimately revolutionizing the industry.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This final chapter presents a synthesis of the main discoveries made during the investigation and examines Easy-SM that the effects its have. This section presents a thorough summary of the findings derived from the study, emphasizing the extent to which the research goals were achieved. In addition, considering the acquired insights, a set of recommendations is suggested. The purpose of these suggestions is to provide guidance for future research, policy-making, and practical applications in the relevant subject. The objective is to emphasize the significance of the study's contributions and provide valuable recommendations for future investigation and use.

Moreover, this chapter will provide practical suggestions for industry experts and stakeholders to successfully embrace and execute Easy-SM technologies. The recommendations will be derived from the analysis of data and insights collected from industry experts, with a focus on best practices and methods for effective integration. The chapter tries to solve common impediments, such as technical challenges, training demands, and standardization issues, by offering practical assistance. The objective is to provide industry professionals with the required knowledge and tools to effectively utilize Easy-SM technologies. This will improve project management, decision-making, and overall operational efficiency in construction projects.

This chapter highlights the importance and practicality of the research by both summarizing important findings and proposing further actions. Its goal is to stimulate ongoing investigation and constant enhancement in the field, promoting a more profound comprehension and more efficient resolutions to the current difficulties.

5.2 Conclusion

This study has investigated the factors that impact the acceptability of technology in site building, with a specific focus on the adoption of sophisticated technologies like Easy-SM. The objective of the research was to determine the primary factors that influence the readiness of construction professionals to adopt these innovations, as well as the effect of technology acceptance on project outcomes. Furthermore, a crucial observation in the field of technology

adoption in the construction industry is the Technology Adoption Model (TAM). It has been found that perceived usefulness and simplicity of use are important factors that predict the acceptance of technology among construction professionals. Technologies that provide evident advantages in terms of efficiency, precision, and cost reduction are more likely to be embraced. Moreover, interfaces that are easy for users to navigate and can be seamlessly incorporated into existing workflows increase the probability of being accepted. The Technology Acceptance Model (TAM) is being extensively utilized in this research as the central concept for designing a questionnaire to gather data on the effectiveness of Easy-SM.

In summary, the issue can be found by first viewing the construction site, obtaining all pertinent information there, and then researching the issue and possible fixes. Moreover, the creation of the suggested Easy-SM should be able to address the issue and reduce the colleague's workload with the help of the chosen item. The use of a Google Forms questionnaire allowed for a thorough analysis. In addition, all of the feedback was saved and is currently being processed through data analysis in SPSS. The results indicated that most respondents supported and approved of the Easy-SM over the current method, which was in line with their familiarity with contemporary technologies. This demographic data highlights how suitable the recommended solution is for use on-site. The created system is well-received and has the ability to increase the efficiency of construction site management, which is further backed by the sample t test analysis that revealed respondents' satisfaction rates following Easy-SM testing. Therefore, other users should be able to use and deploy this Easy-SM at other sites. Finally, there is still much space for improvement in Easy-SM to increase the application's efficiency.

5.3 Recommendations

This study has identified some significant recommendations to improve the acceptance of technology in site construction. First and foremost, it is essential to create extensive training programs to guarantee that construction experts are well knowledgeable in emerging technologies, thereby enhancing their self-assurance and expertise. Therefore, the higher-ranking individuals should endorse Easy-SM to the other website. Management support is crucial; the active participation and allocation of resources by top management can cultivate an environment conducive to innovation. By implementing this, a novel feature may emerge and be integrated into Easy-SM as an enhancement, so enhancing the overall organization of this program. Promoting peer learning and collaboration through workshops and professional networks can facilitate the dissemination of best practices and mitigate reluctance towards new technology. Furthermore, this collaboration is likely to develop novel ideas with the assistance of renowned experts in the field of artificial intelligence, which is now gaining popularity. By implementing strong risk management measures, such as addressing concerns related to cybersecurity and data protection,

trust among consumers can be established. Ultimately, prioritizing the usability and smooth integration of technological solutions into current workflows will enhance their acceptance and implementation. By applying these suggestions, construction companies can enhance the adoption of Easy-SM technology, resulting in improved project efficiency and competitiveness.

Moreover, Easy-SM can be utilise to become more friendly user by add-on another system which is auto language translator. So, Easy-SM also can be use by foreign worker who are appointed to get the rectification work done. This could make the Easy-SM more systematic with foreign worker can fully use the Easy-SM because they understand how to do the job by reading all the information provided in the Easy-SM.

