

# Quality planning in Construction Project

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**Abstract.** The purpose of this paper is to investigate deeper on the factors that contribute to the effectiveness of quality planning, identifying the common problems encountered in quality planning, practices and ways for improvements in quality planning for construction projects. This paper involves data collected from construction company representatives across Malaysia that are obtained through semi-structured interviews as well as questionnaire distributions. Results shows that design of experiments (average index: 4.61), inspection (average index: 4.45) and quality audit as well as other methods (average index: 4.26) rank first, second and third most important factors respectively.

Keywords: quality planning, construction, projects, design, audit

## 1. Introduction

The concept of quality planning in construction projects is to guarantee efforts to accomplish the necessary level of quality for the outcome which are well planned and organized. It is vitally required for a construction company to have an effective quality management system as it helps organizations in improving customer satisfaction whilst providing the organization with a competitive advantage over fellow competitors within the industry [1]. It is about obtaining customers' satisfaction that would lead to long term competitiveness and business survival for the companies by maintaining the quality of construction activities at a mandatory standard.

### 1.1. Background of Study

The term quality is defined as fitness for use [2]. It is about achieving or going beyond customer expectations at a price that signifies a value to them. Generally, quality project planning is to produce the deliverables of the project successfully using the establishment of asset of directions in sufficient fact to inform the project team exactly what must be done, when it must be done and what resources to use in [3][4].

### 1.2 Problem Statement

As observed throughout the years, the achievement of adequate levels of quality in the construction industry has been a setback due to non-existent and poor quality of planning practices, a lot of the construction projects do not achieve their targets [5],[6] where by major outflows of time, money and resources, both human and material are wasted each year[7],[8]. As a result, the need for improvement in project success in the construction industry is the main motivation for this research. This study focuses



particularly on the quality planning stage of a project, due to its high magnitude in determining project success.

### 1.3 Objectives and Scope of Study

The objectives of the research are to identify factors that contribute to the effectiveness of quality planning in construction project. Investigate problems that are encountered in quality planning for construction project and determine the improvements that can be implemented for quality planning in construction project.

## 2. Literature Review

In general, Quality is the characteristic element of an item that can be evaluated as a meeting standard, whereby if it meets or exceeds the standard, it can be said to be of good quality or high quality. However if the item does not meet the standard, it is considered poor quality [9]. Quality Planning is about identifying which standard is relevant to the project and determining how to satisfy them [10].



**Figure 1.** Approaches to conformance in Quality Management [11]

Based on the Figure 1 above, there are four basic approaches identified in Quality Management, which are the quality planning, quality control, quality assurance and quality improvement [11]. Quality Planning is basically one of the steps in Quality Management. In order to proceed with the do, check and act, it is essential to prepare quality plan ahead of time in order to produce quality outcome. Quality management provides the environment within related procedures, techniques and tools that can be deployed effectively leading to the project success [12].

## 3. Methodology

This research is carried out in two stages whereby firstly, factors from literature review were identified. Secondly, a questionnaire survey methodology is employed to determine and rank these factors based on their levels. The survey questionnaires are sent via online survey form to seniors and known associates. The questionnaires also are sent via hand delivery to 50 respondents either engineer, superintendent officer, quantity surveyor and interns. The response rate for the questionnaire survey is about 68% which is very much higher than the normal rate of 20% and 30% for most postal questionnaire surveys of the construction industry. The analysis of survey is done by Relative Importance Index (RII) method. The scores are then transformed to importance indices based on the following formula. The analysis also was based on the qualitative measurement or ranking system. Rating for the questionnaire is 1 – Totally Disagree, 2 – Disagree, 3 – Moderately, 4 – Agree, 5 – Totally Agree. The Average Index Formula as follow [13]:

$$\text{Average Index (AI)} = \frac{\sum (\beta \times n)}{N}$$

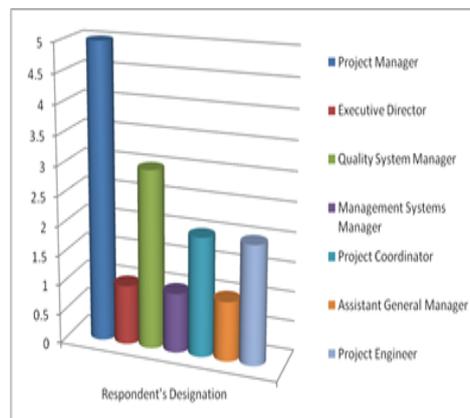
Where,  $\beta$  is weighing given to each factor by respondents

