# Strategy to Improve Supervision Skills Among Site Supervisors in the Construction Industry

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**Abstract**: Supervision define as the role of accomplishing things by people and directing human resources as nicely as a group closer to achieve a common goal. In Malaysia, many issues are found in the construction sector in the term of construction site supervision. Because of these problems, work-related accidents resulting in death and injury occur frequently at the construction sites. The major encountered problems are especially adequate knowledge of the newly graduated building site supervisor about their roles and legal obligations despite being in construction sites during construction applications. Therefore, this study was conducted to identify the problems being faced in the construction site without supervision skill and to determine the importance of supervision skills of site supervisors in construction performance. Several effective strategies are suggested to improve the supervision skills among site supervisors thus to increase the construction performance in the industry. The study employed a quantitative method. Questionnaires were distributed to 70 site supervisors in Johor. The Statistical Package Social Science (SPSS) was used to run the descriptive analysis, normality test and Spearman correlation analysis. The findings showed that delay of construction project, time-management and collaboration of supervision team have the highest mean for problem, importance, and strategy respectively in this study. Furthermore, the results indicated that all three strategies had positive relationships with supervision skills. Effective implementation of solutions in supervision skills will help site supervisors have a better future in the construction industry.

**Keywords**: Supervision, Site supervisor, Construction site, Construction industry, Construction performance

## 1. Introduction

The term "supervision" refers to a process by which one worker is given responsibility by the organization to work with other workers to meet certain organizational, professional, and personal objectives which together promote the best outcomes for service users (Morrison, 2005). Site supervisors typically are responsible for their direct reports' progress and productivity in the construction site. This research will address the significance of supervision skill of supervisors in construction sites. Major problems and effective strategies will also be discussed to improve the construction performance in the workplace.

1.1 Research Background

The construction sector in Johor plays a significant role in creating employment opportunities and generating new income sources for both skilled and unskilled people of the society (Khan *et al.*, 2014). The rise of the developing construction industry has caused high demand of local and foreign workers. Most of them work as inappropriate, unskilled, and untrained workers. Therefore, supervision for site supervisor is needed to ensure good construction performance (Dalibi, 2016). Supervision skills have a main task to carry in preventing accidents in construction sites. Common place supervisory capacities incorporate arranging and assigning work, deciding, checking execution and consistency, giving administration, and building cooperation, and guaranteeing workforce association.

1.2 Problem Statement

Supervision is an increasingly significant part of the construction industry and its quality has a major impact on the overall performance in the construction project in Johor. However, the construction sector poses many issues and difficulties everywhere. Problems become more serious when site supervisors lack time management skills, technical skills, and communication skills. Construction problems such as project delay, inappropriate construction building and cooperation between supervisor and workers in construction sites will always occur thus influencing the construction performance in the construction industry (Abas, M., 2015; Chang *et al.*,2018).

The problem that takes place in the construction sector is lack of supervision quality and time management among site supervisors thus affects construction performance in terms of delay. Failure of site supervisor in performing good supervision skills to manage time effectively in a construction project will affect the construction performance in terms of delay. Therefore, this will cause loss of revenues and lead to poor relationships between the parties in the construction industry.

Lack of supervision skill of site supervisor in terms of technical skill will also cause inappropriate usage of building elements. In the actual construction, construction elements such as building materials which have not been properly supervised and used in compliance with applicable technical requirements will cause the problems of material quality (Chang *et al.*, 2018). This will give a negative impact on safety and quality of the construction project.

The communication skill of the site supervisor can influence the construction performance. The supervisors which are not rich in communication ability or supervision skill will fail to deliver information to site workers thus cause unclear construction activities (Doloi *et al.*, 2012). Insufficient instruction and information from the site supervisor responding to site workers will probably give impact on the progress of construction performance.

1.3 Research Questions

This section should include research questions of the study.

(i) What are the problems of supervision skills being faced by site supervisors in the construction industry?
(ii) What are the importance of supervision skills of site supervisors in the construction industry?
(iii) What are the strategies to improve the supervision skills among site supervisors in the construction industry?
(iv) What are the relationship between supervision strategies (Personnel quality training, innovative construction technology and collaboration of supervision team) and supervision skills among site supervisor in the construction industry?

