ASSESSMENT OF PRODUCTIVITY RATE IN CONSTRUCTION MANAGEMENT USING IONIC FRAMEWORK

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Abstract: Site management is critical in construction, but from the observation made, the issue is about documentation and reporting compilation which is difficult and wastes time to analyze productivity rate. The issues are specified for key in data for manpower and machinery of mast installation for overhead catenary system (OCS) that uses the standard or traditional way such as daily site report in main office Kluang, Johor. This report is to develop an application of daily site report for assessment of productivity rate using Ionic Framework. The outcome of this development was tested in term of functionality to collected data using E-DSR and the respondents show 100% agreement on this product. Finally, this product can be used to produce productivity rate in OCS.

Keywords: *construction management, development, application, productivity rate, ionic framework*

1. Introduction

Civil engineering technicians and technologists assist civil engineers in planning, designing, and constructing infrastructure and development projects. The construction industry is notorious for its resource planning, risk management, and logistic issues, resulting in design flaws, project delays, cost overruns, and contract conflicts (Akinosho, 2017). As a consequence of utilising energy and consuming resources, the construction industry has a significant adverse effect on the environment, manufacturing waste materials and emitting greenhouse gases (Trindade et al., 2020). As a result, all of these have negative environmental consequences for the ecosystem. According to Hossain and Ng (2020), the need of incorporating sustainability in civil construction has been recognised in recent years. Furthermore, industries and organisations understand the value of safeguarding the future while achieving success in the present. Sustainability is most often understood as combining three pillars into design: economics, environmental, and social concerns (Braham, 2017). As the importance of sustainable development grows, more publications on sustainability in the building are being released. Sustainable, creative, and efficient structural design is recognised as is a model for structural health monitoring of high-rise structures, including sustainability in high-rise building design and integrated planning for sustainable construction (Zavadskas et al., 2017).

Site management is critical in construction, but from the observation made, the issue is about documentation and reporting compilation which is difficult and wastes time to analyse productivity rate. When in site, a daily site report is an essential document for the collected data. The data such as time, manpower, machinery and others are vital to measure the productivity rate. These issues can be proved by using the studies that had been made before. Corporate social responsibility (CSR) actions may be effectively communicated via various media, including CSR reports, annual reports, company websites, and social activities, including creating links with non-governmental organisations. However, there is no such systematic content analysis technique (Liao,2017). Key in the data to the datasheet by referencing from other documents is wasting time. This was already proved when most of the studies mentioned these issues in construction management and other management. For example, Oswald (2018) stated that although there is minimal evidence on the usefulness of safety observation reporting (SOR) in reality, many big construction companies employ it as part of their site safety management system. Despite its excellent intentions, the SOR system has issues. These included: significantly increased administration to deliver predictable data; poor data quality; an unwelcome focus on the number of reports rather than their content; their use as a tool to assign individual or organisational blame; and the perception that the SOR forms were being censored before they reached the health and safety team, which eroded trust between the workforce and management. Document management is a difficult task. Contracts, compliance paperwork, drawings and specifications, and other documents all help to guarantee that a project runs well. These papers are crucial in the building process (Chalhoub and Ayer, 2018).

Failure to manage issues, which transmit crucial observations, may result in delays, quality difficulties, or even the total loss of the software project. Various project stakeholders, such as project managers, developers, and even end-users, utilise issue trackers jointly (Mikko, 2021). Internet of thing (IoT) is commonly used in building projects to improve communication between multiple stakeholders throughout the design and construction stages (Svalestuen, 2017). However, IoT implementation in construction project monitoring has been hampered by various challenges such as the unpredictable speed of work, constantly changing site surroundings, and the necessity for frequent synchronisations (Sheikhkhoshkar et al., 2019). IoT is one of the solution that can be made for the issues which is using Ionic and firebase. It is seen that the issues in management not only in construction but also in other businesses, but this study will focus on management in site construction. More specifically, it is about the problem key in data for the mast installation for overhead catenary system (OCS) that uses the standard or traditional way such as daily site report. Thus, the solution for these issues can be solved by using technology which is by creating a platform for building mobile experiences with the web that called Ionic Framework and Firebase as it database. Technology systems or technical systems are defined as machines that apply technology by accepting an input, modifying it according to the system's intended function, and then creating an output. The most fundamental type of technology is the creation and use of simple tools. The innovation using technology can make any documentation for construction be paperless. These will gave lots of advantages to the companies' such reduce money to buy paper (Selbst et al., 2019).

This study was for China Rail Johor Gemas Railways (CRJGR) project. The China Rail Johor Gemas Railways (CRJGR) has five sections which are from Gemas to Johor Bahru. Figure

1 below shows the location of each area for installation mast OCS in five sections but this study focus at main office at Kluang, Johor which is in section three. Site engineer in each section has to do their daily site report for reporting to the office and keep it as data for the planner engineer. This study focuses on making planner engineers work easier on tracking the data from the daily site report. The application that will develop will quickly collect the data and analyse it to measure the productivity rate. The number of output divided by the volume of inputs is frequently referred to as productivity rate (Parc, 2020). In other words, it assesses how effectively a country's production inputs, such as labour and capital, are employed to generate a particular amount of output. Productivity rate is a crucial source of economic development and competitiveness, and it is used as the basis for many international comparisons and evaluations of country performance (Dieppe et al., 2021). Productivity rate, for example, is used to look at the effects of product and labour market laws on economic performance. Productivity rate is an essential factor to consider when calculating an economy's productive potential (Daraio et al., 2018). This application will improve the productivity rate by collecting all the data in the site and the data will accumulate in the database. From the data that already restore in database which is in firebase database. The data will analyse automatically in the application to produce the productivity rate. This application can be used for site engineers, site supervisors and planner engineers. The data of this productivity rate will be focusing on OCS for mast installation. This study will use the observation, engagement which is interview and self - experiences method to create the problem statement and research to study more about the application. As the result, the method that will be used is a questionnaire. The questionnaire will distribute to only 15 selected engineers in construction site.

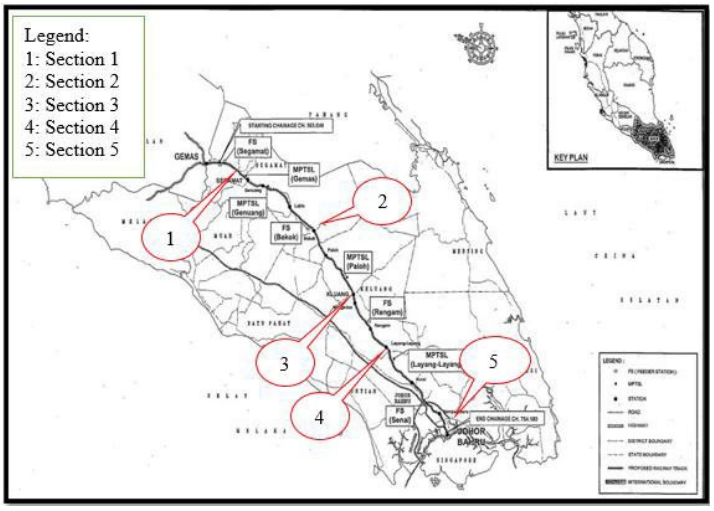


Figure 1. Locations of site project.

The aim of this study is to develop daily site report application for productivity rate assessment that can solve the issue of documentation, reporting compilation and tracking in site management that had been stated in the problem statement which is to identify the issues of data collection for manpower and machinery in mast installation of overhead catenary system (OCS). Besides, to develop a daily site report application that can collect manpower and machinery data for mast installation of overhead catenary system (OCS) using Ionic Framework and to evaluate the effectiveness of daily site report system in term of functionality. This study focuses on mast installation OCS, but the application can be used

for other elements as long as needed for track and productivity rate. In construction, the engineer will always use the productivity rate to plan ahead of the progress of the construction. This application is expected to be used in not only construction companies but also in management. Due to the tracker and productivity rates are used in construction and used in other management companies. This application is not only sustainable, but it also keeps introducing IR 4.0 to companies and let them practice using applications instead of papers.

2. Materials and Methods

The method that been used for findings the targeted person, problem and the details of the problems are using observation, engagement which is through interview and self – experiences. Table 1 below show the description of the method that had been used. While Figure 2 is about the findings after the observation, interview and self – experiences. From the Figure 2, it is known that the aim people for the project are planner engineer, site engineer and site supervisor because they related. For example, site engineer and site supervisor are collecting the data from the site and the data will be given to planner engineer for producing the productivity rate that to compare the actual progress in site and planning progress. The issues that had been identified is regarding the site management documentation.

Table 1. Research Method used address Research Objectives.

Method	Details
Observation	The observation had been made since week 1 during Work Base Learning (WBL) to find the problem in company. The issues that had been identified is regarding site management for documentation part.
Engagement: Interview	From the interview with the planner itself, it is proved that it Quite difficult to track the data for mast installation due to lots of data since CRJGR project has 5 sections.
Self – experiences	As for self – job scope during WBL, supervisor gave a task to track the date of working progress. This task took too much Time due to lots of Daily Site Report (DSR) from each section. The date of construction progress is referencing DSR.

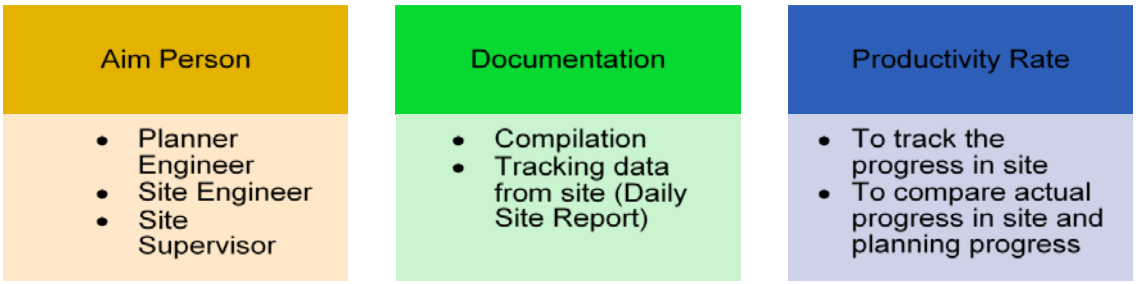


Figure 2. The process of this study.

