



Measuring and Benchmarking the Quality Culture Maturity of Construction Companies in Indonesia

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ABSTRACT

In February 2018, Indonesian government suspended all big-scale elevated construction projects underway in Indonesia for several months to conduct a thorough investigation. The temporary suspension was triggered because of the prevalent construction accidents, most of which were due to construction failures. Previous studies stated that companies should implement a quality culture to carry out quality management properly. This study aims to measure the maturity level of the quality culture of state-owned, private, and foreign construction companies and compare them using gap analysis. In order to do so, this study has developed a measurement instrument adapted for construction companies based on previous studies, expert judgment, and input from respondents. The results showed that the maturity level of state-owned, foreign, and private construction companies in Indonesia were 64%, 70%, and 53% of the expected condition, respectively. In addition, this study observed eight priority indicators to have a significant relationship with construction failure, whose maturity level needs to be improved to reduce the construction failure rate. Those priority indicators included Inspiration & Motivation, Horizontal Alignment, Progress Monitoring, Feedback from Customer, Staff Empowerment, Attitude to Quality Improvement, Attitude to Staff, and Training Provision.

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1. INTRODUCTION

In Indonesia, quality failures, either in the form of construction failures or defects that cause owner dissatisfaction, are still common in construction projects. For example, several Indonesian news websites/portals reported that from July 2017 to Oct 2019, there were more than thirty construction failure incidents on large-scale construction projects in Indonesia, as shown in Figure 1. These incidents occurred almost every month, most of which were conducted by state-owned construction companies. Due to the prevalence of these incidents, in February 2018, Indonesian government suspended all ongoing large-scale elevated construction projects for several months to conduct a thorough investigation.

From the data, it can be concluded that construction quality failures still occur in large-scale construction

projects in Indonesia. Large-scale projects are carried out by large construction companies, and large construction

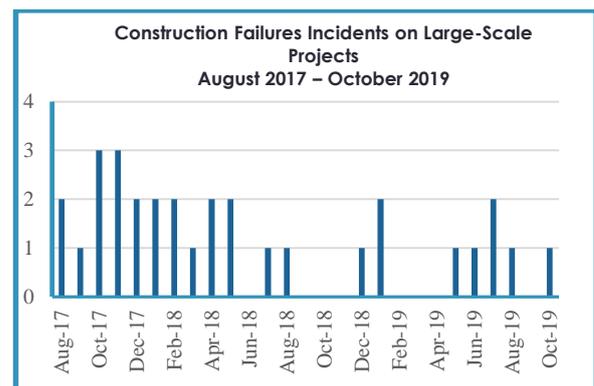


Figure 1. Construction Failures Data on Large-Scale Projects in Indonesia between August 2017 and October 2019

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companies are required to have a quality management system certificate, which Indonesian government requires ISO 9001 certification.

It proves that having a certification of ISO 9001 does not guarantee that a construction company implements a Quality Management System (QMS) properly [1]. Based on a summary of several previous studies, although quality management implementation has been widely applied since 1980s in Japan and 1990s in the American construction industry, it has not been successful in some developing countries [2]. Construction companies complained about several implementation problems, including expensive certification costs, preventing them from establishing a quality management system [3]. Hoonakker et al. [4] stated that the most significant barrier to implementing quality management in a construction company was the culture within the company itself. Every organization that wants to implement or manage a quality program needs a cultural shift and develops an appropriate quality culture [1, 4, 5]. Because of the barriers in the quality system can be reduced if the organization can develop a strong quality culture [5].

However, Willar et al. [6] stated that it is difficult for a company to change its old habits and behavior to assimilate a new quality culture. To be able to form a new culture, the existing internal culture must be reviewed first [7]. Therefore, it is necessary to formulate an appropriate strategy to implement a quality culture in a construction company. Wilson [8] suggested that in the process of change towards a quality culture, a maturity approach is needed as a road map, a framework for developing prioritization of action, a tool for assessment, and a common language and shared vision. The quality culture maturity approach will help organizations assess their current quality culture and identify the actions needed to increase their maturity level [9].

From the results of the literature review that has been carried out, no previous research has measured the quality culture level or quality culture maturity of construction companies. Therefore, this study aims to measure the maturity level of quality culture of the three types of construction companies in Indonesia, which are state-owned, private, and foreign construction companies whose construction quality is known to be very good. In order to do that, a measurement instrument suitable for use in the construction sector must be developed first. The measurement instrument can be used to measure the condition of a quality culture within a company. It can also be used as a basis for comparing conditions between one company to another. In this study, the measurement result of the three types of construction companies was benchmarked to identify the potential improvement to formulate the appropriate strategy to implement a quality culture in state-owned construction companies, which is expected to reduce the number of construction failures.

2. LITERATURE REVIEW

2. 1. Quality Culture in Construction Company

A quality culture was defined as an enterprise environment where quality had become a personal value for all employees. As a result, everyone consistently abided by quality guidelines and felt the quality around them, not just obeying orders from above [10]. This was a condition where quality-focused actions became the behavior of every employee within the company.

Based on previous studies, Mahmood & Mohammed [5] have identified thirteen important dimensions of quality culture, which include: Top management leadership and commitment, Customer focus, Continuous improvement, Education and training, Teamwork, Employee engagement, Empowerment, Partnership with suppliers, Awards and recognition, Communication, Motivation, Organizational structure, and Strategic & quality policy. Meanwhile, according to Saha & Hardie [11], quality culture can be described as a culture that: Prioritizes leadership over supervision; Inspires staff commitment to selected quality activities; Uses the team as the primary management style; Allow the staff at all levels to participate in work-related decisions; Increase pride in work results; Eliminate fear, and; Inspire people to seek continuous improvement.