## 1.4 Research Objectives

(i) To identify the problems of supervision skill being faced by site supervisors in the construction industry.
(ii) To determine the importance of supervision skills of site supervisors in the construction industry.
(iii) To suggest the strategies to improve supervision skills among site supervisors in the construction industry.
(iv) To identify the relationship between supervision strategies (Personnel quality training, innovative construction technology and collaboration of supervision team) and supervision skills among site supervisor in the construction industry.

## 1.5 Scope of the Study

This study is about the effect of supervision skill by site supervisor in construction performance. This research is mainly focused on site supervisors in residential projects. The respondents of this research study would be the site supervisors in the construction industry. The target respondents will be selected and covered mainly in Johor in Malaysia.

## 1.6 Significance of the Study

The supervision skill became one of the significant influencers in construction performance. This study on supervision skills of site supervisors in the construction industry in Malaysia broadens site supervisors' profession and improves the quality of construction performance in the construction industry in Johor, Malaysia. In addition, the study helps the site supervisor's successful delivery of projects within time, quality and cost on proper supervision skill of the construction works. The purpose is to increase the standard and safety of residential buildings in Johor, Malaysia.

## 2. Literature Review

### 2.1 Supervision Skill

Supervision skill can be defined as the function of getting things carried out thru people and directing the efforts of humans as nicely as groups closer to the achievement of a common objective (Manmohan, 2016). The supervision role is to communicate organizational needs, oversee employees' performance, provide guidance, support, identify development needs, and manage the reciprocal relationship between staff and the organization so that each is successful (Service, 2012). Construction supervision offers not solely monitoring the activities of the team in the construction site but also with improving the work environment and stimulating site workers to perform greater efficiently.

### 2.2 Site Supervisor

In the construction industry, supervisors are responsible for the operational management including planning, organizing and facilitating the daily task implementation, and giving relevant technical guidance and support for their crew members (Su, Cong, & Liang, 2019). The site supervisor is the

person who plans, directs, and coordinates onsite activities that result and turns drawings and specifications into reality (Jerald L, 2011).

*(a) Role of Site Supervisor*

The site supervisor's job is highly complex and requires extensive knowledge and skills (Jerald L, 2011). Site supervisor must be able to plan, schedule and coordinate the work of the construction project. They have to understand the interaction of construction cost, schedule, production, quality and also maintaining a safe work environment. Site supervisor must understand how to work with and engage people at all levels through a variety of legal and organizational relationships (Manmohan, 2016).

2.3 Construction Site

Construction is a workplace with high-risk activity, which must be managed from procurement, through the design process and to the end of the construction stage (Swingland, 2001). Everyone involved in a building project must appreciate their role, from client, project supervisor design process (PSDP), designer, project supervisor construction stage (PSCS), contractor and employees (Swingland, 2001).

*(a) Residential Construction Buildings*

Residential project is better known as a house or home. Residential projects include townhouses, houses, condominiums, apartments, cottages, subdivisions and single unit dwellings. The highest value of work done was recorded in Q1 2017 (RM10221 million) (Aslinda & Siah, 2019).

2.4 Problems of Supervision Skill among Site Supervisors

*(a) Delays of Construction Project*

Poor site management, especially supervision can cause construction projects to keep delaying and affect the company performance (Chan, 1997). Lack of supervision skill especially time management strongly influences the worker productivity because the supervisor did not manage the workers well and their selected positions that need to be completed. Changing order from the top management is also an influencer in effect of construction project delay (Ramanathan, 2012). Workers have to wait for the final instruction from the supervisor until the right order is given by the upper-level management of the company.

*(b) Inappropriate Usage of Construction Materials*

The wrong application of construction materials has a direct impact on the overall quality of construction projects (Oke, Ayodeji, 2006). Poor supervision such as shoddy work on the use of construction materials will seriously threaten the quality and safety of the project. (Taiwo, A., Afolami,J, 2011). Lack of moral value and inefficient use of the construction materials by site supervisors can lead to the poor management of construction sites thus causing construction problems. The quality and safety of the construction project will be affected by the lack of supervision skill.

