

Implementation of Quality Management System in Construction

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ABSTRACT : Improving the quality needs to be done by the construction company, often followed by an increase in the cost of quality. One way that companies use to improve the quality of construction is to implement a quality management system. The application of the quality management system is expected to reduce the cost of quality. Many companies engaged in construction services have received ISO 9001: 2008 and implement it in the implementation of projects of construction services. The problems of this research are how the application of the quality of ISO 9001: 2008 and what factors are an obstacle in the implementation of quality standards that affect the value of ISO 9001: 2008 on the construction project. The data collected in this study are primary data and secondary data, where primary data are conducting interviews with Hananan contractor company in the city of Banda Aceh, which has been certified. Assessment of the implementation of quality of ISO 9001: 2008 standards (clause 4 to clause 8) is done using the method of audit scores and variable measurement scale using the Likert Scale. From the data analysis of the implementation of ISO 9001: 2008 at Hananan company in the city of Banda Aceh, obtained a percentage of the average assessment of the implementation clause 4 to clause 8 of 87% was Very good ($81\% \leq \text{Score} \leq 100\%$). Factors to be obstacles in the implementation of ISO 9001: 2008 is the labor factor (human resources), methods or procedures of work, and material or documents.

Keywords: Quality Management System, ISO 9001: 2008, Clause, Likert Scale, Contractors

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I. INTRODUCTION

In the implementation of construction in Indonesia, encountered many construction failures to cause one of them as a result of construction work that is not in accordance with the specified quality standards, construction companies need to improve the quality of the project in accordance with market needs and technological innovation (KPMG, 2012). Occurrence of damage and the collapse of several new school buildings, and so forth, it happened because of the low awareness of construction work that meets the expected qualifications. The results of the investigation, many construction failures caused by failure to apply the standards of quality of the construction and the incompatibility of quality of work which generally do not follow the directives of quality that has been set in the document technical specifications of each job.

In improving contractor performance and optimize the cost of the project, Davis et al. (1989), Abdul-Rahman (1993,1995), Low and Yeo (1998), Love and Li (2000), Rauzana (2016a), Rauzana (2015), Rauzana (2017) and Barber et al. (2000), among others, by means of measuring the cost of quality. Quality costs are costs that occur before and after the product or service is completed (Love et al. 1999).

Quality management can be run through Total Quality Management (TQM), which is actually a master of all the existing quality management system, because TQ includes all aspects of contractor activities that must be managed properly so that the quality of work can satisfy the project owner. According to some authors such as (Chan and Chen, 2004; Ramirez, 2004; Belout and Gauvreau, 2004; Nguyen, 2004; Palacios, 2010; Doloi and Lim, 2007; Rauzana 2016b; Rauzana 2016c; Rauzana 2016d) resource management is very important to improve quality management, cost control and time. ISO 9001: 2008 is a quality management system that is the principle of TQM system is very popular because of its application detailed and systematic. Moreover, in it there's a need periodic internal quality control (Internal Quality Audit). According to Villamil 2015, the risk factors that lead to low quality of projects due to a lack of cooperation within the project team involved, the lack of observation of field supervisors or team, too imposing low cost and fast schedule, inflation and rising material

costs. The poor quality of the project is one of the risks that must be addressed, in dealing with the risk of a much needed project risk management (Haimes, 2005).

Today, the ISO 9001: 2008 to be the top choice for contractors who want to implement a quality management system consistently and systematically. (Wiryodiningrat, 1997). ISO 9001: 2008 shows contractors have real evidence that is recognized nationally and internationally that the company actually has implemented quality management in the production process. The study aims to determine how the application of quality management with reference to ISO 9001: 2008 in Hananan company in the city of Banda Aceh. Based on the above, the problems to be discussed in this study are:

1. How the application of quality standards ISO 9001: 2008 implemented by the contractor in the city of Banda Aceh.
2. What are factors of Constraint in the implementation of ISO 9001: 2008 on contractors in the city of Banda Aceh.