2. 2. Maturity Level of Quality Culture

The maturity level of a company is defined as a state of completion, perfection, or readiness to fulfill the work that can measure the effectiveness, skills, and competence in managing company activities and programs [12]. Several studies have examined the maturity levels of construction companies in various subjects such as risk management [13], knowledge management [12], project management [14], and process improvement [15].

For quality culture maturity, two previous studies have been obtained, but none have been conducted in construction companies. Both of them have developed a tool to measure quality culture maturity in an organization, which were in the library organization conducted by Wilson [8], and in the Aviation company conducted by Spiak [9]. Wilson formulated the Quality Maturity Model (QMM) to determine the library organization's position and prioritize actions toward achieving a quality culture [8]. Wilson observed 41 factors in describing the formation of quality culture. Those factors are grouped into eight facets, namely: "organization's management", "environmental sensing", "attributes of learning organization", "attitude to change", "attitude to quality", "leadership", "investment in staff", and, "alignment" [8]. Meanwhile, Spiak [9] has also compiled a Quality Culture Maturity Model (QCMM) for aviation companies which are grouped into five groups, namely: Foundation, Structure,

Process/Tools, Key Enablers, and Quality Values. These two studies are used as the basis for developing quality culture measurement tools in this study by adapting them to the needs of construction companies. Each of the previous studies has gaps, some of which are not for construction companies, and some are not specifically for measuring quality culture maturity. The complete comparison can be seen in Table 1.

It was first checked whether all elements of the quality culture in the construction company described by Saha & Hardie [11] and Mahmood & Mohammed [5] had been accommodated in the quality culture maturity model from Wilson [8] and Spiak [9]. The following approach was by studying the previous literature on quality maturity in construction companies and comparing it with those elements of the quality culture and Wilson and Spiak's quality culture maturity model. In their research on the project management maturity model (PMMM) in construction companies, Machado et al. [14] have compared the various existing maturity models and concluded that the best PMMMs for construction companies are OPM3 and MMGP Prado.

Both PMMM are sourced from the Project Management Body of Knowledge of PMI, but it is also stated that OPM3 is the most frequently referred to in many studies [14] and is also considered the best stand out because it is published by PMI [16]. In addition, OPM3 also divides the maturity questions based on the project management knowledges, one of which is quality management [16]. Therefore OPM3 is used as a source in this study.

A further study conducted by Permatasari et al. [16] has also compiled various sources, including 42 questions on Quality Management in OPM3, and proposed an assessment model of Contractor Quality Management. Another research that has also produced a maturity model related to construction quality is the Construction Industry Macro Maturity Model (CIM3). As the name suggests, this model is made for the macro scale of the construction industry, not the scale of a

TABLE 1. Gap Comparison of the Main References

| References | for Quality Culture Maturity | for Construction Companies |
|---|------------------------------|----------------------------|
| Quality Culture Maturity Model [9] | yes | no |
| Quality Maturity Model [8] | yes | no |
| Construction Industry Maturity Model [17] | quality maturity | construction industry |
| Knowledge Management Maturity [12] | no | yes |
| Quality Management System (QMS) Maturity [18] | QMS maturity | yes |
| Contractor Quality Management Maturity [16] | QM maturity | yes |

company [17]. However, several of its indicators can be categorized at the company level. This study used these maturity models as references to adapt the existing quality culture model related to its application in construction companies. The first step was to check whether the elements or indicators of these models have been included in the quality culture maturity model that Wilson and Spiak have developed. The comparative meta-analysis of these previous studies can be seen in Table 2.

TABLE 2. Main References of Quality Culture Maturity Model

| Variables/Indicators | Wilson | Spiak |
|--|--------|-------|
| Element of Quality Culture | | |
| Top management leadership and commitment [5, 11] | x | x |
| Customer focus [5] | x | x |
| Continuous improvement [5] | x | x |
| Education and Training [5] | x | x |
| Teamwork [5, 11] | | x |
| Involvement [5, 11], | x | |
| Empowerment [5] | x | x |
| Supplier partnership [5], | | x |
| Reward and recognition [5] | x | x |
| Communication [5] | x | x |
| Motivation [5] | x | |
| Organization Structure [5] | x | x |
| Strategic and Quality Policy [5] | x | x |
| Inspires staff commitment [11] | x | x |
| Increase pride in work results [11] | | x |
| Eliminate fear [11] | | x |
| Quality Maturity in Construction Company | | |
| People and Customer Management [16] | x | x |
| Supplier Partnership [16] | | x |
| Communication of Improvement Information [16] | x | x |
| Customer Satisfaction Orientation [16] | x | x |
| External Interface Management [16] | x | |
| Strategic Quality Management [16, 17] | x | x |
| Team Work Structures [16] | | x |
| Operational Quality Planning [16, 17] | | x |
| Quality Improvement Measurement System [16] | x | x |
| Corporate Quality Culture [16] | x | x |
| Reliability [16] | | x |

| | | |
|----------------------------|---|---|
| Conformance [16] | | x |
| Perceived Quality [16, 17] | x | |
| Responsiveness [16] | | x |
| Assurance [16] | | x |
| Report [17] | | x |

In addition to the elements or indicators in Table 2, there are several other indicators added from the Wilson and Spiak model themselves, namely Knowledge Management, Optimization, Documentation, Proactive/preventive, Staff encouragement to innovate [9], Consistency [8, 9], Alignment, and Attitude [8].