*(c) Poor Teamwork*

A supervisor's lack of competency or reluctance are the primary reasons for ineffective supervision (Grant *et al*, 2012). This leads to good workers leaving, and creates discontent among workers willing to stick with the job. Poor attitudes come up for many workers when they feel unappreciated. Lack of teamwork will occur in the site when there is not clear and good instruction from the supervisor (Louis, 2017). Workers dissatisfaction with the job will result in poor performance and working relationships.

2.5 Importance of Supervision Skill

Supervision skill is important for site supervisors in the construction industry to guarantee the quality of building structures and safety of construction sites (Dalibi, 2016). Besides, supervision skill is significant to carry out by the highly experienced supervisors in avoiding accident occurrence on construction sites (Fang *et al.*, 2015). Moreover, supervision skills can encourage the workers or employees to be more disciplined and adopt good practices in their activities or works (Nation, 2014). Supervision skill can classify as one of the most important elements in the construction development process (Riedel & Al-Keim, 2017). The reason is supervision improves the financial and time management of activities at each stage of the project to ensure time completion without overrun the budget (Riedel & Al-Keim, 2017).

*(a) Time-management Skill*

Time is the most precious resource because it is irreplaceable (M.J. Weeks & Janis, 2004). Time-management skill refers to the way that site supervisors organize and plan how long they need to spend on each construction activity (Memon *et al.*, 2014). Time management skills include a variety of skills that will help people especially site supervisors to manage the time well. The purpose of time management skill is to improve the career and help the project complete work on time (Alvarez *et al.*, 2019).

*(b) Technical Skill*

Technical skill is the more technical area of supervision. It involves the importance of a safe work environment and provides guidance in how to secure that safe work environment (Ibrahim *et al*, 2018). Site supervisors are responsible for an excellent deal of what goes on day to day within the workplace. It is not just a footing that solely assigns tasks. Supervisors must ensure a secure and safe workplace for workers. The site supervisor needs technical skill in determining and solving the problem of the construction activities happening on site. As a construction frontline character who is closest to the workforce to where the work is actually performed by skilled construction craft workers (van Holm, 2017).

*(c) Communication Skill*

Communication skill is an essential part of construction supervision which contributes to three characteristics: critical, time-consuming and pervasive (Dainty, 2007; Manmohan, 2016). Site supervisors work primarily with people rather than the tools of their craft to accomplish their tasks (Jerald L, 2011). Instead of producing work directly, site supervisors direct the work of others and accomplish their work objectives through others (Jerald L, 2011).

2.6 Strategies to Improve Supervision Skill

*(a) Personnel Quality Training*

Training is critical to efficiency especially for supervisors who need to improve supervision skills in terms of time-management skill, communication skill and technical skill (Candace B.C. *et al.*, 2013). More firms are helping supervisors develop and improve their management skills by providing new supervisors with formal training programmes (James & Brad, 2013). Attending training will benefit supervisors to learn some valuable construction supervision skills and techniques which improve construction site productivity on the project (Odusami *et al.*, 2007).

*(b) Innovative Construction Technology*

A good technical solution can improve the construction quality and schedule. Companies in construction should attach importance to the application of innovative technology, introduce more high-tech construction management software and establish an information management platform for

construction projects such as Building Information Modelling (Azhar, 2011). Supervisors can refer to data from the BIM so that they will have a better understanding of the construction project thus giving a better clear instruction to the workers in the construction site.