2.1 Identify Main Problem

It is already defined the problem or issues in the company. It is about documentation, reporting compilation and tracking data which is difficult, wastes time and non-sustainable to measure productivity rate. One the task that had given by mentor industry is key in the data from the daily site report in Aconex sever to produce the productivity rate for mast installation in 5 sections. It is wasting time due to lots of daily site report since 31st October 2019. This documentation not only occur in this company but also in others company. Aconex sever is the software where all the documentation of the company is kept. Figure 3 below shows the Aconex sever while Figure 4 shows the productivity rate template for mast installation. From this problem, the next phase is will introduced the solution.

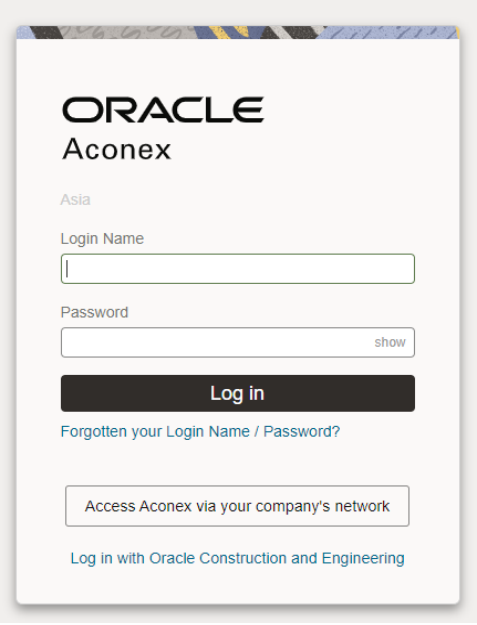
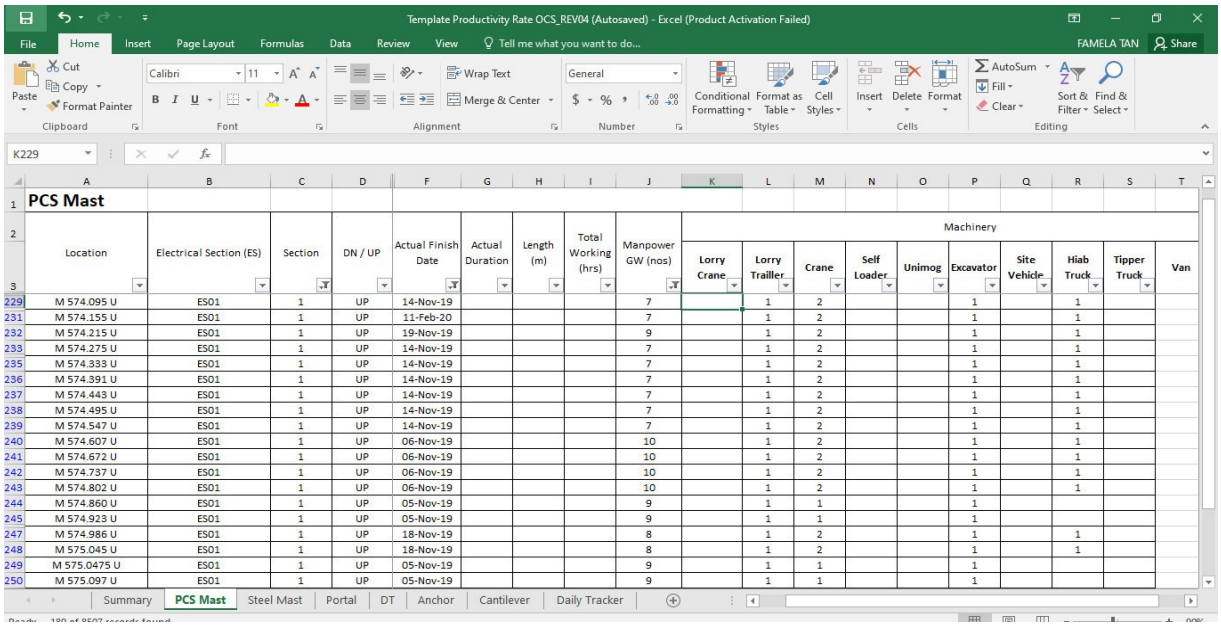


Figure 3. Aconex application



Template Productivity Rate OCS_REV04 (Autosaved) - Excel (Product Activation Failed)

PCS Mast

	Location	Electrical Section (ES)	Section	DN / UP	Actual Finish Date	Actual Duration	Length (m)	Total Working (hrs)	Manpower GW (nos)	Machinery								
										Lorry Crane	Lorry Trailler	Crane	Self Loader	Unimog	Excavator	Site Vehicle	Hiab Truck	Tipper Truck
229	M 574.095 U	ES01	1	UP	14-Nov-19				7		1	2			1		1	
231	M 574.155 U	ES01	1	UP	11-Feb-20				7		1	2			1		1	
232	M 574.215 U	ES01	1	UP	19-Nov-19				9		1	2			1		1	
233	M 574.275 U	ES01	1	UP	14-Nov-19				7		1	2			1		1	
235	M 574.333 U	ES01	1	UP	14-Nov-19				7		1	2			1		1	
236	M 574.391 U	ES01	1	UP	14-Nov-19				7		1	2			1		1	
237	M 574.443 U	ES01	1	UP	14-Nov-19				7		1	2			1		1	
238	M 574.495 U	ES01	1	UP	14-Nov-19				7		1	2			1		1	
239	M 574.547 U	ES01	1	UP	14-Nov-19				7		1	2			1		1	
240	M 574.607 U	ES01	1	UP	06-Nov-19				10		1	2			1		1	
241	M 574.672 U	ES01	1	UP	06-Nov-19				10		1	2			1		1	
242	M 574.737 U	ES01	1	UP	06-Nov-19				10		1	2			1		1	
243	M 574.802 U	ES01	1	UP	06-Nov-19				10		1	2			1		1	
244	M 574.860 U	ES01	1	UP	05-Nov-19				9		1	1			1			
245	M 574.923 U	ES01	1	UP	05-Nov-19				9		1	1			1			
247	M 574.986 U	ES01	1	UP	18-Nov-19				8		1	2			1		1	
248	M 575.045 U	ES01	1	UP	18-Nov-19				8		1	2			1		1	
249	M 575.0475 U	ES01	1	UP	05-Nov-19				9		1	1			1			
250	M 575.097 U	ES01	1	UP	05-Nov-19				9		1	1			1			

Figure 4. Spreadsheet of productivity rate.

2.2 Idea for Problem Solution

As the problem is regarding the documentation and reporting compilation which is wastes time due to many data, non-sustainable and difficult to measure productivity rate. These traditional or usually methods that only using paper for daily site report will develop to modern way which is using application that is sustainable, easy to use, save time and direct analysing data. Sustainability pillar number 2 which is Advanced Design Software (Use software and database for planning, simulation, dimensioning etc). Figure 5 below shows the transformation in this project

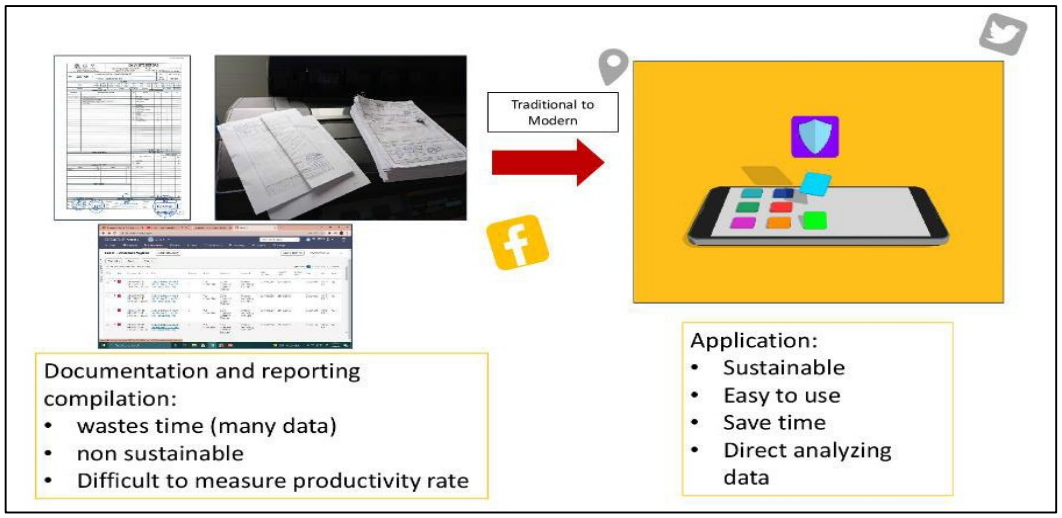


Figure 5. Transformation in the Project.

2.3 Prototype

Prototype create in order to study the issue solutions created in the previous stage. Prototypes may be shared and tested inside the design team, in other departments, or on a small group of individuals who are not part of the design team. This is an experimental phase whose goal is to find the best solution for each of the challenges highlighted in the previous three phases. The answers are implemented in the prototypes one by one, and based on the users' experiences, they are either approved, enhanced, and re-examined, or rejected. By the conclusion of this stage, the design team will have a better understanding of the product's restrictions and issues, as well as a better understanding of how actual users will behave, think, and feel while engaging with the final product. Figure 6 below shows the prototype of this project and Table 2 is regarding how to use it. This prototype is development of daily site report to the application.