2. 3. Construction Failure Construction failure or also known as the defect, is a condition where the whole or part of the construction results does not comply with the required contractual specifications [19], based on the function, performance, as well as legal and user requirements, regarding the structures, services, or other facilities [20]. The construction failure rate was often indicated by the cost and amount of rework [21-23]. Therefore, this study used the Cost of Rework (Y1) and the Number of Rework (Y2) as the indicators of the Construction Failure variable.

3. RESEARCH METHODOLOGY

This research was conducted by collecting data regarding the existing condition of the quality culture maturity of three types of large construction companies in Indonesia, namely state-owned, private, and foreign construction companies, and then comparing each of them and also to the expected condition by conducting a gap analysis. The existing condition was taken from the perceptions of the respondents who are employees of the three types of companies. The expected conditions were collected from the perceptions of expert practitioners from large construction companies with at least managerial positions and more than ten years of experience. The complete flowchart of this study method is presented in Figure 2.

Of all the referred previous studies about maturity in construction companies, three of them make comparisons among the construction companies. All three studies were carried out by distributing questionnaire instruments to respondents who were employees of construction companies. Two of them only compare the companies' final maturity score/level [12, 18] but did not compare them by the indicators/elements. The other one has compared by the indicator level, but the companies being compared are individual companies in the same category, not a group of companies representing different categories [16]. One study has compared the companies

by grouping them into categories, such as the core business, annual revenue, number of quality staff, number of employees, and location, but only comparing the final maturity score [18]. This study measured the quality culture maturity of construction companies grouped by a category, which is by their ownership and then compared them by their quality culture maturity indicators score. By benchmarking, the company can identify its position compared to other companies and the potential factors that can be developed [18].

The existing conditions were identified by collecting data on respondents' perceptions about the quality culture maturity level of the company they work for, using a questionnaire instrument. The questionnaire questions were derived from the quality culture maturity variables and indicators identified from the literature review and validated by external experts serving as practitioners or academicians with more than 15 years of experience in the construction industry. During content and construct validation, there were several variables and indicators proposed by the experts to be combined, and the constructs were adjusted accordingly. There is also an indicator, namely punishment added by the expert. They think that punishment is still needed in the Indonesian construction industry. The list of the variables and indicators is presented in Table 3.

After that, for each indicator, a question item was provided with five options of answers which described