*(c) Collaboration of Supervision Team*

Supervision team in a construction company is a significant participant in supervising the efficiency of building projects. Professional supervisory team should focus on the improvement of the supervision quality and technical level of supervisory personnel (Services, 2012). Supervisory companies can apply qualified professional construction tests to understand the education level of the supervisors in the construction site. Experienced and talent supervision teams can be assigned by the construction company to improve the supervision performance and productivity in the construction site.
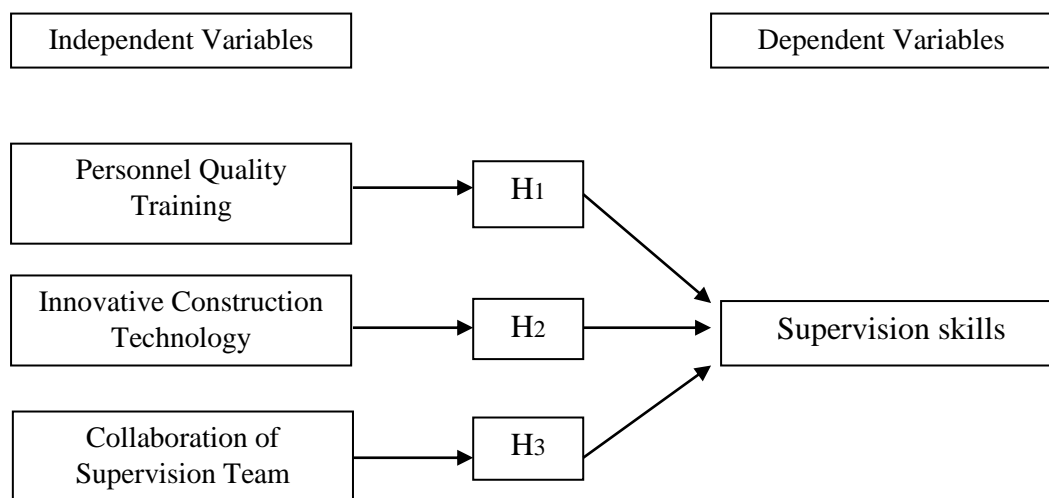
2.7 Research Framework



**Figure 2.1: Research Framework**

Research framework aims to show independent variables and dependent variable in this study. There are three independent elements (Personnel Quality Training, Innovative Construction Technology and Collaboration of Supervision Team) which influence the dependent variable (Supervision skills).

2.8 Hypothesis

$H_1$: The personnel quality training has improved the supervision skills among site supervisors in Johor, Malaysia.

$H_2$: The innovative construction technology has improved the supervision skills among site supervisors in Johor, Malaysia.

$H_3$: The collaboration of the supervision team has improved the supervision skills among site supervisors in Johor, Malaysia.

## 3. Research Methodology

3.1 Research Design

Research design is defined as a detailed planning of the proposed research work (Megel & Heermann, 1993). The type of research used is descriptive study that define as an inflexible, planned in advance and formulated, and is typically supported by a large specimen (Churchill & Iacobucci 2004; Hair *et al*. 2003)

For this research, quantitative research is used in the studies on how the supervision skills (time-management skill, technical skill, and communication skill) effect on the construction performance among site supervisors. To achieve the objectives in this study, questionnaires (quantitative) will be conducted as a method to collect data. Figure 1 below show the research flow chart.
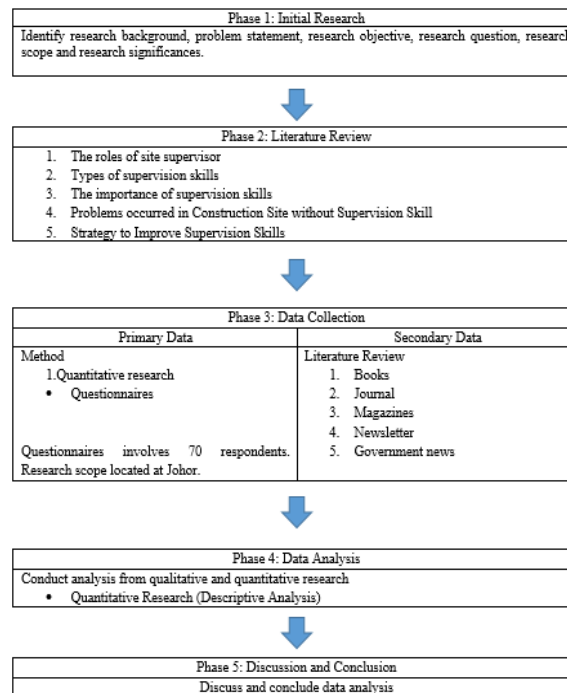
3.2 Research Flow Chart

| Phase 1: Initial Research |
| --- |
| Identify research background, problem statement, research objective, research question, research scope and research significances. |

| Phase 2: Literature Review |
| --- |
| 1. The roles of site supervisor |
| 2. Types of supervision skills |
| 3. The importance of supervision skills |
| 4. Problems occurred in Construction Site without Supervision Skill |
| 5. Strategy to Improve Supervision Skills |

| Phase 3: Data Collection | |
| --- | --- |
| Primary Data | Secondary Data |
| Method | Literature Review |
| 1.Quantitative research | 1. Books |
| • Questionnaires | 2. Journal |
| | 3. Magazines |
| | 4. Newsletter |
| Questionnaires involves 70 respondents. Research scope located at Johor. | 5. Government news |

| Phase 4: Data Analysis |
| --- |
| Conduct analysis from qualitative and quantitative research |
| • Quantitative Research (Descriptive Analysis) |

| Phase 5: Discussion and Conclusion |
| --- |
| Discuss and conclude data analysis |