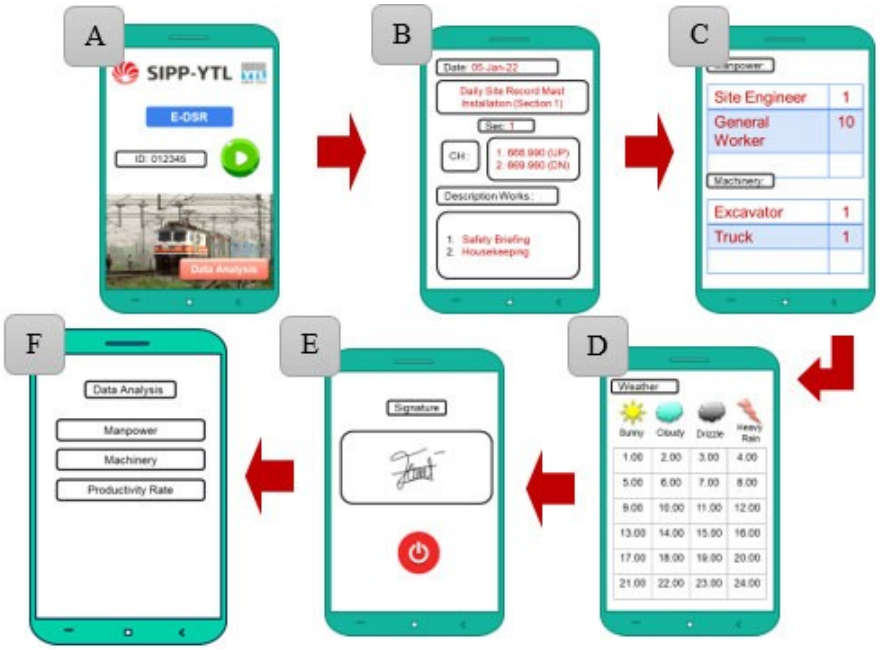


Figure 6. Prototype of E-DSR.

Table 2. Procedure using E – DSR.

Process	Details
A	The user has to enter their staff ID. Then press the “start” button to fill in their details of daily site report.
B	The user has to fill in the details at the site construction as record for daily site report.
C	The user has to fill in the details of manpower and machinery as record for daily site report.
D	This part is for weather details. The user needs to record the weather an hour. First, they need to press the time and the icon will pop up. Then, they will need to choose the weather for that time.
E	They should put their digital or photo of signature. Then press the “end” button finish their daily site report and all the data will store in database for analysis.
F	To see the analysis either by days, weeks or months can be seen by press the “Data Analysis” button. The three items are manpower, machinery and productivity rate. These analyses will produce automatically.

2.4 Application Development

The application develops by using Ionic Framework. This application renamed as E – DSR can function as collecting data, analyse data and measure productivity rate. Figure 7 below show the flowchart how this application function. The details of each items are explaining in Table 3 while figure 8 below shows the flowchart in developing the application.

Figure 7. Flowchart of the study.

Table 3. This is a table Explanation of Application E – DSR.

Function	Details
Data Collection	This application function as data collection. The users such as site engineer use it to key in the data such as manpower and machinery or others element depending on their site. As for this product, it will be focusing on mast installation in railways. This application will be collecting all the data in the site and the data will accumulate in the database which is using Firebase Database.
Analyse Data	The data will automatically generate and analyse in the application. This is because all the data can be seen in the application.
Measure Productivity Rate	The productivity rate will automatically generate and produce in the application.

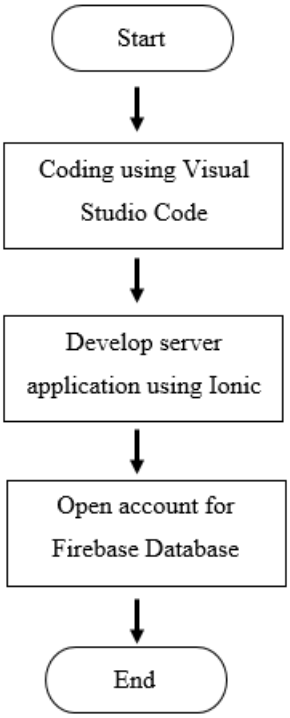


Figure 8. Flowchart of E – DSR development.

Figure 9 below show the coding that using Visual Studio Code. The first step for developing this application is creating coding. Coding means the act of giving anything a code in order to be classified or identified.

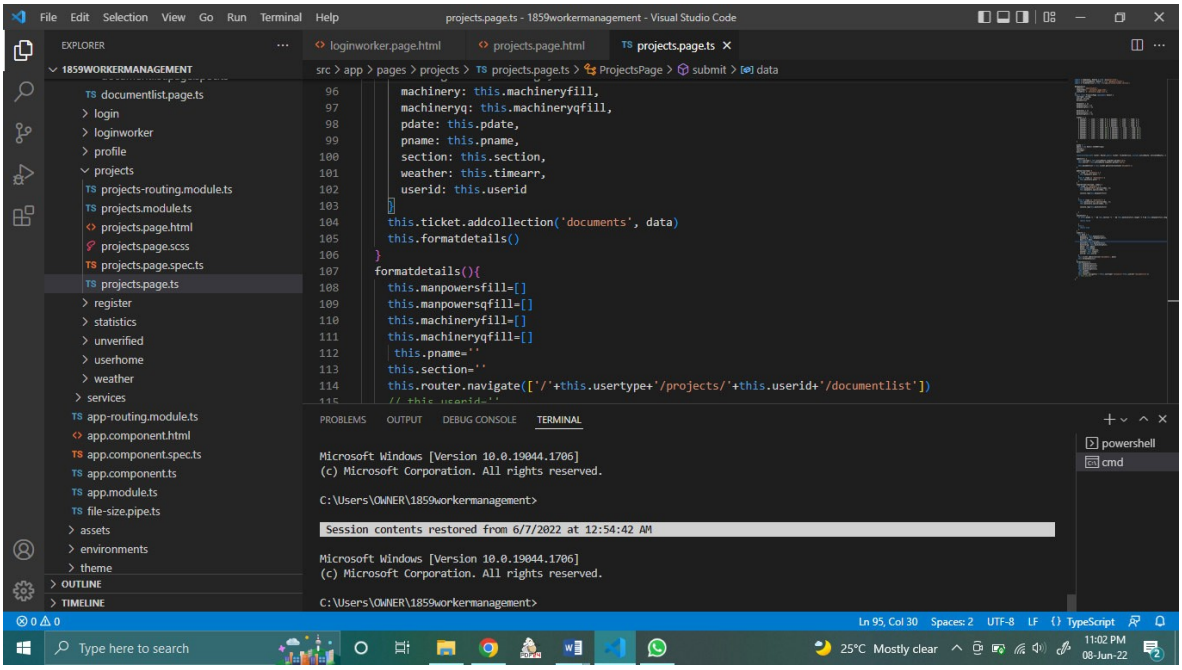


Figure 9. Programming for E – DSR development.

Figure 10 below show the second step which is developing server application using Ionic Framework. While Figure 11 below show the interface of E-DSR that already developed.

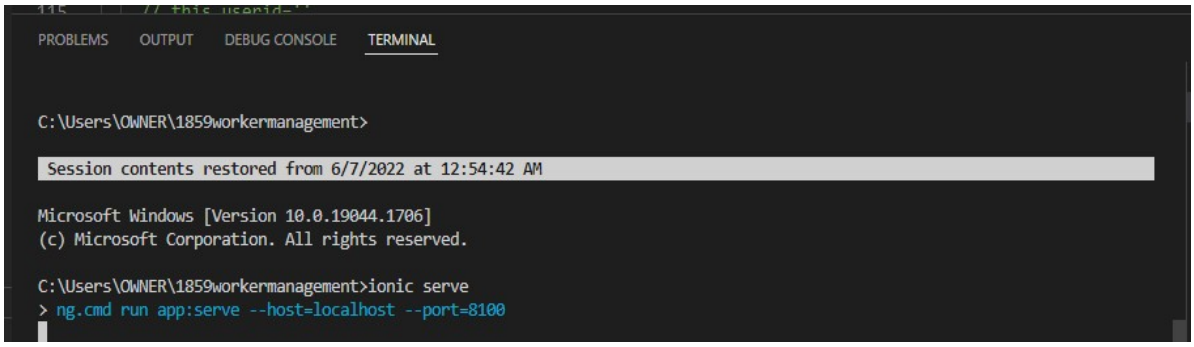


Figure 10. Server of application

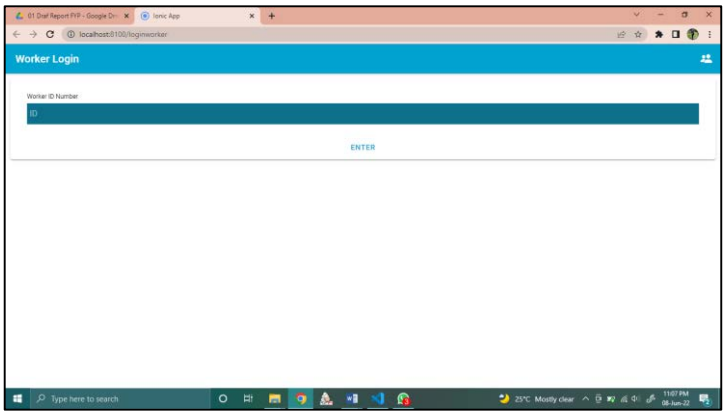


Figure 11. Interface of E – DSR development

Figure 12 below show the account for firebase of database. Firebase of database act as storage for the file to back up.

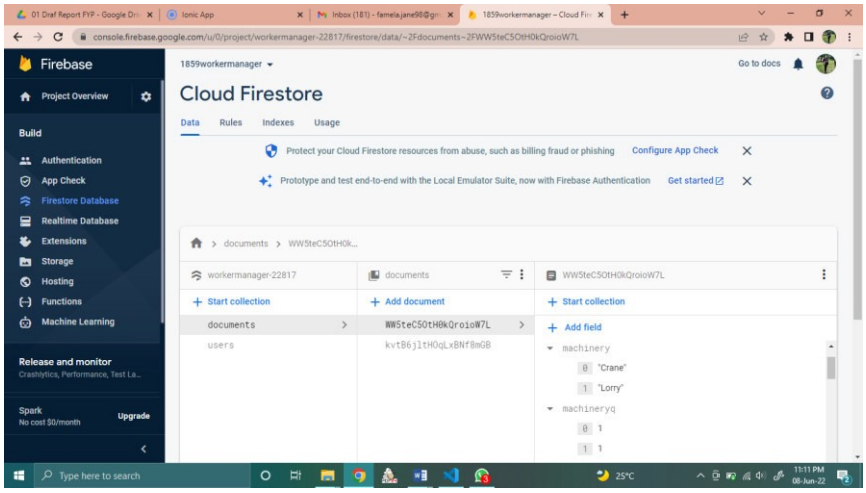


Figure 12. Firebase of database

Figure 13 below show how to operate or run the application and table 4 below is the explanation of the application.

Figure 13. Content of E - DSR.

Table 4. Instructions for using the E – DSR.