REFERENCES

Disney, O. (2023). Total bim on the construction site: a dynamic single source of information. Journal of Information Technology in Construction, 28, 519-538. https://doi.org/10.36680/j.itcon.2023.027

Wilke, A., Caban-Martinez, A., Ajelli, M., Vasquez, C., Petrie, W., & Beier, J. (2019). Mosquito adaptation to the extreme habitats of urban construction sites. Trends in Parasitology, 35(8), 607-614. https://doi.org/10.1016/j.pt.2019.05.009

Bekr, G. (2014). Study of the causes and magnitude of wastage of materials on construction sites in jordan. Journal of Construction Engineering, 2014, 1-6. https://doi.org/10.1155/2014/283298

Ghanem, M., Hamzeh, F., Seppänen, O., & Zankoul, E. (2018). A new perspective of construction logistics and production control: an exploratory study.. https://doi.org/10.24928/2018/0540

Huang, Y. and Yang, T. (2019). Exploring on-site safety knowledge transfer in the construction industry. Sustainability, 11(22), 6426. https://doi.org/10.3390/su11226426

Toyin, J. and Mewomo, M. (2022). An investigation of barriers to the application of building information modelling in nigeria. Journal of Engineering Design and Technology, 21(2), 442-468. https://doi.org/10.1108/jedt-10-2021-0594

Araújo, I., Costa, D., & Moraes, R. (2014). Identification and characterization of particulate matter concentrations at construction jobsites. Sustainability, 6(11), 7666-7688. https://doi.org/10.3390/su6117666

Yan, H., Ding, G., Li, H., Wang, Y., Zhang, L., Shen, G., … & Feng, K. (2019). Field evaluation of the dust impacts from construction sites on surrounding areas: a city case study in china. Sustainability, 11(7), 1906. https://doi.org/10.3390/su11071906

Carra, G., Argiolas, A., Bellissima, A., Niccolini, M., & Ragaglia, M. (2018). Robotics in the construction industry: state of the art and future opportunities. https://doi.org/10.22260/isarc2018/0121

Guamán, R., Álvarado, R., Martínez-Rocamora, A., & Cheein, F. (2021). Workspace analysis of a mobile manipulator with obstacle avoidance in 3d printing tasks. Applied Sciences, 11(17), 7923. https://doi.org/10.3390/app11177923

Budiman, H., Numan, İ., & Idham, N. (2021). Freehand drawing and architectural expression. Journal of Architectural Research and Design Studies, 5(1). https://doi.org/10.20885/jars.vol5.iss1.art5

Dosch, P., Tombre, K., Ah-Soon, C., & Masini, G. (2000). A complete system for the analysis of architectural drawings. International Journal on Document Analysis and Recognition (Ijdar), 3(2), 102-116. https://doi.org/10.1007/pl00010901

Li, W. (2022). 3d virtual modeling realizations of building construction scenes via deeplearning technique. Computational Intelligence and Neuroscience, 2022, 1-11. https://doi.org/10.1155/2022/6286420

Marcos, C. (2022). Ideation, representation and notation. the process of architectural design as a dialogue between the architect and architecture mediated through drawing.. https://doi.org/10.3280/oa-832-c56

Obaju, B., Fagbenle, O., & Amusan, L. (2022). Building production management competencies for building students: academia and construction industry perspectives. Iop Conference Series Earth and Environmental Science, 993(1), 012001. https://doi.org/10.1088/1755-1315/993/1/012001

Sirimaha, J. and Kaewlex, P. (2021). Instructional media for construction drawing by autodesk revit structure.. https://doi.org/10.2991/assehr.k.210203.152

Григорьева, В. (2024). Architectural graphics as a means of forming the author's graphic culture of future specialists. SPAUP, (2), 188-198.   https://doi.org/10.31650/2786-7749-2024-2-188-198

Ajayi, S., Oyedele, L., Bilal, M., Akinadé, O., Alaka, H., & Owolabi, H. (2017). Critical management practices influencing on-site waste minimization in construction projects. Waste Management, 59, 330-339. https://doi.org/10.1016/j.wasman.2016.10.040

Amusan, L., Aigbavboa, C., Olubiyi, T., & Babatunde, O. (2021). Informatics approach to innovative site management practices for improving construction works. International Review of Civil Engineering (Irece), 12(2), 108. https://doi.org/10.15866/irece.v12i2.18812