**Figure 1: Research Flow Chart**

3.3 Data Collection

Data collection can be defined as a method to collect and evaluate data on interesting variables in an established systematic way to make one answer specific research questions, test hypotheses and evaluate results (Kabir, 2016). Generally, data collection methods were divided into two which are primary and secondary data. This research was based on primary and secondary data collection. The sources related to supervision skill of site supervisors were gathered and analyzed to identify the problems caused by supervision, importance of supervision skill and strategies to improve the supervision skill among site supervisors in the construction industry.

*(a) Quantitative Data*

Quantitative analysis approaches are distinguished by information collection that can be interpreted numerically, usually presenting findings using numbers, tables and graphs (Acaps, 2012). Quantitative data is empirical in nature, and can be measured mathematically.

*(b) Primary Data*

Primary data is data that is collected by a researcher himself/herself from the first experience sources. An advantage of using primary data is that the researchers collect information for their

study's specific purposes. Researchers use primary data such as surveys, questionnaires, interviews and experiments to collect data for their research (Ajayi, 2017).

*(c) Secondary Data*

Secondary data refers to data already collected by someone for his/her research purposes which provide basic research principles (Mike, 2017). Researchers can use secondary data for their research when faced with limited time and resources on their study. Secondary data can be collected from published articles, the data available in the text, tables, graphs, and appendices of the published articles, or upon the original data (Church, 2002).

## 3.4 Research Instruments

Research instruments are simply tools for obtaining information relevant to research projects (David & Peter, 2003). The key instruments that are used in this study of quantitative method consist of closed, open-ended questionnaires. In this study, quantitative data is collected through closed-ended questionnaires and through open-ended questionnaires. The questionnaire items are built mainly on the basis of the research goals and research questions.

*(a) Questionnaire*

According to Paul (2008), questionnaire is a research tool that consists of a set of questions for the purpose of collecting data from respondents. 70 sets of questionnaires in mail form will be used to publish among the population of site supervisors to get the responses. Google Forms may be considered as a platform to distribute all the questionnaires to the respondents via email, WhatsApp, and Facebook.

## 3.5 Population

Population refers to a complete set of cases or group members to whom the research applies (Saunder *et al.*, 2009). The research population for this study comprised all the site supervisors in the Johor area. This research focused on the supervision skill of site supervisors in residential projects; thus, the target population was the site supervisors in the construction sector.

*(a) Sampling*

According to Latham (2007), the sampling method is taking a representative selection of the population and utilizing the information collected as research data. 70 site supervisors as respondents will be chosen to answer the questionnaires.

## 3.6 Response Rate

A total of 70 sets of questionnaires have been distributed to site supervisors in Johor, Malaysia but only 51 sets were getting back. The response rate 72.86%.

## 3.7 Data Analysis

*(a) Descriptive Analysis*

The data retrieved from the questionnaire were analyzed using 'Statistical Package for Social Science' (SPSS). The computer-based statistical package helps in generating statistical result based on numerical form. Since SPSS enable the dealing with large amounts of data and can perform all the analysis covered in the text, it's convenient and easy to interpret the data.

*(b) Correlation Analysis*

Correlation analysis was used to see the differences, relationships or influence between independent variables and dependent variable of the study (Sekaran & Bougie, 2019). Correlation

analysis was conducted to determine the relationship between independent variables (personnel quality training, innovative construction technology and collaboration of supervision team) and dependent variable (supervision skills). This research emphasizes the three strategies play a role as independent of the relationship between the supervision skills among site supervisors.

## 4. Findings and Discussion

4.1 Demographic Analysis

The background information of the respondents was analyzed which include types of project sector, types of residential project, number of workers in construction site, types of most workers in construction site and experience of respondent in construction sector.