Legend	Details
A.	This is for admin view page. The admin will login using the email that had been provided.
B.	The admin can view these 3 items. Admin can manage the user.
C.	Admin can view the documents and the statistic is data of productivity rate.
D.	In this section, the admin can add or remove users. Admin also can change other users to admin
E.	This section is for adding the users.
F.	The productivity rate data that already measured by using data from the documents
G.	Enter ID to login. The key in the data section. This section is for the engineer to fill in their daily site report

2.5 Validate of Application

After the application been developed, it will validate or prove the effectiveness of the function. The method that will used to validate this application is the standard method which is questionnaire method. A questionnaire is a popular data gathering strategy that is an important aspect of any research project. According to Ikart, E. M. (2019), pretesting a questionnaire is a basic way for determining whether a questionnaire may cause problems for respondents or interviewers in advance. As a result, seasoned researchers and survey methodologists have deemed questionnaire pretesting essential. There are a few crucial factors when it comes to survey questionnaire design best practises. Establishing pertinent information, study aims and objectives, data gathering techniques, questionnaire clarity and writing style, question structure, appearance and feel, the flow, and questionnaire pretesting are only a few of them (Ikart, 2018).

The questionnaire will be created using Google Form. Fatria and Listari (2017), mentioned that Google Drive might make teaching and learning more dynamic and inventive, resulting in learning-based learning. Iqbal, M., Rosramadhana, Amal, B.K., and Rumapea, M.E. (2018), the Google Form as a tool for assigning Social Science courses. The assignment may be completed online using the following link. There are many templates in google form that can be used to make a questionnaire. The questionnaire was distributed by WhatsApp on the site. This project distributed the questionnaire 15 selected which is planner, site engineer and site supervisor. The video on how to use the application was also uploaded in the YouTube page (https://www.youtube.com/watch?v=AkS6z-AKccg). Figure 14 below shows the distribution questionnaire on site.

Figure 14. Questionnaire distribution in site

3. Results

The failure management regarding the documentation especially in daily site report in the construction due too much papers to handle. Regarding this issue, application had been developed which is E – DSR. This application is a fantastic approach to gather, assess and compute the productivity rate. The data will be simpler to track as a result. It is anticipated that the programme will be created to make chores or occupations easier for planning engineers, site engineers, and site managers. Additionally, the

company now uses paper for daily site reports, which is not sustainable, especially in a sustainable environment, in an effort to reduce paper waste. This programme not only promotes IR 4.0 to businesses and gives them the opportunity to practise using the Internet of Things (IoT) in place of paper, but it is also sustainable.

This application function as data collection. The users such as site engineer use it to key in the data such as manpower and machinery or others element depending on their site. As for this product, it will be focusing on mast installation in railways. This application will be collecting all the data in the site and the data will accumulate in the database which is using Firebase Database. The data will automatically generate and analyse in the application. This is because all the data can be seen in the application. The productivity rate will automatically generate and produce in the application. The result shows from the questionnaire that has been distributed to selected respondents which consists of Site Engineer, Planner Engineer and Site Supervisor Quantity. These surveys have been conducted to 15 respondents. This survey conducted to know the effectiveness of E – DSR. The results obtained will present a complete of result and analyzes of the study in the form of tables, graphs and figure so that the key information is highlighted.

3.1 Data Analysis

This questionnaire has three sections, Section A, Section B, Section C and Section D. Section A is about the background information. The background and respondent information is shown in Section A. Section B is for data collection with is to identify the issues of data collection for manpower and machinery data in mast installation of overhead catenary system (OCS). While Section C is for development of application and Section D is for to evaluate the effectiveness of daily site report application that can collect manpower and machinery data for mast installation of overhead catenary system (OCS) using Ionic Framework.

3.2 Distribution of mean score (Agreement Level)

In mathematics and statistics, the idea of mean is crucial. The most typical or average value among a group of numbers is called the mean. It is a statistical measure of a probability distribution's central tendency along the median and mode. It also goes by the name "anticipated value". Su A type of psychometric response scale in which responders specify their level of agreement to a statement typically in five points.

Mean Score	Interpretation of Mean Score
1.00–2.00	Low
2.01–3.00	Moderately Low
3.01–4.00	Moderately High
4.01–5.00	High

Figure 15. Mean score for 5 Point Scale (Norasmah & Sabariah, 2007; Norasmah & Salmah, 2011)

Cohen's Kappa always ranges between 0 and 1, with 0 indicating no agreement between the two raters and 1 indicating perfect agreement between the two raters.

Cohen's Kappa	Interpretation
0	No agreement
0.10 - 0.20	Slight agreement
0.21 - 0.40	Fair agreement
0.41 - 0.60	Moderate agreement
0.61 - 0.80	Substantial agreement
0.81 - 0.99	Near perfect agreement
1	Perfect agreement

Figure 16. Mean Score for 2 Point Scale (Ho et al., 2019)

3.3 Respondents (Questionnaire)

As for the questionnaire, the section A is regarding the details of respondent such as gender, age, occupation and work experiences.

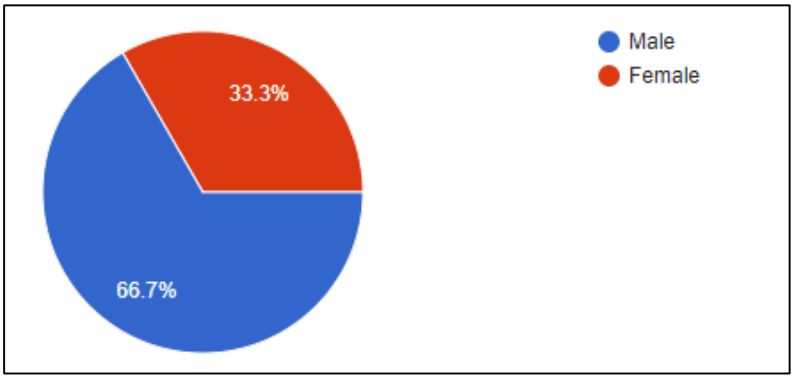


Figure 17. Percentages by the gender

From Figure 17 above it can be seen that the 15 respondents consist of 10 (66.7%) male and 5 (33.3%) female. The difference percentage between male and female is 33.4%. This different expected due to there are more male working in site office than female. It is a logical when employer employed more male staff at site. Table 5 below show the summary of gender respondent.

Table 5. Summary of gender respondent.

Gender	Respondent	Percentages
Female	5	33.3%
Male	10	66.7%

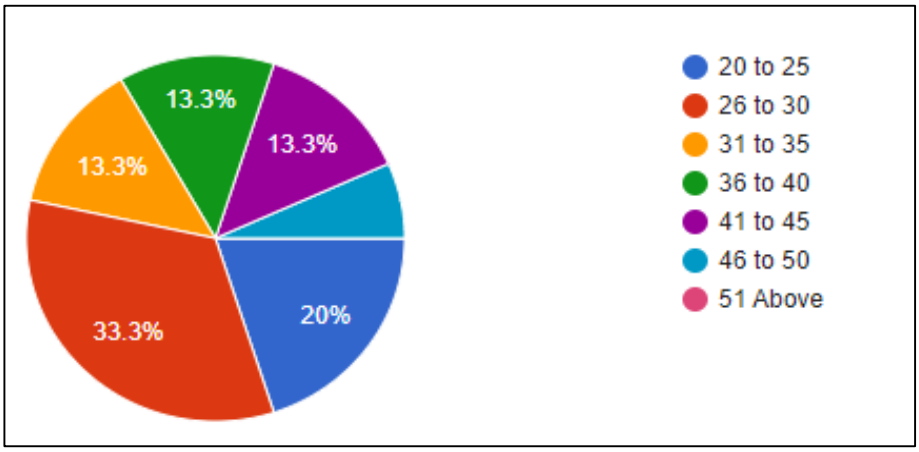


Figure 18. Percentages of ages respondent

From Figure 18 above it can be seen that the 15 respondents consist of 6 category of ages which is 20 to 25 years old, 26 to 30 years old, 31 to 35 years old, 36 to 40 years old, 41 to 45 years old and 46 to 50 years old. The highest age is 26 to 30 years old which is 5 respondents. Table 6 below show the summary of age respondent.

Table 6. Summary of age respondent.

Ages	Respondent	Percentages
20 to 25	3	20.0%
26 to 30	5	33.3%
31 to 35	2	13.3%
36 to 40	2	13.3%
41 to 45	2	13.3%
46 to 50	1	6.67%
51 Above	0	0.00%

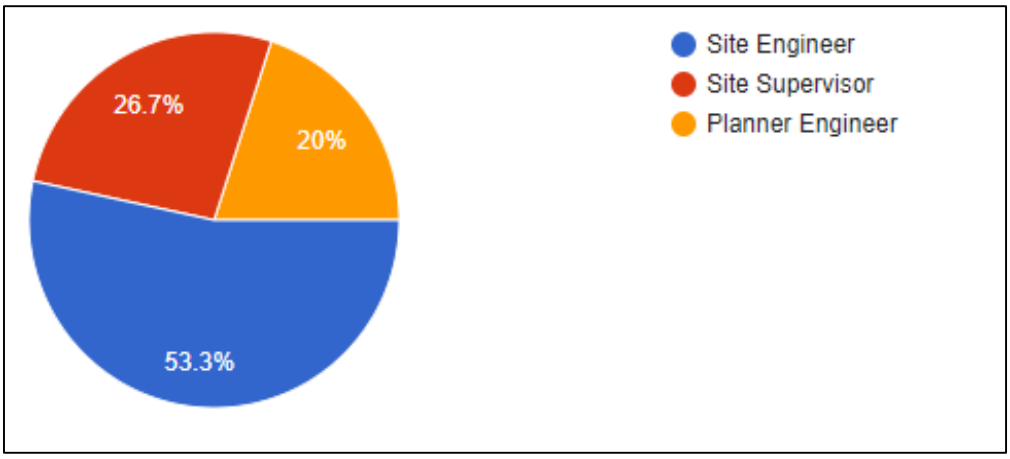


Figure 19. Percentages by the types of occupation.

From Figure 19 above it can be seen that the 15 respondents consist of 3 category of occupation which is Site Engineer, Site Supervisor and Planner Engineer. The highest occupation is Site Engineer which is 8 respondents. Table 7 below show the summary of occupation respondent.