1.1 Quality Management System

According to various authors (Munns and Bjeirmi, 1996; PMI, 2008; Roldão, 2007; Lewis, 2007; Navas, 2008) definition of the project is an activity that is unique and has a start time and end of the project, activities are not repeated, and has the goal of having a cost effective, time efficient, and the quality was good. One of the factors that affect the low quality of infrastructure related to errors in the procurement for the construction work, which is the process of acquisition of the various resources that will realize the planned building construction (Hughes et.al, 2006; Watermeyer, 2012; Mohsini & Davidson, 1989).

The notion of quality in terms of conventional definitions generally reflects the characteristics directly from a product such as: reliability, easy to use. The notion of quality in terms of strategic definition, where quality is everything in accordance with the needs and desires of customers. (Gaspersz, 2001). Quality is the appropriate product to meet customer needs and customer satisfaction (Suardi et al, 2004).

According to Hurlock (2004), the risk factors that affect the quality is the problem the design, specification ambiguous, construction issues, and issues a third party. Design changes caused by errors and changes in scope and specifications of the work. Kalayjian (2000) states that the project risk factors that often happens is that the project scope is ambiguous, inaccurate estimates, the boundary is not clearly, and inflation. According to Pires et al. (2007), failures in construction projects due to risks related to quality.

According Gaspersz, 2001, the quality management system focused on the consistency of the work process, quality management system based on prevention of mistakes that would arise, the quality management system includes Clauses: objectives, customer, output, processes, input, suppliers, and measurements for feedback and feed forward. According to some authors such as Yang, 2001; Chau, 2004; Singh, 2011; Chau, 2003, which affecting the quality of the project are the stakeholders involved in the project.

Quality management systems often referred to as Quality Control and Quality Assurance. Quality Control is engineering activities and activity monitor, evaluate and follow-up order to the terms that have been set is reached, while the term Quality Assurance means all planned and systematic actions applied, to reassure customers that the process of the work the contractor will meet the requirements.

1.2 Benefits Implementation of ISO 9001: 2008

The quality management system ISO 9001 2008. The revised outline of ISO 9001: 2008 is not too much different from its predecessor ISO 9001: 2008. As for the differences between versions 2000 and 2008 were significantly more emphasis on the effectiveness of the processes implemented within the organization. (Syukur, 2010). ISO 9001: 2008 is not a product standard, ISO 9001: 2008 is only a quality management system standards. Decreasing quality because of inflation factor, and also the economic cycle. In times of prosperity.

The benefits of implementing ISO 9001: 2008 has acquired many companies including the following (Gaspersz, 2001):

- a. Increase customer confidence and satisfaction through quality assurance of organized and systematic.
- b. Companies that have been certified ISO 9001: 2008 are permitted to advertise to the mass media.
- c. Improving the quality and productivity of management through cooperation and better communication
- d. Improving the quality awareness within the company.

II. REQUIREMENTS OF ISO 9001:2008

Contractors who wish to obtaining ISO 9001: 2008 can follow the steps outlined as follows (Gaspersz, 2001):

1. The commitment of top management
2. Establish a steering committee or coordinator of ISO
3. Study the requirements of the quality management system ISO 9001: 2008.

4. Implement a quality management system ISO 9001: 2008.

ISO 9001: 2008 consists of eight clauses as follows:

- 1) Clause One : Scope
In terms of this clause has emphasized the standard requirements to meet customer satisfaction
- (2) Clause Two : Normative References
This clause only contains references to be prepared by the contractor, namely:
 - a. Government Regulation
 - b. The manuals on quality
- (3) Clause Three : Terms and Definitions
This Clause states that the terms and definitions given in ISO 9001: 2008 is to establish, document, implement, maintain of measures for implementation of quality management system ISO 9001: 2008 and the need for continuous improvement.
- (4) Article Four: Quality Management System
The general requirements in lead and run an organization needs systematic management
- (5) Clause Five: Management Responsibility.
The verse emphasizes the commitment of top management. Associated with customers, top management must ensure that customer satisfaction has been met
- (6) Clause Six : Resource Management
Resource provider organizations must be able to provide the resources required to implement and maintain a quality management system ISO 9001, and always improving customer satisfaction.
- (7) Clause Seven : Product realization
In terms of product realization planning organizations must ensure that the product realization processes are under control, in order to meet product requirements.
- (8) Clause Eight : Measurement analysis and improvement
The general requirements in Clause 8 of the measurement, analysis and improvement, which the organization should establish a plan and implement process measurement, monitoring, analysis and improvement to ensure conformity of the product.