*(a) Respondents' Demographics Information*

The majority of the respondents were working in the private sector (86.3%) while the rest were working in the government sector. The types of residential projects were apartment or condominium (33.3%), bungalow (15.7%), semi-detached (17.6%), terrace (21.6%) and others residential (11.8%). 49% of the respondents had more than 40 workers in their construction site followed by 10 – 19 workers (21.6%), 20 – 29 workers (13.7%), 30 – 39 workers (9.8%) and 5.9% of respondents had less than 10 workers. The study comprises 23.5% of local workers and 76.5% foreign workers in construction sites. The respondents have 1 – 3 years' experience in the construction industry with 35.3%, followed by 3 – 6 years (31.4%), less than 1 year (11.8%) and more than 6 years (21.6%).

4.2 Descriptive Analysis

The descriptive analysis in this research aims to examine what the site supervisor's perception is towards the problem and importance of the supervision skills in the construction industry.

*(a) Traits of Problem in Supervision Skills*

### Table 1: Mean Analysis of Problem in Supervision Skills

| Element | Mean |
|---|---|
| Delays of construction project | 4.0098 |
| Inappropriate usage of construction materials | 3.4706 |
| Poor Teamwork | 3.5922 |

Table 1 illustrates the statistical results for the problem of supervision skills being faced by site supervisors in the construction industry. Problem of 'Delays of Construction Project' scored the highest mean among all the problems which is 4.0098. The mean of 'Poor Teamwork' and 'Inappropriate Usage of Construction Materials' are 3.5922 and 3.4706, respectively. To summarize, 'Delays of Construction Project' is the main and frequent problem being faced by most of the site supervisors in the construction industry.

*(b) Traits of Importance in Supervision Skills*

### Table 2: Mean Analysis for Importance of Supervision Skills

| Element | Mean |
|---|---|
| Importance of time-management skill | 4.2353 |
| Importance of technical skill | 4.2010 |
| Importance of communication skill | 4.1412 |

Table 2 illustrates the statistical results for supervision skill among site supervisors in the construction industry. Importance of 'Time-management skill' scored the highest mean among all the problems which is 4.2353. The mean of 'Importance of technical skill' and 'Communication skill' are 4.2010 and 4.1412 respectively. To conclude, 'Importance of time-management skills' is the most important supervision skill that needs to be focused for site supervisors in the construction industry.

(c) Traits of Strategies to Improve Supervision Skills

**Table 3: Mean Analysis for Strategies to Improve Supervision Skills**

| Element | Mean |
|---|---|
| Personnel Quality Training | 3.9935 |
| Innovative Construction Technology | 3.9020 |
| Collaboration of Supervision Team | 4.0392 |

### 4.3 Normality test

Normality test is used to determine whether a parametric test can be used or not. There are two tests which are Kolmogorov-Smirnov (K-S) test and Shapiro-Wilk (S-W) test are designed to test the normality of the data by comparing the data to the normal distribution. This study is using a Kolmogorov-Smirnov test due to the number of respondents are 51. If the value of $p > 0.05$, it can be concluded that the data are normal whereby if the value of $p < 0.05$, the data is non-normal, and Spearman's rho should be conducted in the correlation analysis.

**Table 4: Kolmogorov-Smirnov Test**

| Variables | Kolmogorov-Smirnov[a] | | |
|---|---|---|---|
| | Statistic | df | Sig. |
| Personnel Quality Training | 0.182 | 51 | 0.000 (Non-normal) |
| Innovative Construction Technology | 0.231 | 51 | 0.000 (Non-normal) |
| Collaboration of Supervision Team | 0.203 | 51 | 0.000 (Non-normal) |
| Supervision Skills | 0.148 | 51 | 0.007 (Non-normal) |

The Kolmogorov-Smirnov test shows that the significant value for each dimension which is personnel quality, innovative construction technology, collaboration of supervision team and supervision skills are less than 0.05, which explains that all the data are non-normal. Hence, Spearman's rho was used in the correlation test.

### 4.4 Correlation Analysis

In this study, Spearman Rho's correlation will be used to measure the relationship between two variables.