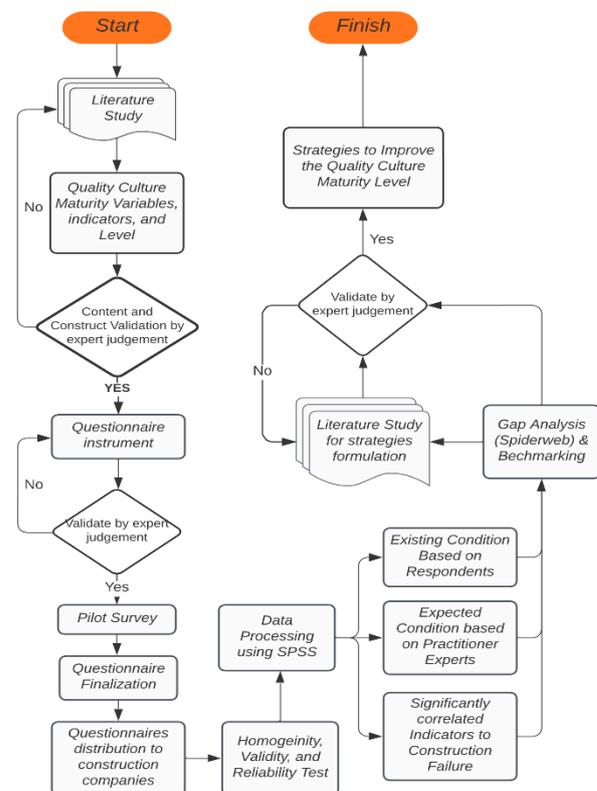


Figure 2. Research Method

TABLE 3. Research Variables

| Code | Variables | Code | Indicator | Reference |
|-----------|-----------------------------------|-------|--|-----------------|
| X1 | Leadership | X1.1 | Vision and value setting | [8, 9] |
| | | X1.2 | Trust | [8, 9] |
| | | X1.3 | Inspiration & motivation | [8] |
| | | X1.4 | Decision making | [9] |
| | | X1.5 | Leadership Commitment | [9, 13] |
| | | X1.6 | Setting expectations / common language | [9, 13, 16] |
| X2 | Management & Communication | X2.1 | Knowledge Management | [9, 12] |
| | | X2.2 | Process Management | [8, 9, 13, 24] |
| | | X2.3 | Vertical alignment | [8] |
| | | X2.4 | Horizontal alignment | [8] |
| | | X2.5 | Optimization | [9] |
| | | X2.6 | Strategic plan generation | [8, 13, 16, 17] |
| | | X2.7 | Progress monitoring | [8] |
| | | X2.8 | Performance measurement | [8, 9, 16] |
| | | X2.9 | Documentation / Report | [9] |
| | | X2.10 | Communication flow | [8, 9, 13, 16] |
| | | X2.11 | Consistency | [8, 9] |
| | | X2.12 | Compliance | [9] |
| | | X2.13 | Proactive / preventive | [9] |
| | | X2.14 | Root cause analysis / corrective action | [9] |
| | | X2.15 | Staff structure | [8] |
| | | X2.16 | Feedback from Customer | [8, 16] |
| X3 | Staff Participation & Empowerment | X3.1 | Staff empowerment | [8, 9, 16] |
| | | X3.2 | Learning level | [8, 9] |
| | | X3.3 | Staff encouragement to innovate | [8, 9, 16] |
| | | X3.4 | Contribution | [8] |
| | | X3.5 | Teamwork | [9, 16] |
| X4 | Attitude | X4.1 | Attitude to risk | [8, 13] |
| | | X4.2 | Attitude to Quality | [8, 16] |
| | | X4.3 | Attitude to quality improvement | [8, 16] |
| | | X4.4 | Attitude to Change | [8] |
| | | X4.5 | Perception of drivers of change | [8] |
| | | X4.6 | Type of quality improvement initiatives | [8, 9] |
| | | X4.7 | Perception of responsibility for the quality | [8, 9, 13] |
| | | X4.8 | Attitude to mistakes | [8] |
| | | X4.9 | Fairness/justice | [9] |
| | | X4.10 | Functional excellence / capability | [9, 16] |
| | | X4.11 | Customer service | [8, 9, 16] |
| X5 | Investment in Human Resources | X5.1 | Attitude to staff | [8, 9] |
| | | X5.2 | Training provision | [8, 9, 13] |
| | | X5.3 | Development of staff | [8, 9, 16] |
| | | X5.4 | Recognition of staff | [8, 9, 16] |
| | | X5.5 | Punishment of Staff | Experts |

the levels of quality culture maturity. These levels were based on several previous studies and inputs from external experts and are shown as follows [25],

- Level 1 (Ad hoc): The implementation of quality culture is still non-existent or chaotic [8].
- Level 2 (Repeatable): Quality culture implementation is already in existence, with some being continuously carried out, although it is not well-defined or structured [8].
- Level 3 (Defined): The implementation of quality culture is already well-defined but not routinely conducted [8, 26].
- Level 4 (Managed): The quality culture implementation is well-defined and already routinely executed but not regularly evaluated, or when adequately assessed, the results are not accompanied by corrective improvement [8, 12, 25].
- Level 5 (Continuous): The implementation of quality culture is well-defined, regularly implemented, evaluated, and continuously improved [8, 12].

The five answer options for each indicator were formulated based on previous studies, representing the five levels of quality culture maturity adapted to construction company operations, which the experts also validated. Examples of the answer options are shown in Table 4.

The next step is to conduct a pilot survey to 15 respondents who are also employees of large construction companies. The result stated that the questionnaire was understandable, with some editorial-

related inputs. After the questionnaire was corrected according to the input from the pilot survey, the questionnaire was distributed to respondents.

Respondents were asked to select the level that best describes the current condition of their company for each indicator question and also the relative influence each indicator has on construction failure. Construction failure is represented by the cost of rework and the number of reworks. To obtain the expected conditions data, the same instrument was provided to twenty-six contributing external practitioner experts to identify the required maturity level to establish a quality culture in a construction company. These practitioners were also from the large state-owned construction companies with managerial positions and above. The twenty-six experts' and respondents' answers were then compared for a gap analysis. From the gap analysis results, it can be known how far the current condition of quality culture maturity has met the expected conditions.

The results of the data collection were assessed first with Data Adequacy Test (KMO & Bartlett), Comparative Homogeneity Test (Independent T Sample & Anova), Validation Test (Product moment Pearson Correlation), and Reliability Test (Cronbach's Alpha), using the SPSS software. The results of those tests were valid and reliable data on the existing condition of quality culture maturity level in construction companies. With this data, a gap analysis was carried out between the existing and optimum/expected conditions. The gap analysis results were represented in the form of a spiderweb diagram.

TABLE 4. Example of Quality Culture Maturity Indicator and Its Levels

| Maturity Level | Indicator |
|-----------------------------|--|
| | X1.1. Vision and Mission Setting |
| Level 1 (Ad-Hoc) | Upper management has not set a vision and values. |
| Level 2 (Repeatable) | Upper management has defined the company's vision and values, but still difficult to understand for the employees. |
| Level 3 (Defined) | Upper management has clearly defined the company's vision and values and communicated them to all employees through various media, including dialogue sessions and the induction of new employees. |
| Level 4 (Managed) | The company's vision and values have been defined and communicated to all employees and become the basis for formulating all policies, procedures, targets, performance indicators / KPIs, and employee development plans. |
| Level 5 (Continuous) | Upper management has defined, communicated, and aligned the company's vision and values. All employees have implemented it, and it has become a daily behavior that is always tried to be maintained. |

4. RESULTS AND DISCUSSION

4. 1. Existing Condition Quality Culture Maturity of Construction Company

A total of 214 respondents contributed to the survey. They were employees of 31 big-grade construction companies in Indonesia, of which 71 were from state-owned companies, 71 were from private companies, and 72 were from foreign companies.

The results of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy test showed a result of 0.962 which means that the sample is sufficient with a significance value of <0.05, which means that there is a correlation between variables and is feasible for the next process. The results of the homogeneity test with the Kruskal Wallis H Non-Parametric Test also stated that the sample was homogeneous based on the categories of Work Experience, Education, and Position. The validity test with the Pearson Correlation test also stated that with an alpha of 5%, all question items were valid. Likewise, the Cronbach Alpha test results stated that the instrument is reliable with a value of 0.971. After the data were proven

sufficient, homogeneous, valid, and reliable, it was followed by data processing and analysis.