III. MATERIALS AND METHODS

In general, the contents of the questionnaires that have been submitted to the respondents are as follows:

- a. The procedure for filling the questionnaire
Explanation of the procedures for filling the questionnaire carried out before the respondents fill out the questionnaire, this was done so that the respondent did not make a mistake in filling out the questionnaire.
- b. Fill in the questionnaire
The purpose is to fill out questionnaires to determine how does the application of quality ISO 9001: 2008 implemented by the contractor in the city of Banda Aceh and what factors become an obstacle in the implementation of quality standard ISO 9001: 2008 on contractors in the city of Banda Aceh.

According Johnson (2000), data collection is a technique for physically obtaining data to be analysed in a research study. The data collected should be in accordance with the processing techniques to be used to answer the research questions of the study. This research uses previously collected data that has been identified from previous research. The data used in this study consisted of primary data and secondary data. Primary data were questionnaire survey. Secondary data were obtained through the study of literature. Where survey questionnaire distributed to Hananan contraction company in the city of Banda Aceh. At this stage, data collection techniques of observation, the results of questionnaires and interviews, questionnaires distributed to contractors who have received ISO 9001: 2008 in the city of Banda Aceh, Indonesia. Respondents in this study were the project manager, site manager, and field implements. In analyzing the data from the interviews implementation of ISO 9001: 2008 in the contracting company, assessment / scoring given to each question of Clause 4 to Clause 8, with the following criteria (Sugiyono, 2009):

- (1) Score 1 (Very Poor)
 - a. The lack of Quality Management System
 - b. The lack of documentation
 - c. The lack of Application
- (2) Score 2 (Poor)
 - a. The existence of Quality Management System
 - b. The lack of documentation
 - c. The lack of Implementation in the field
- (3) Score 3 (Medium)

- a. The existence of Quality Management System
- b. The existence of documentation, but disorganized
- c. Implementation of ISO is not made in full in the field, (applied 41-60%)
- (4) Score 4 (Good)
 - a. The existence of Quality Management System
 - b. The existence of documentation and well-organized
 - c. Implementation of ISO is not made in full in the field, (applied 61-80%)
- (5) Score 5 (Very Good)

Quality Management System and documentation are in accordance with ISO 9001: 2008 and its application has been fully implemented in the field (applied 81- 100%).

For the Likert Scale assessment categories are as follows: (Sugiyono, 2009):

- a. Very Good (81% to 100%)
- b. Good (61% to less than 80%)
- c. Medium (41% to less than 60%)
- d. Poor (21% to less than 40%)
- e. Very Poor (less than 20%)

The results of the assessment of questionnaire who had been tabulated, then calculated using the following formula:

$$\text{Score} = \frac{\text{Total Score (A)}}{\text{Total value (B)}} \times 100\%$$

Where:

Total Score (A) = Total Score (1-5)

Total value (B) = Total value of the maximum score for each clause.

IV. RESULTS AND DISCUSSION

Data collection techniques of observation, the results of questionnaires and interviews, with questionnaires distributed to Hananan company who have received ISO 9001: 2008 in the city of Banda Aceh, Indonesia. Respondents in this study were the project manager, site manager, and field implementers.

Respondents were selected to fill out the questionnaire are:

1. Project Manager (Respondent 1 / R1)
2. Site Manager (Respondent 2 / R2)
3. Executor in the field (Respondent 3 / R3)
4. Executor in the field (Respondent 4 / R4)

Assessment of the implementation of ISO 9001: 2008 in the contracting company is in Clauses 4 to 8, with the following topics:

- a. Clause 4. Quality Management System
- b. Clause 5. Management Responsibilities
- c. Clause 6. Resource Management
- d. Clause 7. Product Realization
- e. Clause 8 Measurement, Analysis, and Improvement.