$n$  is the frequency of the respondents

$N$  is the total number of respondents

#### 4. Result and Discussion

The questionnaires had been distributed to the professional in construction projects and government agency. A total of 50 questionnaires for the total of industry are distributed through self-delivery of hardcopy questionnaires and email to the companies involved. Figure 2 shows the respondent's designation which consist of project manager, executive director, quality system manager, management systems manager, project coordinator, assistant general manager and project engineer. Respondent's designation category is much important in this research as it adds validity to set opinions and ideas of respondents on problems in quality planning in construction project in Malaysia. Project managers have the highest proportion (33.3%) and lowest are Executive Director, Management Systems Manager and Assistant General Manager (6.67%).



**Figure 2.** Respondent Designation

Figure 3 illustrates the area of experience in quality planning for respondent. Having been allowed to identify the perspective with one or more quality planning functions, the respondents showed a relatively uniform representation of the functions in quality plans, with design of experiment and inspection as highest areas of experience. Quality audit and other methods as the second most common areas of expertise among the respondents.



**Figure 3.** Area of experience in Quality Planning

Table 1 shows the ranking for each of the aspect included in the questionnaire. The aspect ranking is analysed by using Average Index Formula method.

**Table 1.** Important Aspect in Quality Planning

Rank	Important Aspects	Average Index
1	Benefit/cost analysis	4.01
2	Benchmarking	4.13
3	Flowcharting	4.1
4	Design of Experiments	4.61
5	Cost of Quality	4.06
6	Quality Audits	4.26
7	Inspection	4.45
8	Control Charts	4.24
9	Pareto Diagram	4.03
10	Statistical Sampling	4.24
11	Trend Analysis	4.09
12	Any Other Methods	4.3

The important factors or aspects in quality planning agreed by respondents are the design of experiments (average index: 4.61), inspection (average index: 4.45) and quality audit as well as other methods (average index: 4.26) rank first, second and third most important aspect respectively. It is expected that design of experiments (DOE) ranks first because it is an essential method in quality planning. DOE is the design of any information-gathering exercises where variation is present, whether under the full control of the experimenter or not. It should be simultaneous with the project objectives and goals to have an effective integration with the project. If DOE is not carried out properly, it can create problems during the execution of the project. Inspection which is the next most important aspect from the ranking is so significant in quality planning because inspection is one of the most important elements in achieving a successful construction project. Proper inspection requires sound judgment, diplomacy, procedural knowledge, effective inspection techniques, and complete and accurate documentation. Quality audit is also another important aspect in the quality planning because it affects the project flow and systems in different ways. Quality audit is basically the process of systematic examination of a quality system carried out by an internal or external quality auditor or an audit team. It is an important part of organization's quality management system and is a key element in the ISO quality system standard, ISO 9001.

However, the least important aspect from the ranking are pareto diagram (average index: 4.03), Cost of Quality (average index: 4.06) and Trend Analysis (average index: 4.09). Probably, pareto diagram is insignificant to them for some reason. One of the reason might be because it is a type of chart that contains both bars and a line graph which is not accurate enough to contribute in quality planning. Inaccuracy can result in decrease in chances of achieving a quality project execution. Cost of quality is among the bottom ranked aspect as it is the general perception, that higher quality requires higher costs, either by buying better materials or machines or by hiring more labour where by in current projects, the cost are basically limited and fully dependant on the country's economy causing the priority of extra expenditures to be less prioritized. Trend analysis is rank as number 10 because most of the companies prefer their own personal methods and project flow, rather than analyse trends of other projects.