The data processing is conducted to determine two findings. The first is a comparison between the existing and expected conditions of quality culture maturity level based on the data obtained from respondents. The second is the relationship between the X variable (from each indicator) and the Construction Failure Variable, namely the Cost of Rework and the Number of Rework, based on the Pearson Correlation Test of the respondent data.

Regarding the expected condition, the answers obtained from the expert practitioners were dominated by Levels 4 and 5. However, the answers to level 5 were more prevalent. Since the information was based on ordinal data, the selected answer that occurred more frequently was observed in Level 5. Only one indicator was considered sufficient at Level 4, namely Attitude to Risk (X4.1). The following in Figure 3 is the gap analysis of construction companies' quality culture maturity level in Indonesia. The gap analysis showed the indicators that needed to be improved to achieve the expected condition and the comparison with the other types of companies. Suppose the condition in one type of company is better. In that case, it indicates that the indicator is improvable in other companies, and its better implementation can be used as a reference for improvement strategies.

According to the data analysis result of the state-owned construction companies, only 6 of the 43 indicators met the expected condition, with four being the Management and Communication variable indicators. The remaining indicators were below Level 5, with one

only reaching Level 2, namely the X5.4. Recognition of Staff in the Investment in Human Resources variable.

Four indicators also had a gap of 2 levels from the expected condition, namely X1.5. Leaders Commitment, X1.6. Expectation Setting, X2.10. Communication Flow' X3.2. Level of Learning, and X4.1. Attitude to Risk. The remaining 32 indicators have only one gap with the expected condition.

Based on Figure 3, it was observed that there was one (and the only) quality culture maturity level indicator that was expected to be sufficient at level 4, namely X4.1. Attitude to Risk. Although, the existing condition of this indicator in the state-owned companies has not met the expected conditions, which is only at Level 3 (Defined). This means that the attitude of employees in handling risks has not been managed and evaluated regularly. In the state-owned companies, the variable with the highest level of maturity was the Organizational Attitude, accompanied by Management and Communication. On the other hand, the lowest was the Investment in Human Resources, followed by the Leadership variable. This indicated that the respondents who are construction company employees feel that the investment in employees provided by their company was still insufficient. In addition, they also feel the lack of leadership from their company leaders regarding the quality programs.

Regarding the correlation with construction failure, only seven indicators did not correlate with the Cost of Rework (Y1) and the Number of Rework (Y2) in state-owned companies. The remaining 36 indicators

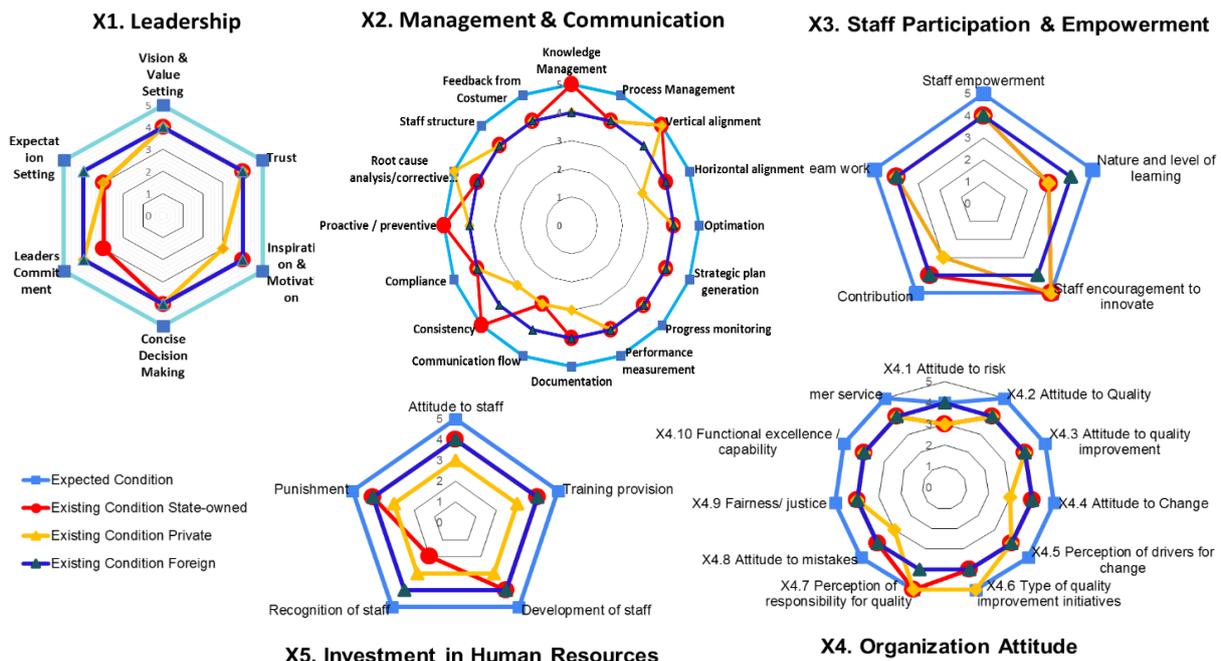


Figure 3. Gap Analysis of the Quality Culture Maturity Level of Construction Companies in Indonesia

correlated with construction failure, where 27 correlated with Y1 or Y2, and the other 9 correlated with Y1 and Y2, respectively. In this study, the indicators that have a significant correlation with the two construction failure indicators were categorized as high significance, and those that correlated only with one of them were classified as low significance. Those nine indicators that have a high significance with the construction failure are described in Table 5. Among the nine indicators that significantly affected construction failure, only one of them has reached the expected level of maturity, namely X2.3. Vertical Alignment. The other eight have one gap level with the expected condition (Level 5). This indicated that the eight high significant indicators

required maturity improvement to achieve the expected conditions. The comparison of the significant indicators of the three types of construction companies is presented in Figure 4.