Table 7. Summary occupation respondent.

Occupation	Respondent	Percentages
Site Engineer	8	53.3%
Site Supervisor	4	26.7%
Planner Engineer	3	20.0%

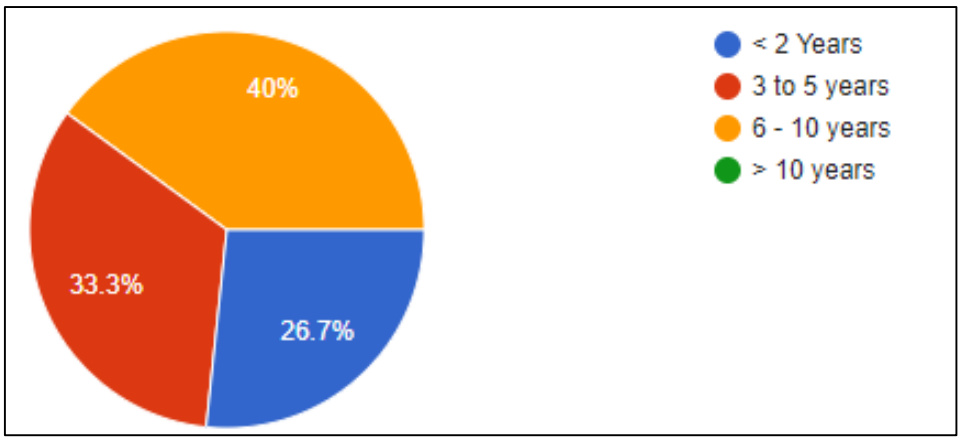


Figure 20. Percentages by the work experiences.

From Figure 20 above it can be seen that the 15 respondents consist of 3 category of work experiences which is below 2 years, 3 to 5 years and 6 to 10 years. The highest occupation is Site Engineer which is 8 respondents. Table 8 below show the summary of work experiences respondent.

Table 8. Work Experiences Respondent.

Work Experiences	Respondent	Percentages
< 2 years	4	26.7%
3 to 5 years	5	40.0%
6 to 10 years	6	33.3%
> 10 years	0	0.00%

3.4 The Effectiveness between Data Collection and Respondent

This part of analysis will analyse between section A and section B from the questionnaire. Figures below shows the analysis that taken from the questionnaire.

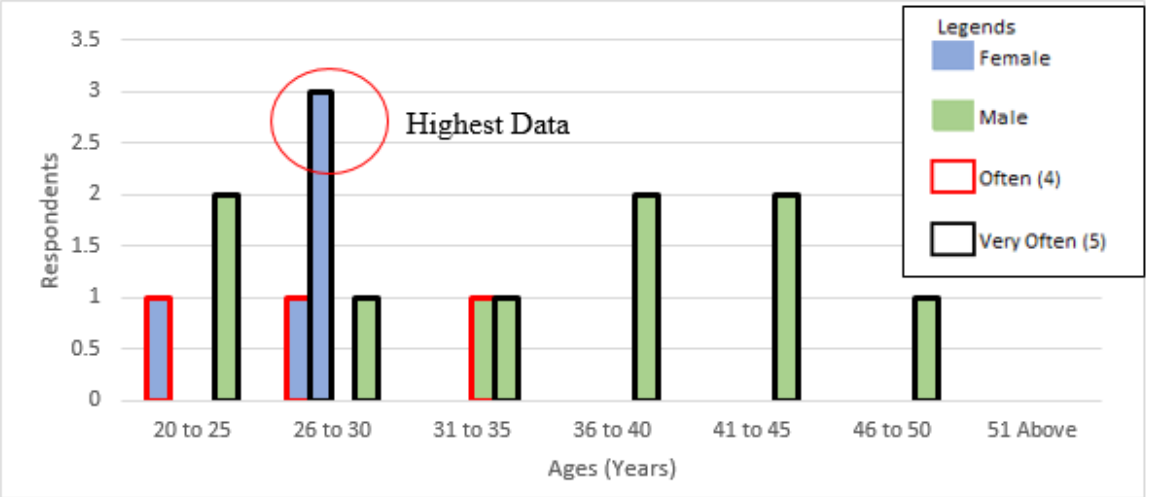


Figure 21. The often respondent using daily site report

From Figure 21 above, it is show bar graph regarding first question in section B about how often the respondent using daily site report (DSR) in site. The 'X' axis of this graph is ages of the respondent and "Y' axis is number of respondents. This question has scale which is 1 to 5 and 1 refer to rarely and 5 refer to very often. Majority of the respondent respond that they very often using DSR in site which is shown in the graph with black bar line while the red bar line is representing scale 4 that is often. The mode of this graph is female in age range 26 to 30 years which is 3 respondents. Percentages differences between the highest and lowest female is 40.0% while male is 20.0%. Mean is 4.87 while standard deviation is 0.339 and variance is
0.116. Besides, majority respondent is at age range 26 to 30 years which is 5 respondents. The result to be expected due to that DSR is used in site. According to Wu et al. (2021), every construction industry is using DSR in their site.

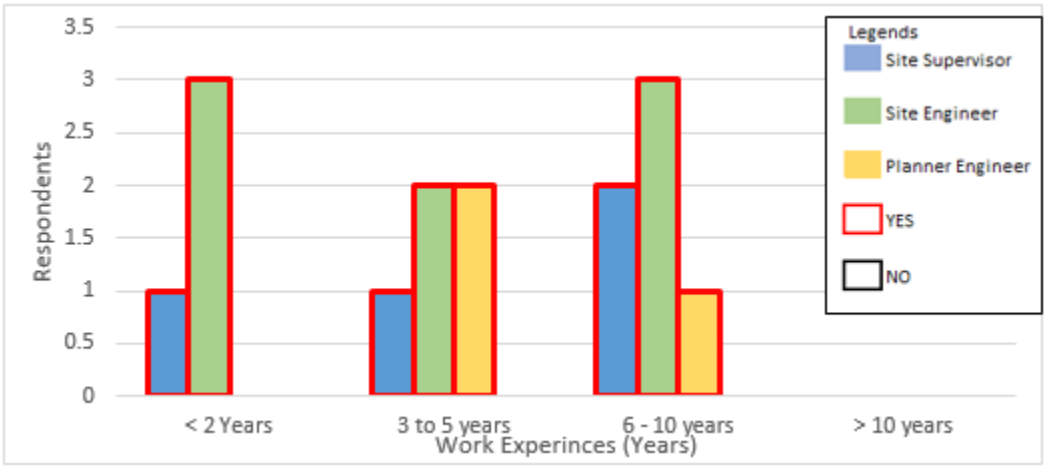


Figure 22. Daily site report for reporting.

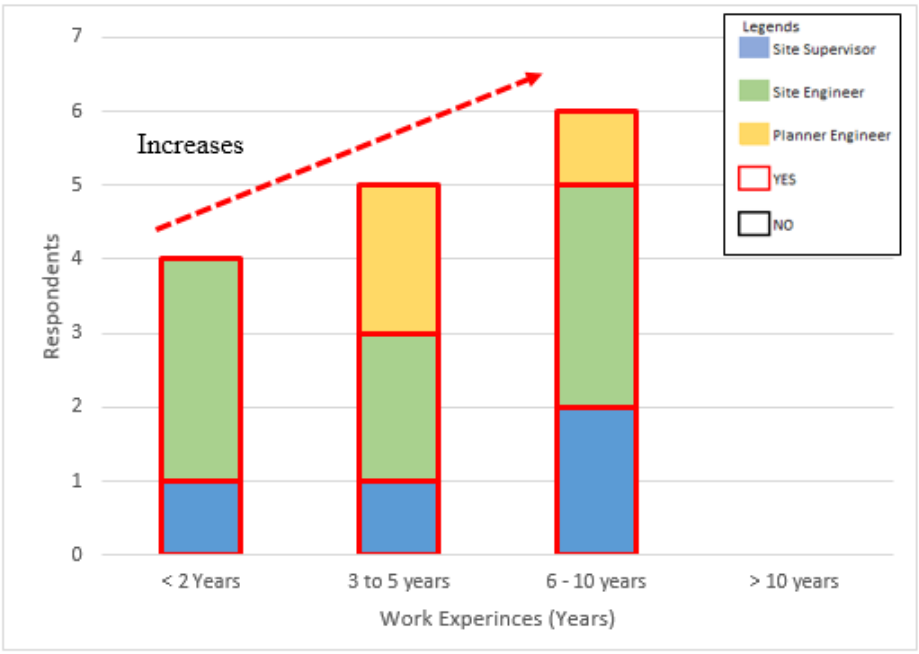


Figure 23. Daily site report for documentation.

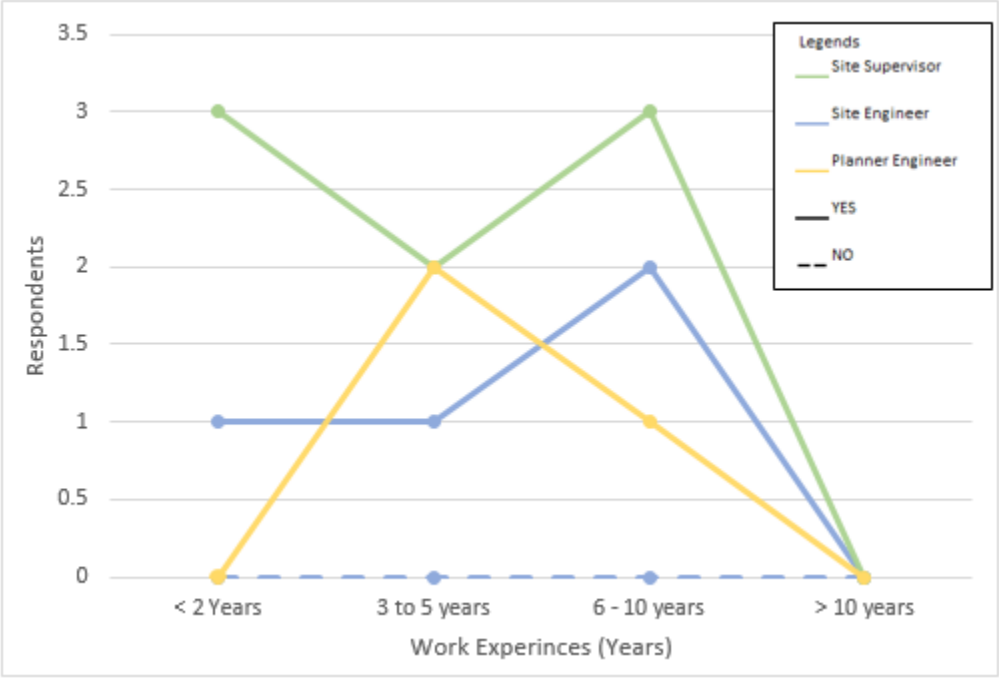


Figure 24. Daily site report for tracking

From Figure 22 above, it is show bar graph regarding second question in section B about used of daily site report for reporting purpose. Meanwhile Figure 23 above, it is show bar graph for documentation purpose and Figure 24 is line graph for tracking purpose. The 'X' axis of this graph is work experiences of the respondent and "Y' axis is number of respondents. This question is "YES" "NO". It is shown that all the respondents are