## 5. Conclusion

The purpose of this study was to identify important aspects or factors that contribute to the effectiveness of high-quality planning construction projects. The study was conducted through survey questionnaires, and semi-structured interviews with project team members in Malaysia. The research results showed that Malaysian construction companies used in the study exposed to light different approach to quality. The results indicated several barriers to planning for quality, including a lack of quality enterprise culture

and the difficulty of developing a plan for long-term quality. The study also showed that most companies are reluctant to change their current practice because clients are not driving a high quality approach based on the selection of the contractor. The observed results indicate that the economic crisis that disrupted over the development of a quality plan. Generation of the results of this study, the following conclusions can be made for the construction industry. The planning process identified the common quality on the basis of the study will be useful for other contractors, subcontractors especially the lower graduates who do not have a quality system in practice. Therefore, it is important to conduct training programs to improve the knowledge of Malaysian entrepreneurs in these areas and approach to quality planning feasible and attractive enough to participate in the larger market. The concept of quality planning should still be educated, and a process that is suitable for the construction industry while overcoming the obstacles identified should be developed to achieve better results with investing in quality.

### References

- [1] Meredith, J. R. and Mantel, S. J. (2006), *Project Management – A Managerial Approach*, 6th ed., Wiley, New York, NY.
- [2] Harris, F., & McCaffer, R. (2001). *Modern Construction Management* (5th ed.). Oxford: Blackwell Science Ltd.
- [3] Turner, J.R. (1999), *The Handbook of Project-based Management: Improving the Processes for Achieving Strategic Objectives*, McGraw-Hill, London.
- [4] Leung, M. Y., Ng, S. T. and Cheung, S. O. (2004), *Measuring Construction Project Participant Satisfaction*, *Construction Management and Economics*, Vol. 22 No. 3, p.319.
- [5] Kerzner, H. (2006), *Project Management: A Systems Approach to Planning, Scheduling and Controlling*, 9th ed., Wiley, New York, NY.
- [6] Robinson, H. S., Carrillo, P. M., Anumba, C. J. and Al-Ghassani, M. (2005), *Review and Implementation of Performance Management Models in Construction Engineering Organisations*, *Construction Innovation*, Vol. 5 No. 4, pp. 203-217.
- [7] Tan, C. K., & Abdul-Rahman, H. (2005). *Preliminary Research into Overcoming Implementation Problems in Construction Projects*. *Proceeding of the 4th Micra Conference*. Faculty of the Built Environment, University Malaya, pp. 08.15-08.28.
- [8] D.A.Bumb, D. M. Ghaitidak (2016), *Study of Quality Assurance and Quality Management System in Multi storey RC Building*, *International Journal on Recent and Innovation Trends in Computing and Communication* ISSN: 2321-8169 Volume: 4 Issue: 5, pp. 112 – 113.
- [9] Sarshar, M., Haigh, R. and Amaratunga, D. (2004), *Improving Project Processes: Best Practice Case Study*, *Construction Innovation*, Vol. 4 No. 2, pp. 69-82.
- [10] Biggar, J. L. (1990). *Total Quality Management in Construction*. *Transactions of the American Association of Cost Engineers*, Q.1.1-Q.1.4.
- [11] Dissanayaka, S. M., Kumaraswamy, M. M., Karim, K., & Marosszeky, M. (2001). *Evaluating Outcomes from ISO 9000 - Certified Quality Systems of Hong Kong Constructors*. *Total Quality Management*, 12(1), pp. 29-40.
- [12] Abdul-Rahman, H. (1996). *Some Observations on the Management of Quality among Construction Professionals in the UK*. *Construction Management and Economics*, 14, 485-495.
- [13] Majid, M. Z. & McCaffer, R. (1997). *Discussion of Work Performance of Maintenance Contractors in Saudi Arabia*. *Journal of Management in Engineering ASCE*, Vol. 13, No. 5, Pg. 91.