Bankvall, L., Bygballe, L., Dubois, A., & Jahre, M. (2010). Interdependence in supply chains and projects in construction. Supply Chain Management an International Journal, 15(5), 385-393. https://doi.org/10.1108/13598541011068314

Edike, U. (2021). Material management practices and factors influencing material conservation on construction sites in nigeria. Journal of Engineering Design and Technology, 21(4), 1197-1211. https://doi.org/10.1108/jedt-06-2021-0319

Fesenko, T. (2022). Improving models for sustainability evaluation of construction projects in the initiation and planning processes. Eastern-European Journal of Enterprise Technologies, 4(3(118)), 51-66. https://doi.org/10.15587/1729-4061.2022.263668

Hwang, B. and Tan, J. (2012). Green building project management: obstacles and solutions for sustainable development. Sustainable Development, 20(5), 335-349. https://doi.org/10.1002/sd.492

Onubi, H., Yusof, N., & Hassan, A. (2019). Adopting green construction practices: health and safety implications. Journal of Engineering Design and Technology, 18(3), 635-652. https://doi.org/10.1108/jedt-08-2019-0203

Onubi, H., Yusof, N., & Hassan, A. (2020). Effects of green construction on project's economic performance. Journal of Financial Management of Property and Construction, 25(3), 331-346. https://doi.org/10.1108/jfmpc-09-2019-0076

Yu, M., Zhu, F., Yang, X., Wang, L., & Sun, X. (2018). Integrating sustainability into construction engineering projects: perspective of sustainable project planning. Sustainability, 10(3), 784. https://doi.org/10.3390/su10030784

Yu, W., Cheng, S., Ho, W., & Chang, Y. (2018). Measuring the sustainability of construction projects throughout their lifecycle: a taiwan lesson. Sustainability, 10(5), 1523. https://doi.org/10.3390/su10051523

Duan, C., Huang, Y., & Tian, H. (2022). Research on the development of intelligent fire inspection system for construction engineering. Highlights in Science Engineering and Technology, 28, 228-233. https://doi.org/10.54097/hset.v28i.4112

Li, X. (2022). Application of bim smart site integrated construction technology in large medical building construction. https://doi.org/10.2991/978-94-6463-108-1_43

Shi, M., Zhang, H., & Zhang, R. (2013). The inclination of bridge pier due to neighboring embankment construction and its rectification technique. Applied Mechanics and Materials, 353-356, 79-83.https://doi.org/10.4028/www.scientific.net/amm.353-356.79

Xiao, J., Guo, D., Wang, Q., Gao, X., & Sun, J. (2023). Deviation rectification of a high-rise building with piled raft foundation: a case study. Proceedings of the Institution of Civil Engineers - Forensic Engineering, 176(1), 22-32. https://doi.org/10.1680/jfoen.21.00036

Zhang, Q. (2023). Application of satellite remote sensing in the treatment of power transmission line unplanned construction operation. https://doi.org/10.1117/12.2685857

Ahmed, S. (2019). A review on using opportunities of augmented reality and virtual reality in construction project management. Organization Technology and Management in Construction an International Journal, 11(1), 1839-1852. https://doi.org/10.2478/otmcj-2018-0012

Bilal, M., Oyedele, L., Qadir, J., Munir, K., Ajayi, S., Akinadé, O., … & Pasha, M(2016). Big data in the construction industry: a review of present status, opportunities, and future trends. Advanced Engineering Informatics, 30(3), 500- 521. https://doi.org/10.1016/j.aei.2016.07.001

Duan, S. and Yangliu, J. (2021). Research on the application value of bim in building construction. E3s Web of Conferences, 253, 02047. https://doi.org/10.1051/e3sconf/202125302047

Gürgün, A., Koç, K., & KÜNKCÜ, H. (2022). Exploring the adoption of technology against delays in construction projects. Engineering Construction & Architectural Management, 31(3), 1222-1253. https://doi.org/10.1108/ecam-06- 2022-0566

Hou, L., Wu, S., Zhang, K., Tan, Y., & Wang, X. (2020). Literature review of digital twins applications in construction workforce safety. Applied Sciences, 11(1), 339. https://doi.org/10.3390/app11010339

Liu, K., Meng, Q., Kong, Q., & Zhang, X. (2022). Review on the developments of structure, construction automation, and monitoring of intelligent construction. Buildings, 12(11), 1890. https://doi.org/10.3390/buildings12111890