100.0% agree that they used daily site report for reporting when all the respondent answer "YES". The mode of this graph is respondent with work experiences 6 to 10 years and site engineer is the highest percentages. Percentages differences between the highest and lowest site engineer is 12.5% while site supervisor is 25.0% and planner engineer is 33.3%. Mean is 1.00 while standard deviation is 0.000 and variance is 0.00. The difference percentage between highest and lowest work experiences is 13.3%. The differences between YES and NO answer from the respondent is 100.0%. This result was expected because all the respondent used DSR in site. DSR is used for reporting and documentation to record the data from the site every day. As for tracking, it is used to know the productivity of the activities in certain day and planner can planned ahead the progress of the report.

Figure 25. Histogram of purpose daily site report

Figure 25 above shows the histogram that created from the data. The histogram is representing the purpose of daily site report which is for reporting, documentation and tracking. From the histogram, the mode is at age 26 to 30 years old. There are 3 range age that have the same frequency of respondent which is 2 respondents.

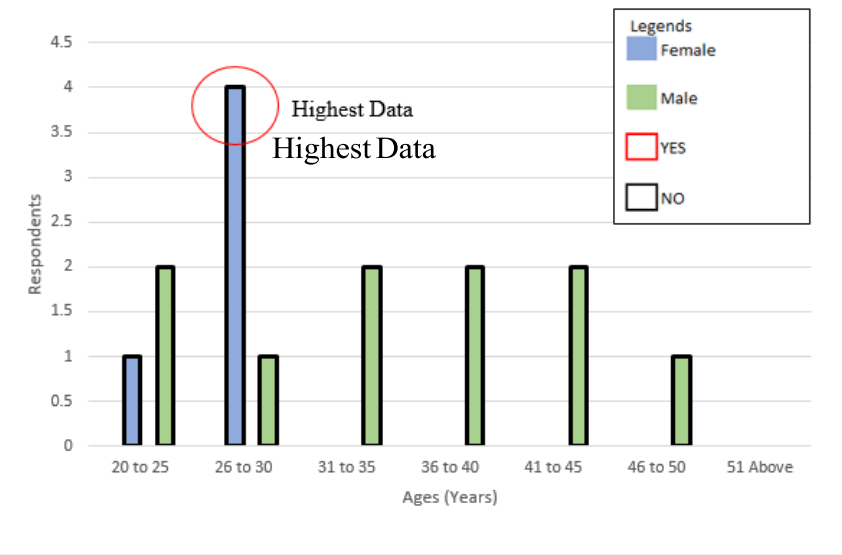


Figure 26. Summarize of data from daily site report

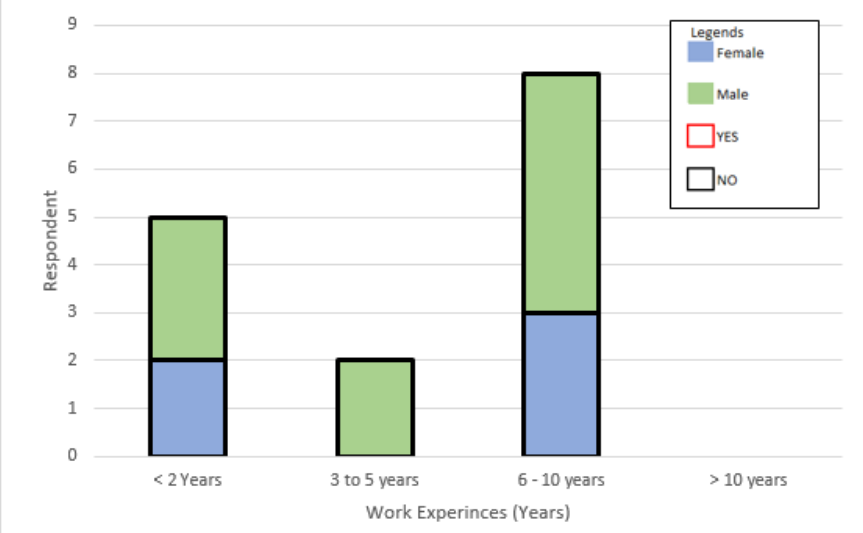


Figure 27. The manageable of many documentations of daily site report

From the Figure 26 above, it is regarding the easy to summarize the data from Daily Site Report while Figure 27 is regarding the manageable of many documentation of Daily Site Report. It is shown that all the respondents are 100.0% agree that they find DSR is quite difficult to summarize and manage when all the respondent answer "NO". The mode of the data is Male due to the highest and most result from the graph which is 8 respondents. The range of the respondent is 4 to 6 for years of experiences. The standard deviation and variance are 0 and 0 for both question. The differences between YES and NO answer from the respondent is 100.0%. This result was expected because too many DSR and it make too difficult to handle. As for this construction project, there are 5 sections and the manageable of DSR is not easy since too many documents. It will make the engineer confuse or error in data.

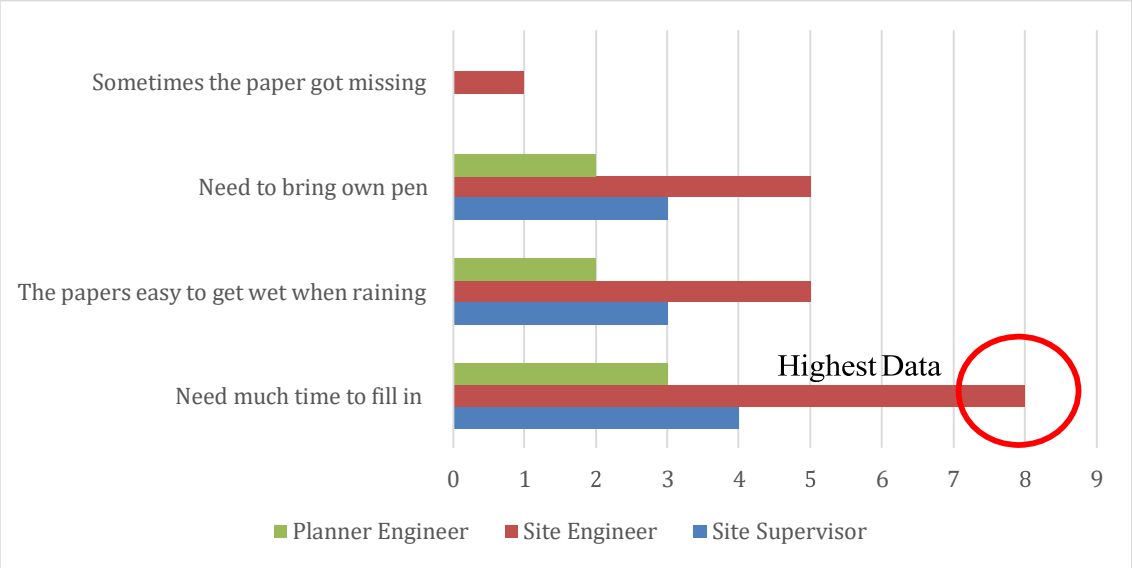


Figure 28. The major problem daily site report

From the 28 above, it can be seen that amount of site engineer is greater than site supervisor and planner engineer which is as for site engineer, it is 8 (53.3%) people while site supervisor is 4 (26.7%) people and planner is 3 (20.0%) people. It also can be seen that amount of male is greater than female which is as for male, it is 10 (66.7%) people while female is 5 (33.3%) people. The mode of the data is male due to the highest and most result from the graph which is 10 respondents. The range of the respondent 3 to 8 people as for occupation. The standard deviation and variance are 0.900 and 0.810. The difference percentage between highest and lowest of type occupation is 33.3%. The mean of the result is 1.912. The major problem for DSR is need much time to fill in followed by the papers will get wet easier. These 2 major problems are expected in the result due to the reason of their experiences in the site.

3.5 The Effectiveness between Development of Application and Respondent

This part of analysis will analyse between section A and section C from the questionnaire. Figures below shows the analysis that taken from the questionnaire.