*(a) The relationship between Strategy and Supervision Skills*

**Table 5: Result of Correlation Analysis**

| Hypothesis | Variables | Correlation rank (r) | Significant (p) |
|---|---|---|---|
| H1 | Personnel Quality Training | 0.378 (3) | 0.006 |
| H2 | Innovative Construction | 0.440 (2) | 0.001 |

| | | | |
|---|---|---|---|
| H3 | Technology Collaboration of Supervision Team | 0.514 (1) | 0.000 |

** Correlation is significant at the 0.01 level (2-tailed)

Table 5 shows the Spearman correlation results for the relationship between all the variables and supervision skills. From the table, Personnel Quality Training found to have a moderate relationship with supervision skills (r = 0.378, p < 0.01), followed by the innovative construction technology (r = 0.440, p < 0.01) and lastly collaboration of supervision team (r = 0.514, p < 0.01).

*(b) Summary of Hypothesis Testing*

**Table 6: Summary of Hypothesis Testing**

| Hypothesis | Summary |
|---|---|
| H1: There is a positive relationship between personnel quality training and supervision skills among site supervisors in Johor, Malaysia. | Accepted |
| H2: There is a positive relationship between innovative construction technology and supervision skills among site supervisors in Johor, Malaysia. | Accepted |
| H3: There is a positive relationship between collaboration of supervision team and supervision skills among site supervisors in Johor, Malaysia. | Accepted |

4.5 Discussion

Based on the result for first objective, the mean value for each problem of supervision skills being faced by the site supervisor in the construction industry. The results show that the most serious problem is delays of construction projects in the highest mean score of 4.0098. Delays of construction projects are the problem of supervision that site supervisors most agree. This is because delays of construction projects scored the highest mean value (4.0098) among all. As the previous study stated the lack of supervision skill especially time management strongly influences the worker productivity because the supervisor did not manage the workers well as their selected positions that need to be completed (Sue, K. *et al.* 2007). Furthermore, project teams, especially site supervisors, are slow in making decisions that may stand for major cause delays in construction sites (Chan, 1997).

Next, the results show that the second highest mean is poor teamwork with a mean range of 3.5922. Teamwork is the ability to join individuals who work in an efficient and effective manner to arrive at a set goal in a construction project (Wao & Joel, 2013). Most construction project ventures require teamwork to achieve the required objectives and meet client's ever increasing and changing requirements (Wao & Joel, 2013). Poor teamwork will occur in the construction site when there is not clear and good instruction from the supervisor (Louis, 2017).

Lastly, the third problem of supervision skills being faced by site supervisors in the construction industry is inappropriate usage of construction materials which have the lowest mean score of 3.4706. In the actual construction, some of the site supervisors sought to obtain more economic benefits (Ogunsemi, D.R., (2002). They have the behaviours such as shoddy work on the use of construction materials which seriously threaten the quality and safety of the project (Taiwo, A., Afolami, J., 2011). This will cause problems of the quality of buildings thus bringing harm to the people (Folagbade, S.O., 2002). The lack of supervision skill will totally affect the quality and safety of the construction project.

Based on the result for second objective, the mean value for each importance of supervision skills among site supervisors in the construction industry. The highest mean is 4.2353 which is the importance of time-management skill. This is because the importance of time-management skill scored the highest mean value (4.2353) among technical skill and communication skill. The purpose of time-management skill is to improve our career and help the project complete work on time (Alvarez Sainz, Ferrero, & Ugidos, 2019). According to Balog, Mindas and Knapcikova (2016), saving time helps companies to save money and increase productivity.

Next, the second highest mean is importance of technical skill, scored a mean of 4.2010. Technical skill involves the importance of a safe work environment and provides guidance in how to secure that safe work environment (Ibrahim, Muhamad Noor, Nasirun, & Ahmad, 2018). Site supervisors are responsible for an excellent deal of what goes on day to day within the workplace. It is not just a footing that solely assigns tasks. Supervisors must ensure a secure and safe workplace for workers. Workers must be able to report unsafe or dangerous workplace conditions or hazards to a supervisor without concern of reprisal (Ibrahim *et al.*, 2018).

Lastly, the lowest mean is 4.1412 which is important for communication skill. Communication skill is the most time-consuming skill than time-management and technical skill because site supervisors generally spend a lot of time communicating with workers in site (Manmohan, 2016). They coordinate the contributions to the project of many different entities, including subcontractors, suppliers, designers and ever the client (Management, 1995). They design, implement and monitor construction processes. All of this is accomplished through communication skills.