Sepasgozar, S. and Davis, S. (2018). Construction technology adoption cube: and investigation on process, factors, barriers, drivers and decision makers using nvivo and ahp analysis. Buildings, 8(6), 74. https://doi.org/10.3390/buildings8060074

Africa, A. (2019). A comprehensive study on application development software systems. International Journal of Emerging Trends in Engineering Research, 7(8), 99-103. https://doi.org/10.30534/ijeter/2019/03782019

Bougheloum, L. (2024). A novel smartphone application for real-time localization and tracking for visually impaired individuals. https://doi.org/10.21203/rs.3.rs- 4009211/v1

Cioruța, B. and Coman, M. (2022). Acquisition of field data through mobile-based apps dedicated to soil health protection. Asian Soil Research Journal, 76-83. https://doi.org/10.9734/asrj/2022/v6i4119

Hsu, Y. and Ching, Y. (2013). Mobile app design for teaching and learning: educators' experiences in an online graduate course. The International Review of Research in Open and Distributed Learning, 14(4). https://doi.org/10.19173/irrodl.v14i4.1542

Kim, D. (2024). Advancing mobile app development and generative ai education through mit app inventor. https://doi.org/10.35542/osf.io/k95js

Ndebele, M. and Mazhindu, A. (2023). Design and implementation of an android gis data collection application for students with non-programming experience using the mit app inventor: a case study on a tick data collection app. Intelligent Information Management, 15(01), 11-23. https://doi.org/10.4236/iim.2023.151002

Panselinas, G., Fragkoulaki, E., Angelidakis, N., Papadakis, S., Tzagkarakis, E., & Manassakis, V. (2018). Monitoring students' perceptions in an app inventor school course. European Journal of Engineering and Technology Research, (CIE), 5. https://doi.org/10.24018/ejers.2018.0.cie.633

Pérez-Jorge, D. and Martínez-Murciano, M. (2022). Gamification with scratch or app inventor in higher education: a systematic review. Future Internet, 14(12), 374. https://doi.org/10.3390/fi14120374

TOP, A. and Gökbulut, M. (2021). Android application design with mit app inventor for bluetooth based mobile robot control.. https://doi.org/10.21203/rs.3.rs-628321/v1

APPENDIX A – GANTT CHART SEM 7

NO	ITEM	SEP			OCT					NOV				DEC				JAN			
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20
		11/9/23 - 16/9/23	18/9/23 - 23/9/23	25/9/23 - 30/9/23	2/10/23 - 7/10/23	9/10/23 - 14/10/23	16/10/23 - 21/10/23	23/10/23 - 28/10/23	30/10/23 - 4/11/23	6/11/23 - 11/11/23	13/11/23 - 18/11/23	20/11/23 - 25/11/23	27/11/23 - 2/12/23	4/12/23 - 9/12/23	11/12/23 - 16/12/23	18/12/23 - 23/12/23	25/11/23 - 30/12/23	1/1/24 - 6/1/24	8/1/24 - 13/1/24	15/1/24 - 20/1/24	22/1/24 - 27/1/24
1	WBL REGISTRATION AND RESEARCH AT WORK PLACE (INDUSTRY)	X																			
2	RESEARCH INTRODUCTION		X	X																	
	Definition of Research		X	X																	
	Get an idea from the Department Workkplace		X	X	X	X															
3	RESEARCH TOPIC				X	X															
	Investigate and Observe the issues				X	X															
	Identify the Topic and discuss with Supervisor				X	X															
4	RESEARCH FRAME WORK					X	X														
	Set the objectives and the aim					X	X														
	Literature Review					X	X														
	Research Methodology					X	X														
	Research Design					X	X														
5	OBSERVATION 1						X														
6	RESEARCH PROPOSAL							X	X	X	X	X	X	X	X	X	X	X			
	Draft of Chapter 1: Introduction							X	X	X											
	Draft Chapter 2: Literature Review										X	X									
	Draft of Chapter 3 : Methodology											X	X								
	Submission of Chapter 1,2 & 3 Draft													X							
	Editing of Proposal							X	X	X	X	X	X	X	X	X	X	X			
7	PROPOSAL PRESENTATION (Slide preparation for proposal Presentation)																X	X			
8	PROPOSAL PRESENTATION																	X			
9	PROPOSAL FINAL EDITING (Final editing of Proposal)																	X	X		
10	OBSERVATION 2																		X		
11	SUBMISSION OF FINAL PROPOSAL																			X	
12	FINAL EVALUATION & KEY IN PROCESS OF MARKS																				X