4. 2. Benchmarking the Quality Culture of Indonesian Construction Companies

Based on the answers from the external experts, the ideal maturity conditions were found within the range of Levels 4 and 5. Suppose the respondent's response value at Levels 4 and 5 was classified as a mature condition, and the value at Levels 1 and 2 was classified as a poor condition, then the percentage of the mature condition can be calculated.

TABLE 5. The High Significance Indicators of State-Owned Construction Company

| Variable | Indicator | Expect. Level | Exist. Level | G a p | Correlation | | |
|-----------------------------------|-----------|---------------------------------|--------------|-------|-------------|---------|---------|
| | | | | | Y1 | Y2 | |
| Leadership | X1.3. | Inspiration & Motivation | 5 | 4 | 1 | 0.265* | 0.305** |
| | X2.3. | Vertical alignment | 5 | 5 | 0 | 0.319** | 0.278* |
| Management & Communication | X2.4. | Horizontal alignment | 5 | 4 | 1 | 0.304** | 0.298* |
| | X2.7. | Progress monitoring | 5 | 4 | 1 | 0.374** | 0.240* |
| | X2.16. | Customer Feedback | 5 | 4 | 1 | 0.268* | 0.352** |
| Staff Participation & Empowerment | X3.1. | Staff empowerment | 5 | 4 | 1 | 0.240* | 0.370** |
| Organization Attitude | X4.3. | Attitude to quality improvement | 5 | 4 | 1 | 0.305** | 0.358** |
| | X5.1. | Attitude to staff | 5 | 4 | 1 | 0.325** | 0.325** |
| Investment in Human Resources | X5.2. | Training provision | 5 | 4 | 1 | 0.252* | 0.242* |

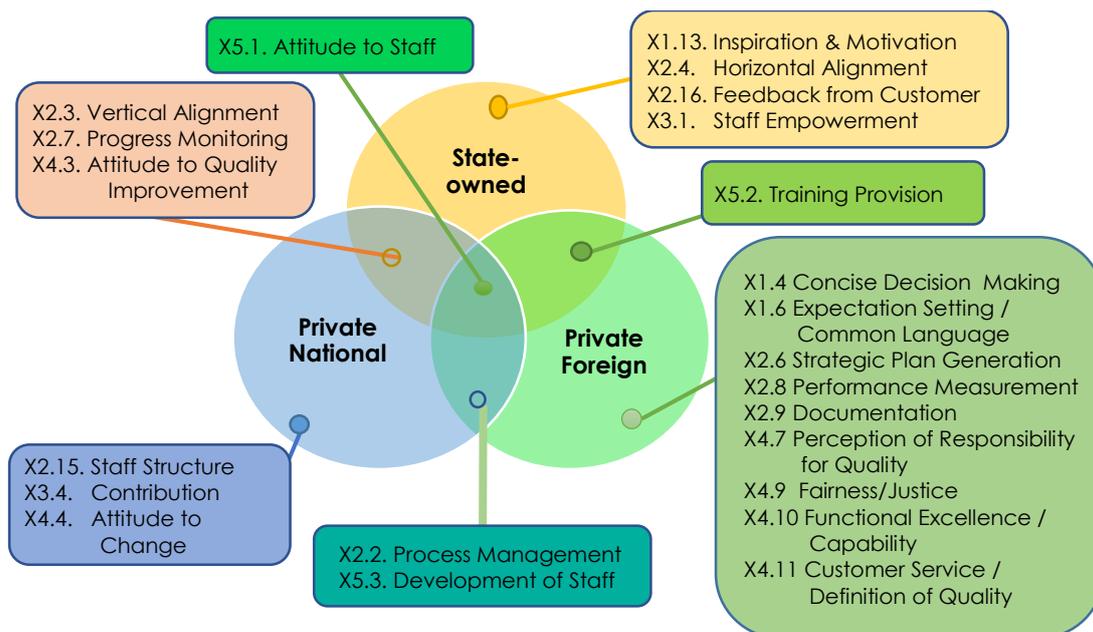


Figure 4. Priority Strategy of Quality Culture to Reduce the Construction Failure Rate

The data obtained in this study included state-owned, private, and foreign private companies. The results found in the state-owned company were juxtaposed with those obtained at two other companies, as shown in Table 6.

The data in Table 6 shows the existing maturity conditions of quality culture by assuming all indicators have the same weight. The highest and lowest were foreign and national private companies with 70% and 53% of the expected condition, respectively. While state-owned companies account for 64%, indicating that many improvements were required to develop the quality culture properly and to reduce the construction failure rate.

From the prioritized indicators in Figure 4, it can be seen that there is one same indicator that is considered significant to be improved by the three types of construction companies, namely X5.1 Attitude to Staff. It implies that this indicator is a common problem in Indonesian construction companies. Regarding the eight significant indicators of state-owned construction companies, as seen in the spider web diagram in Figure 3, it can be seen that the conditions in the other two types of companies are at the same level or lower, so they cannot be used as a reference for better implementation. However, there are several other indicators that are not considered to have an effect on construction failure, whose level is still below foreign companies and even private companies. In the state-owned companies, all the prioritized indicators are at Level 4, meaning that all the companies already have standards and procedures related to all those prioritized indicators. However, it remains the implementation that should be maintained and carried out consistently, including for their system of periodic evaluation and continuous improvement.