Recapitulation of the application of clause 4 (Quality Management System). from the results of the questionnaire of the respondents of clause 4 (Quality Management System) data obtained as table 1.1.

Table 1.1 Summary of Assessment Clause 4

Questions	R1	R2
I.1	4	5
I.2	4	4
I.3	4	4
I.4	4	4
I.5.a	4	4
I.5.b	4	5
I.5.c	4	4
I.5.d	4	4

I.5.e	4	4
I.5.f	4	4
I.5.g	4	3
II.1	5	3
II.2	5	4
II.3	5	4
II.4	5	4
II.5	5	4
III.1	5	4
III.2	5	4
III.3	5	4
III.4	5	4
III.5	5	4
III.6	5	4
III.7	5	4
IV.1	5	4
V.1	5	4
TOTAL	114	100

The percentage of the application of clause 4 (Quality Management System) is calculated as follows:

a. The total score of the interview (A)

Twenty-five questions Clause four:

- Respondent 1 (R1): 114

- Respondent 2 (R2): 100

Maximum score (B) clause four : $5 \times 25 = 125$

The minimum value in clause four: $1 \times 25 = 25$

Range of interval: $(125-25): 5 = 20$

The application of clause four is :

Respondent 1 (R1) = 114

$$\text{Score} = \frac{\text{Total Score (A)}}{\text{Total value (B)}} \times 100\%$$

$$\text{Score} = \frac{114}{125} \times 100\% = 91.2\%$$

Respondent 2 (R2) = 113

$$\text{Score} = \frac{\text{Total Score (A)}}{\text{Total value (B)}} \times 100\%$$

$$\text{Score} = \frac{113}{125} \times 100\% = 90.4\%$$

The average percentage of clause 4 on a Likert scale of the respondents are:

$$\frac{91.2\% + 90.4\%}{2} = 90.8\%$$

Results of the assessment including the *Very Good* category = $(81\% \leq \text{Score} \leq 100\%)$.

Table 1.2 Summary of Application of Clause

Clause	Respondent	Question	Score
Clause 5 Management Responsibilities	2	17	69, 63

Clause 6 Human Resource Management	4	17	67, 69, 79, 69
Clause 7 Product Realization	4	50	245, 189, 233, 231
Clause 8 Measurement, Analysis, and Improvement	4	17	81, 77, 80, 79

Table 1.3 Assessment of ISO 9001: 2008

Clause	Percentage
Clause 4 (Quality Management System)	90,80%
Clause 5 (Management Responsibilities)	77,64%
Clause 6 (Human Resource Management)	83,53%
Clause 7 (Product Realization)	89,80%
Clause 8 (Measurement, Analysis, and Improvement)	93,24%
Mean	87,00%

4.1 Factors of Constraints in Implementation of ISO 9001: 2008 In Contracting Company

These constraints factors are based on the respondents' assessment questionnaire. Factors which are divided into five groups, namely:

- a. Manpower (Human Resources)
- b. Machinery / Equipment
- c. Methods / Procedures
- d. Material / Form
- e. Money / Capital

Clause 6 (Resource Management) faced major obstacles, namely documentation and staff. In clause 5 on Management Responsibility, factors that become obstacles in clause 5 is a labor in which some workers often ignore the quality policy that has been there. In clause 4 (Quality Management System) is constraint factor here is in the form of manpower and material form.

V. CONCLUSION

From the analysis of the quality management system ISO 9001: 2008 the contracting company in Banda Aceh, can be summed up as follows: The level of implementation of ISO 9001: 2008 in Hananan contracting company in the city of Banda Aceh amounted to 87.00% included in the category "Very Good" (81% to 100%), and the factors are the constraints in the implementation of quality management system ISO 9001: 2008 is labor factor (Human Resources), methods or procedures of work, material, and form or document was not reach 100%.

From the results of the assessment questionnaire, Hananan company in Banda Aceh has been getting very good results in the application of ISO 9001: 2008 on the construction project, the results should be maintained and held the increase in the clauses that get less than the maximum value. Implementation of ISO 9001: 2008 requires a change of culture verbal into written, and the need for commitment from the top management of companies to implement ISO 9001: 2008 is continuously on each subsequent project.

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