NO	ITEM	FEBRUARY			MAC					APRIL				MAY				JUNE			
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20
		29/1/24-03/2/24	5/2/24-10/2024	12/2/24-17/2/24	19/2/24-24/2/24	26/2/24-2/3/24	4/3/24-9/3/24	11/3/24-16/3/24	18/3/24-23/3/24	25/3/24-30/3/24	1/4/24-6/4/24	8/4/24-14/4/24	15/4/24-20/4/24	22/4/24-27/4/24	29/4/24-4/5/24	6/5/24-11/5/24	13/5/24-18/5/24	20/4/24-25/5/24	27/5/24-1/6/24	3/6/24-8/6/24	10/6/24-15/6/24
	WBL REGISTRATION AND RESEARCH AT WORK PLACE (INDUSTRY)	■																			
	Submission Appendix B1 and B2 to PUO	■																			
	Preparation of Data Colelction		■																		
	PREPARATION FOR DATA COLLECTION		■	■																	
	Resources identification and selection			■																	
	PROJECT IMPLEMENTATION AND DEVELOPMENT				■	■	■	■	■												
	Data Collection				■																
	Product Development					■															
	Test run the project					■	■	■	■	■	■	■	■								
	RESULT ANALYSIS											■	■	■	■	■	■				
	interpret the results											■	■	■							
	state and summarize all the results													■	■	■	■				
	REPORT WRITING																	■	■	■	■
	Continuation on the writing of final report																	■	■		
	preparation for final year project dissertation																		■		
	Presentation at Industry																			■	
	PREPARATION FOR FINAL YEAR PROJECT PRESE																				■
	FYP PRESENTATION																				■
	PRESENTATION WITH INDUSTRIAL PANEL																				■
	FINAL REPORT SUBMISSION																				■

Legend:
- ■ Planned
- ■ Actual

Position *
- ○ Project Manager
- ○ Project Engineer
- ○ Site Supervisor
- ○ Site Agent
- ○ Other...

Working Experience *
- ○ < 2 years
- ○ 2 - 5 years
- ○ 6 - 10 years
- ○ > 10 years

Section 3 of 5

Section B: Technology Acceptance Model (Perceived Usefulness PU)

Description (optional)

Updating progress using Easy-SM enable me to shorten the completion of project. *

	1	2	3	4	5	6	
Strongly Disagree	○	○	○	○	○	○	Strongly Agree

Updating progress using Easy-SM surely improve the job quality *

	1	2	3	4	5	6	
Strongly Disagree	○	○	○	○	○	○	Strongly Agree

Updating progress using Easy-SM make it easier to track progress within site *

	1	2	3	4	5	6	
Strongly Disagree	○	○	○	○	○	○	Strongly Agree

Updating progress using Easy-SM improved the reporting productivity *

	1	2	3	4	5	6	
Strongly Disagree	○	○	○	○	○	○	Strongly Agree

Section C : Technology Acceptance Model (Perceived Behavior Control PBC)

Description (optional)

I am confidently to use Easy-SM for job tracking progress. *

	1	2	3	4	5	6	
Strongly Disagree	○	○	○	○	○	○	Strongly Agree

I have the knowledge to use Easy-SM for job tracking progress. *

	1	2	3	4	5	6	
Strongly Disagree	○	○	○	○	○	○	Strongly Agree

I have control over usage of Easy-SM for job tracking progress. *

	1	2	3	4	5	6	
Strongly Disagree	○	○	○	○	○	○	Strongly Agree

I have the resources to use Easy-SM for job tracking progress. *

	1	2	3	4	5	6	
Strongly Disagree	○	○	○	○	○	○	Strongly Agree

Section C : Technology Acceptance Model (Behavior Intention BI)

Description (optional)

I intend to use Easy-SM for job tracking progress *

	1	2	3	4	5	6	
Strongly Disagree	○	○	○	○	○	○	Strongly Agree

I intend to frequently use Easy-SM to perform job tracking progress *

	1	2	3	4	5	6	
Strongly Disagree	○	○	○	○	○	○	Strongly Agree

Assuming i have access to Easy-SM for job tracking progress, i intend to use it. *

	1	2	3	4	5	6	
Strongly Disagree	○	○	○	○	○	○	Strongly Agree

Given that i have access to Easy-SM for job tracking progress, i predict that i would adopt it. *

	1	2	3	4	5	6	
Strongly Disagree	○	○	○	○	○	○	Strongly Agree