Furthermore, for the prioritized indicators, based on literature review and experts advise, there were recommended strategies for increasing the maturity level. State-owned construction companies were advised to view employees as the company's main asset with commitment and guarantee of employee welfare. This aimed to make employees company's assets that are committed to running the organization system [8]. Large state-owned construction companies are big

organizations which had already invested in their employees, as part of government regulation or as the organization's effort. Based on the external experts' suggestion, the employees of large state-owned construction companies are likely to feel undervalued when they do not understand the additional benefits that the organization has provided or what they received is not what they expected or needed. This indicates that the companies should survey the benefits being expected by the employees to support their work and welfare. Companies should also review their employees' needs for continuous development of skills due to the rapid development of the business environment [27].

Company leaders are advised to reformulate expectations for employees, usually in the form of a Key Performance Index, that are clear and measurable. Employees should mutually agree on these KPIs and are regularly evaluated [9]. Companies should also define a complete improvement measurement system to evaluate the impact of each improvement activity [28]. Also, to define a collaborative strategy orientation for the improvement program to be integrated across all company elements [9], because one of the main problems encountered in continuous improvement was the lack of a comprehensive company-wide planned strategy [28]. The external experts also suggested that companies evaluate the coordination system between work units/departments, using the internal customer's concept to improve the management qualities continuously. This should subsequently be carried out to conduct a 360-degree performance appraisal by collecting feedback from employees' subordinates, colleagues, supervisors, and self-evaluation by themselves.

The company should also establish a customer feedback system that should have at least seven components [29], such as service indicators, performance targets and standards, feedback collection tools and process management, and reporting and IT systems. Additionally, the company should campaign the importance of customer complaint information to improve the organization's image, disseminate procedures for reporting customer complaints,

TABLE 6. Benchmarking of Quality Culture Maturity in Constructions Company

| Variable | State-Own Company | | | Private Company | | | Foreign Company | | |
|--|-------------------|------------|------------|-----------------|------------|------------|-----------------|------------|------------|
| | Poor | Medium | Mature | Poor | Medium | Mature | Poor | Medium | Mature |
| X1. Leadership | 12% | 29% | 59% | 16% | 32% | 52% | 11% | 25% | 64% |
| X2. Management & Communication | 11% | 21% | 68% | 10% | 31% | 58% | 5% | 21% | 74% |
| X3. Staff Participation & Empowerment | 9% | 26% | 64% | 11% | 35% | 54% | 6% | 26% | 68% |
| X4. Organization Attitude | 11% | 20% | 69% | 12% | 31% | 57% | 7% | 17% | 76% |
| X5. Investment in Human Resources | 19% | 24% | 57% | 16% | 41% | 44% | 12% | 19% | 69% |
| Quality Culture Maturity Level Existing Condition | 12% | 24% | 64% | 13% | 34% | 53% | 8% | 22% | 70% |

implement an incentive system for reporting customer problems, and non-usage of customer complaints to evaluate the personal performance of certain employees [30].

For staff empowerment, companies are advised to facilitate employees to share learning, information, and knowledge [9]. They should also provide opportunities for employees to propose suggestions at open meetings and implement a reward and punishment system. The measurement, assessment, and adjustment of the quality improvement plan based on employees' inputs are very important, as well as communicating the performance results and impacts to all involved individuals [9]. Company leaders should provide the employees with an understanding of the limits of the decision-making authority and that they can always return to their direct leaders if they do not want to or worry that they have crossed their authority limits. This gives employees the opportunity and trust to contribute to decision-making and, simultaneously, acknowledge the direct leaders about their power over their subordinates [31]. Company leaders should always provide recognition and appreciation to excellent employees for them to feel valued by the organization. This fosters pride and confidence in job performances, increases the sense of belonging to the company, as well as creates enthusiasm and motivation for quality improvement [8, 9, 32, 33].

The problems with employee attitudes towards quality improvement are often caused by the changes in work patterns, which occur due to the quality improvement programs, such as document congestion, difficulties in measuring job results, and unsupportive subcontractors [34]. This indicates that employees need to understand the importance of quality improvement programs, which should be preceded explicitly by the role of top management, and to be involved in quality improvement programs to establish good communication, relationships, and motivation [34].

Several studies also stated that one of the methods of changing the attitude of employees was by conducting training and workshops on the importance of quality improvement programs [8, 9, 32, 35]. The company should conduct regular training that should be aimed at the staff and leaders' levels, such as motivational training to inspire employees, including those in the management position. The leaders should be provided with adequate training related to the knowledge of company quality management, as well as motivational and inspirational skills [36]. The training should not only be related to the technical areas of work but also related to the methods of dealing with customers in obtaining feedback and maintaining expectations [29, 30]. According to the involved experts, an effective training program should be developed based on employee management plans. It should also be appropriately structured with working

hours, such as 60% and 40% for job progress and training, respectively.

The experts in this study also suggested the need to implement a reward and punishment system to spur employees towards implementing quality improvement programs. Subsequently, they also recommended the need to launch a company rebranding campaign if necessary. A rebranding campaign can increase the employees' and customers' awareness of the proclaimed organizational quality culture [36].