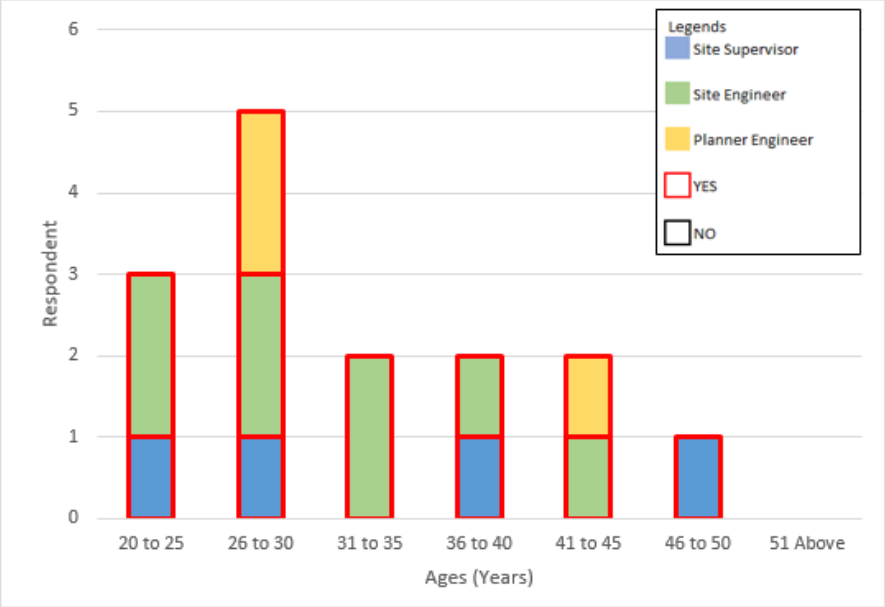


Figure 29. The development of daily site report application

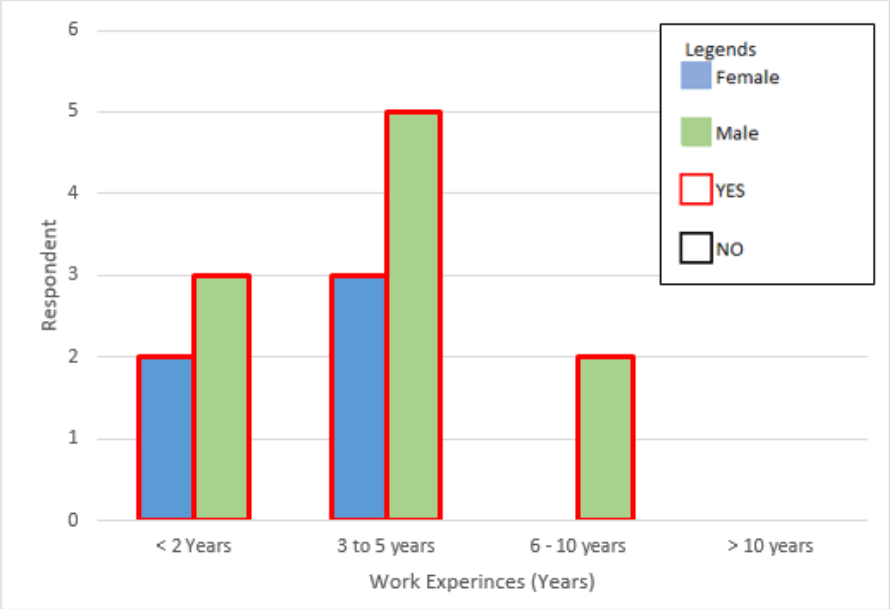


Figure 30. The effectiveness of E – DSR

From Figure 29 and Figure 30 above, it is show bar graph regarding question in section C. As for graph in Figure 29 it is about the relevant for Daily Site Report to develop into application while graph in Figure 30 is regarding saving time and easy to manage. It is shown that all the respondents are agree that E – DSR application is relevant to develop. All of the respondent also agreed that this application can save lot of time and easy to manage. It is shown that all the respondents are 100.0% agree when all the respondent answer "YES". The mode of the data is male due to the highest and most result from the graph which is 10 respondents. The standard deviation and variance is 0.00 the uses of DSR while the mean is 1.00. The differences between YES and NO answer from the respondent is 100.0%.

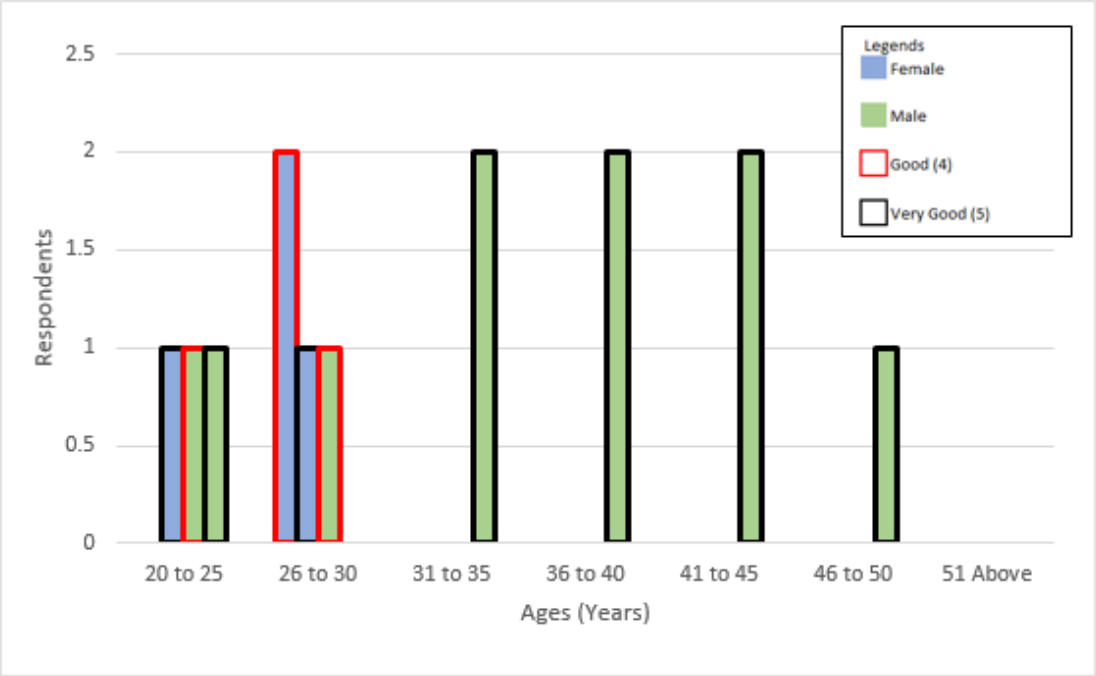


Figure 31. Design satisfaction of E – DSR

From the Figure 31, it is show bar graph regarding question in section C. It can be seen that amount of male is greater than female which is as for male, it is 10 (66.7%) people while female is 5 (33.3%) people. While the highest ages are 26 to 30 years old. It is shown that all the respondents are agree that they satisfy with the design of this application. The mode of the data is 5 dues to the highest result from the graph. The median also 4.73 while the standard deviation and variance is 0.442 and 0.195.

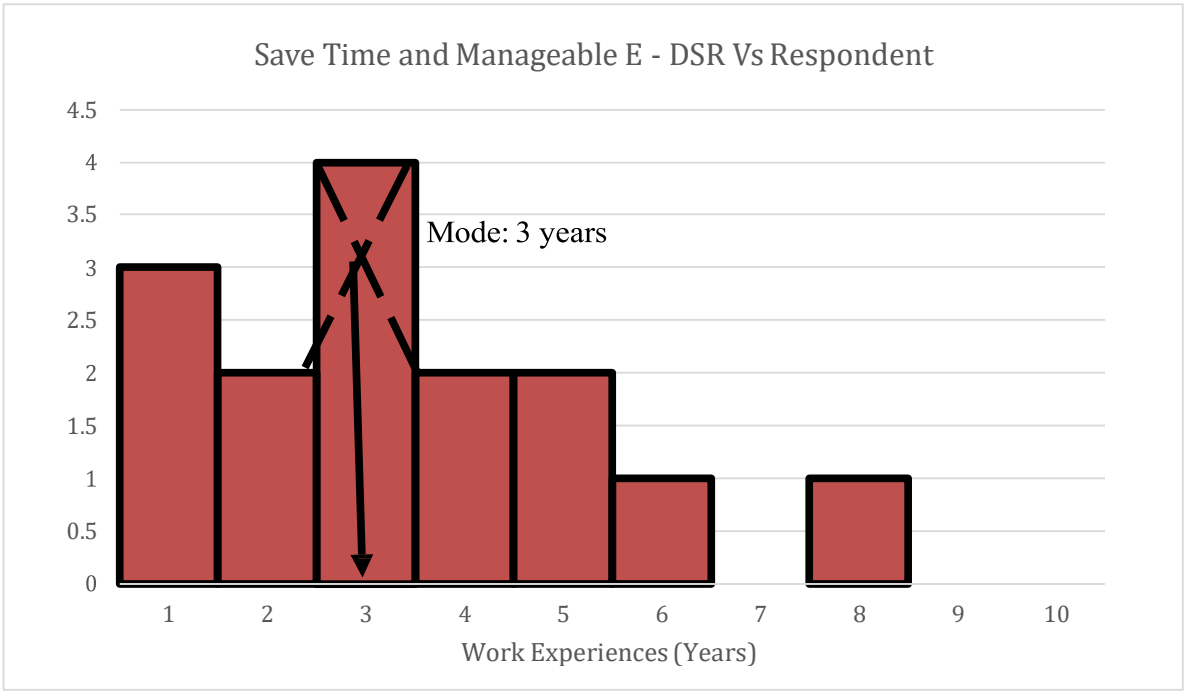


Figure 32. Histogram of Satisfaction of E – DSR

Figure 32 above shows the histogram that created from the data. The histogram is representing the satisfaction of daily site report which is for development, time, manageable and sustainable. From the histogram, the mode is at age 3 years working experiences.

3.6 The Effectiveness between Application and Respondent

This part of analysis will analyse between section A and section D from the questionnaire. Figures below shows the analysis that taken from the questionnaire.