Based on the result for third objective, the mean value for each strategy to improve supervision skills among site supervisor in the construction industry. The highest mean 4.0392 which is the collaboration of supervision team. This is because collaboration of supervision team scored the highest mean value (4.0392) among personnel quality training and innovative construction technology. To perform on-site quality supervision, experienced and talent supervisor must be assigned by the company to increase the site performance and productivity of the construction project (Service, 2012).

Next, the second highest mean is personnel quality training, scored a mean of 3.9935. According to Candace (2013), training is critical to efficiency especially for supervisors who need to improve supervision skills in term of time-management skill, communication skill and technical skill. Attend training will benefit supervisor to learn some valuable construction supervision skills and technical which improve construction site productivity on the project (Odusami *et al.*, 2007).

Lastly, the lowest mean is innovative construction technology which scored 3.9020. Technology is the invention, modification, use and awareness of resources, devices, techniques, crafts, systems, organizational methods to solve a problem, to develop a pre-existing solution to a problem, to accomplish a goal or perform a specific purpose (Skibniewski & Zavadskas, 2013).

Discussion for forth objective of this study is as the following hypothesis:

*(a) Personnel Quality Training*

For this study, personnel quality training is based on the potential of training that can improve the supervision skills either positively or negatively among site supervisors in the construction industry. H1 indicates that there is a positive relationship between personnel quality training and supervision skills among site supervisors. The results showed significant positive correlation coefficients between personnel quality training and supervision skills ($r = 0.378$, $p < 0.01$), demonstrating that H1 is accepted.

*(b) Innovative Construction Technology*

H2 indicates that there is a positive relationship between innovative construction technology and supervision skills among site supervisors in the construction industry. The results showed that significant positive correlation coefficients between innovative construction technology and supervision skills ($r = 0.440$, $p < 0.01$), demonstrating that H2 is accepted. Hence, the result indicated that the strength of association between innovative construction technology and supervision skills was moderate.

*(c) Collaboration of Supervision Team*

H3 indicates that there is a positive relationship between collaboration of supervision team and supervision skills among site supervisors in the construction industry. The results showed significant positive correlation coefficients between collaboration of supervision team and supervision skills ($r = 0.514$, $p < 0.01$), demonstrating that H3 is accepted. The result indicated that the strength of association between collaboration of supervision team and supervision skills was strong.

Based on the result, the three hypotheses (H1, H2 and H3) of this study are accepted as they achieved a significant level ($p < 0.05$). According to the correlation analysis, the personnel quality training, innovative construction technology and collaboration of supervision team to improve the supervision skills among site supervisors in the construction industry. The discussion on the findings of the study is required in observing the degree of agreement or the degree of disagreement between the current study and the previous study. All the discussions are not just looking for the past literature to support the current findings but also need to identify the applicability of the research measures and their applicability in a local setting as it is commonly used by the researchers.

## 5. Conclusion

Based on the findings of this study, it helps site supervisors to understand the problem and importance of supervision skills in achieving superior performance in their working environment. Moreover, it provides several strategies of implementing effective supervision skills that may be useful for site supervisors, future researchers and also practitioners.

The research was carried out to identify the problems of supervision skill being faced by the site supervisors in the construction industry, to determine the importance of supervision skill of site supervisors in the construction industry and to suggest the strategies to improve supervision skill among site supervisors in the construction industry. Research methodologies such as descriptive and correlation analysis were conducted to achieve the objectives of this study. For Objective 1 and 2, the results showed that the most serious problem occurred in the construction site is delays of construction projects while the most important skills to improve supervision tasks are developing the skill of time-management among site supervisors in the construction industry respectively. For Objective 3, the result had shown three hypotheses are accepted of the relationship of strategy and supervision skills. Moreover, in the data analysis related to above hypotheses, it was result that the collaboration of supervision team is the highest value which most of the site supervisors agreed that team collaboration is the effective and significant strategy to improve the supervision skills among site supervisors in the construction industry. The researcher hoped that more focus on this research of supervision skill of site supervisors to create a productive work environment in the construction site and explored information about the effective supervision skills to meet the standards as well as an improvement for the future supervision in the construction industry.

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