5. CONCLUSION

This research has developed a tool to assess the maturity level of the quality culture of construction companies. By conducting an assessment and gap analysis, it can be identified which indicators still need to be improved in maturity to reduce the failure rate of construction. After that, benchmarking can also be carried out by measuring the quality culture maturity condition of other types of construction companies and using it to identify the potential improvement and as a lesson if they had better conditions. By identifying which indicators need to be improved, studying how to improve them, and seeing examples of better implementation in other companies, the formulation of a quality culture improvement plan in an organization will be more focused and directed. In this paper, the indicators discussed for improvement are only those related to construction failure, while this tool can be used for other purposes related to quality performance.

This research is only limited to the case study of construction companies in Indonesia. Therefore, further research should be developed for larger data samples. The limitation of this research is to analyze the gap between the existing and the expected conditions on the maturity level of quality culture in construction companies in Indonesia. Further research is suggested to develop more technical strategies or systems to increase the maturity level of the quality culture to reduce construction failures in Indonesia.

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7. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article, and also confirmed that the article is free of plagiarism.

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9. Appendix-Questionnaire sample

| Variable | Sub Variable | Question & Multiple Answer Choices | Choose one of the conditions that best describes your company | | | |
|----------|----------------------------|------------------------------------|---|---|----------------------|---|
| 2 | Management & Communication | 7 | Progress monitoring | <p>13 How does the company monitor progress towards achieving company goals?</p> <p>a <i>The progress towards achieving company goals is never monitored.</i></p> <p>b <i>The progress of achieving company goals has been monitored, but not done routinely and programmed.</i></p> <p>c <i>There is already a program/system for monitoring the progress of achieving company goals, but the monitoring results have never been followed up.</i></p> <p>d <i>There is already a progress monitoring program in the achievement of company goals, and corrective actions are in place if needed.</i></p> <p>e <i>Progress in achieving company goals is closely monitored by a monitoring system, and corrective actions are taken and documented if needed. This monitoring program is evaluated regularly and improved.</i></p> | | |
| | | 8 | Performance measurement | <p>14 How is the performance measurement process in your company?</p> <p>a <i>Don't know/no performance measurement.</i></p> <p>b <i>Performance measurement uses only mathematical measures like volume per day, percentage of weight, etc.</i></p> <p>c <i>Performance measurement uses mathematical measures and client feedback.</i></p> <p>d <i>The performance of several processes is measured using performance indicators based on the expectations of the client, while several others have used KPI as a reference.</i></p> <p>e <i>All performance measurements have used KPI references which are prepared based on the company's strategic objectives which are evaluated and improved regularly.</i></p> | | |
| | | 5 | Investment in Human Resources | 3 | Development of staff | <p>41 Do you feel that the company supports the self-development of its employees?</p> <p>a <i>There is no Employee development program.</i></p> <p>b <i>Employees are supported to develop themselves.</i></p> <p>c <i>There are already skills development programs prepared by the company for employees in certain sections and levels.</i></p> <p>d <i>Employees are supported in developing their skills, there is already a skill development program prepared by the company for all employees.</i></p> <p>e <i>All Employees are encouraged to develop their careers and talents. The company already has a clear development path. Employee development is evaluated to determine the cadre of future company leaders.</i></p> |

| | | |
|---|----|--|
| | 42 | Did you get a reward or recognition for your best work? |
| | a | <i>No, not even getting any attention.</i> |
| | b | <i>Some get rewards, some don't, depending on their respective managers.</i> |
| 4 | c | <i>Yes, there is a company commitment to employee recognition, although not in a clear specific system.</i> |
| | d | <i>Yes, there are systems, structures and processes for employee recognition and/or rewards and/or development.</i> |
| | e | <i>Yes, employees feel valued for recognition and/or rewards and/or development systems, structures and processes that are clearly and consistently implemented and developed.</i> |
| | | |

Persian Abstract

چکیده

در فوریه ۲۰۱۸، دولت اندونزی تمام پروژه های ساخت و ساز در مقیاس بزرگ را که در اندونزی در دست اجرا بود، به مدت چند ماه به حالت تعلیق درآورد تا تحقیقات کاملی را انجام دهد. تعلیق موقت به دلیل حوادث ساخت و ساز رایج که بیشتر آن ها به دلیل خرابی های ساخت و ساز بود، آغاز شد. مطالعات قبلی بیان می کردند که شرکت ها باید فرهنگ کیفیت را پیاده سازی کنند تا مدیریت کیفیت را به درستی انجام دهند. این مطالعه با هدف سنجش میزان بلوغ فرهنگ کیفیت شرکت های ساختمانی دولتی، خصوصی و خارجی و مقایسه آنها با استفاده از تحلیل شکاف انجام شده است. برای انجام این کار، این مطالعه یک ابزار اندازه گیری را برای شرکت های ساختمانی بر اساس مطالعات قبلی، قضاوت کارشناسان و ورودی پاسخ دهندگان ایجاد کرده است. نتایج نشان داد که سطح سررسید شرکت های ساختمانی دولتی، خارجی و خصوصی در اندونزی به ترتیب ۶۴، ۷۰ و ۵۳ درصد شرایط مورد انتظار است. علاوه بر این، این مطالعه هشت شاخص اولویت دار را مشاهده کرد که رابطه معنی داری با شکست ساخت و ساز دارند که سطح بلوغ آنها برای کاهش نرخ شکست ساخت و ساز نیاز به بهبود دارد. این شاخص های اولویت شامل الهام و انگیزه، تراز افقی، نظارت بر پیشرفت، بازخورد از مشتری، توانمندسازی کارکنان، نگرش به بهبود کیفیت، نگرش به کارکنان، و ارائه آموزش بودند.