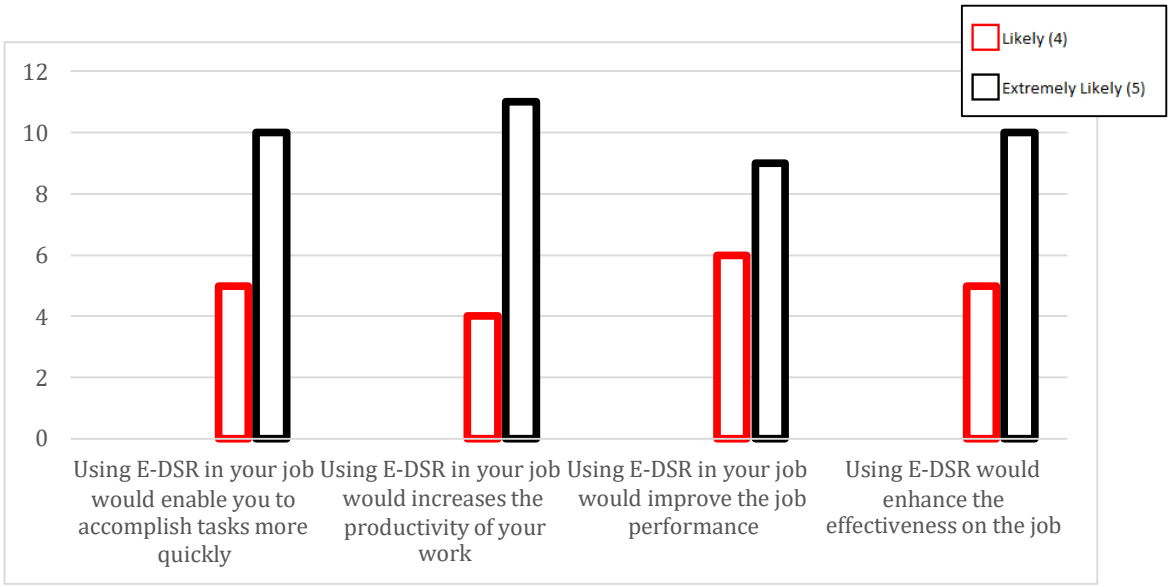


Figure 33. The functional of E – DSR

From Figure 33 above, it shows the respondent feedback regarding the effectiveness using E – DSR application. Majority respondent indicate on scale 4 and above which is the respondent agree that the application was effective. It is proved that all the respondent said that using E –DSR would able to complete the task quickly, will increases productivity, improve performance and enhance the effectiveness on the job. The median also 5 while the range of the result is only between 4 to 5. The standard deviation and variance is 0.488 and 0.238 for effectiveness of the E – DSR while mean is 4.67. Meanwhile, the standard deviation and variance is 0.458 and 0.210 for improve the performance of the E – DSR while mean is 4.73. As for increases the productivity, the standard deviation and variance is 0.488 and 0.238 for improve the performance of the E – DSR while mean is 4.67. As for able to complete the task quickly, the standard deviation and variance is 0.507 and 0.257 for improve the performance of the E – DSR while mean is 4.60.

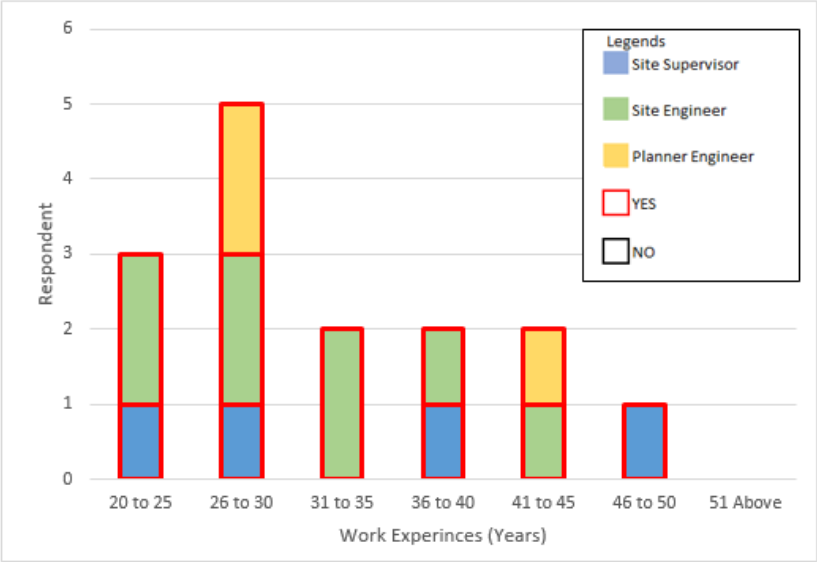


Figure 34. The useful, easy and understandable of E – DSR

From Figure 34 above, it shows the respondent feedback regarding the effectiveness using E – DSR application. Majority respondent indicate on "YES" which is the respondent agree that the application was effective. It is proved that all the respondent said that using E – DSR is useful, easy to use and understandable.

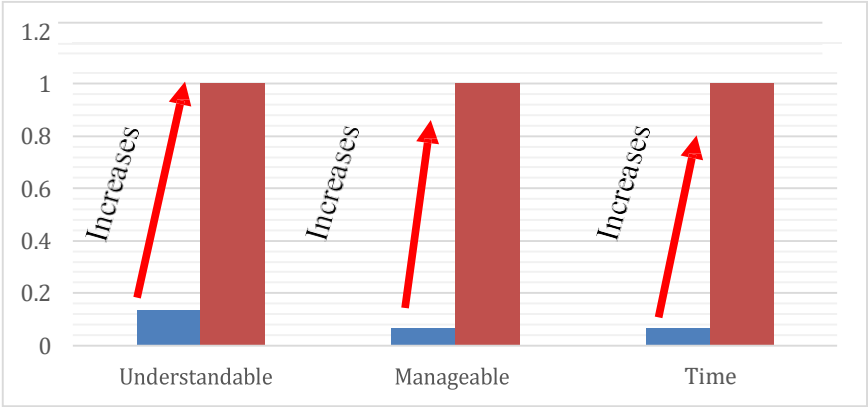


Figure 35. Comparison mean between conventional method vs E – DSR

From Figure 35 above shows the comparison mean between conventional method vs E – DSR application. It is shown that E – DSR is more effective than conventional method which is using paper. It is proof that the application is much understandable, manageable and save time. From the trend of the bar graph, the mean of conventional method is lower than E – DSR. The respondent agreed that using application is much better than papers. It can make work much efficient and productivity increase.

4. Discussion

The results obtained from survey forms have been answered by the respondents. The analysis from the findings of demographic criteria such respondents from the gender, age group, occupation and experience working. As for first objective to identify the issues of data collection for manpower and machinery in mast installation of

overhead catenary system (OCS). The respondents agree for the issues that in the questionnaire and they answered the questionnaire accordingly to their experiences.

The solution to overcome the issue is to develop a daily site report application that can collect manpower and machinery data for mast installation of overhead catenary system (OCS) using Ionic Framework. It is clear that all of the respondents believe that the E – DSR application should be developed. All of the respondents stated that this application may save a significant amount of time and is simple to use and they satisfied with the design of the application. As for the effectiveness of daily site report system in term of functionality. The majority of respondents say that the application was effective on a rating of 4 or above. It was established that all respondents said that utilizing E – DSR would allow them to finish tasks more quickly, boost productivity, improve performance, and increase work effectiveness. Table 9 below shows the comparison between the conventional method and E – DSR application.

Table 9. Comparison between Conventional method vs E – DSR Application.

Conventional method	**E – DSR application**
Used papers which lead to waste papers	Paperless
Need much time to fill in	Save time which is much easy to key in.
Hard to summarize due to lots of papers	Automatically produce the
Hard to manage	Manageable

5. Conclusion

Based on the data analysis in the preceding chapter, this part highlights the findings, conclusions, and recommendations. By evaluating how effectively some of the study's goals were achieved, the effectiveness of utilising the E- DSR programme to monitor productivity rate at YTL main office Kluang was evaluated. In this chapter, the researcher should have the advice to update the system to be much better and function able from the project that will be carried out. It is also one of the steps that researchers thought about after the project has been completed to carefully analyse what suggestion would be generated during the project. E - DSR serves the same purpose as a daily site report but also has the ability to calculate productivity rate. Employees were able to simplify their everyday tasks while still getting work done thanks to E-DSR. Additionally, E – DSR is a system that is easy to use, affordable, and accessible everywhere as long as users have their device. It may also minimise the amount of paper used. This programme demonstrates that it is superior to the current system, which mostly managed the company using paper-based methods, based on the data results and user use. Additionally, E-DSR taught the worker on the construction industry's Innovation Revolution 4.0 (IR 4.0) technologies.

In summary, the aim of this project achieved. The issue is that it takes time and effort to compile documentation and reports in order to analyse productivity rates. The study's three objectives are to identify the issues of data collection for manpower and machinery in mast installation of overhead catenary system (OCS), to develop a daily site report application that can collect manpower and machinery data for mast installation of overhead catenary system (OCS) using Ionic Framework, and to evaluate the

effectiveness of daily site report system in term of functionality. The study's focus is on the placement of each part for the installation of the mast OCS as well as the office building and construction site of the YTL CRJGR Main Office in Kluang.

The inability to manage paperwork, particularly in daily site reports in construction, as a result of having too many documents. E – DSR, an application, had been created in response to these problems. This application is a great tool for gathering, analysing, and computing productivity rate. As a consequence, tracking the data will be easier. The application is expected to be developed to make tasks or jobs for planning engineers, site engineers, and site managers simpler. In an attempt to limit paper waste, the corporation has also started using paper for daily site reports, which is not sustainable, particularly in a sustainable environment. This initiative is not only sustainable but also promotes IR 4.0 to companies and provides them the chance to practice utilizing the Internet of Things (IoT) in lieu of paper.

The respondents have responded to the findings from the survey forms. The study of data from demographic questions about respondents' gender, age group, employment, and work history. As for the first goal, to identify the problems with data collecting for labour and equipment in overhead catenary system mast installation (OCS). The survey respondents agreed with the concerns raised and provided responses based on their own experiences. The answer to address the problem is to design a daily site report application that can gather personnel and machinery data for mast installation of overhead catenary system (OCS) using Ionic Framework. It is apparent that all of the respondents agree that the E – DSR application should be created. All of the respondents mentioned that this application may save a substantial amount of time and is easy to use and were happy with the design of the application. In terms of functionality, it was going well when the majority of responders think the application was successful due to analyse of the data from questionnaire. It was discovered that every responder thought using E
– DSR will help them accomplish projects faster, increase productivity, enhance performance, and improve job effectiveness

Recommendation

As a result of the above findings, some suggestions that suggested to improve the used of E – DSR application. As for scope this E – DSR application to be used for mast installation in CRJGR Project. So, here some suggestions to be improve this application for more user to use. Firstly, the application only has data for the productivity rate but do not have a graph. The graph can be created so that it can be much easy for the users to read the data. Moreover, E – DSR application also can be developing by using other than Ionic Framework that cheaper or affordable. Software can be creating such as Network Solutions, Web.com, SquareSpace, and WordPress.com. User can create the application by using the platform as per mention. All of this software is easy to use and can get free access for all.

Besides, the application only can be used for android. This application can be improved by developing it for Apple version also due to some engineer using IPhone. So that everyone can use it easily. The researcher's conclusion is that technology in the

construction industry is crucial for producing the best quality and product for the project. E-DSR may reduce the expense of utilizing paper, save time, and help the organization become more organized. Consequently, the company's technology may persuade more customers to purchase its services. By using technology in business, Malaysia may be able to compete successfully with other nations across the globe. A country's economy may benefit from technology in the building industry.

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