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ANALYSIS OF TQM IMPLEMENTATIONS IN THE FLOOR TILES INDUSTRY

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Abstract

The Floor Tiles Industry in accordance with State Regulations is one of the manufacturing industries that can participate in Indonesia into a Developed Industrial Country, supported by the availability of various technologies and product innovations so that domestic floor tiles can be accepted. In the face of increasing competition, domestic floor tiles industry trying to improve the quality of the products by implementing a strict standardization system for production processes and products produced by implementing TQM. Based on the components that influence of TQM, variables of leadership, technical competence and organizational culture are closely related to certain factors. A leadership pattern that focuses on goals or targets determined and taken based on scientific thinking by taking into account the various parties involved will improve the quality. Education and training as well as employee involvement by providing controlled independence as well as improving the technical quality.

Keywords: Leadership, technical competence, organizational culture, TQM, Floor Tiles

1 | Introduction

Indonesia is one of the biggest manufacturing industry bases in Southeast Asia with a percentage of 20.27% in the economy on a national scale. The manufacturing industry in Indonesia developed current able to swift the role of base on commodity to manufacturing. In today's highly dynamic global business environment, the customers want the best quality of international competition becomes more intense and it becomes very clear that only organizations committed to providing the best quality are able to continue to grow. Quality is a very relevant concept and is a strategic factor that can leading competition role with the success in organization [1]. Placing a high strain on quality enables organizations to meet the needs and wants of customers accurately, and ultimately leads to the realization of the better business competition [2]. Total Quality Management is one of the most commonly adopted and prominent quality improvement philosophies in the development business environment. The Floor Tiles Industry in accordance with State Regulations is one of the manufacturing industries that can participate in Indonesia into a Developed Industrial Country, supported by the availability of various technologies and product innovations so that domestic floor

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tiles can be accepted abroad market. Association of Floor Tiles Indonesia (ASAKI) is optimistic that the prospects for the floor tiles industry are still bright. ASAKI even projects that the consumption of the country's ceramic producers could increase to 70% by the end of 2020, higher than the achievement rate of the floor tiles industry over the past 5 years and the growth of the floor tiles sector is projected to be in the range of 5-6%. Based on the data, ASAKI says that the consumption per capita of floor tiles in Indonesia continues to increase every year, while the production capacity of the floor tiles industry has not increased. Meanwhile, the surge in exports occurred in the United States which reached 130%, followed by the Philippines 60%, and Taiwan 40%. In the face of increasing competition, domestic floor tiles industry trying to improve the quality and productivity of their products by implementing a strict standardization system for production processes and products produced by implementing Total Quality Management (TQM). Several studies claim the major benefits of influencing TQM are productivity, quality, performance improvement, cost reduction, and overall waste elimination that lead to organizational performance [3]. Some empirical evidence suggests a direct and indirect TQM approach [4]. Several researchers have found important effects of influence TQM [5]. The scientific findings described above, it shows that influence of TQM a positive and significant on the operational performance of an organization. The most effective leadership style for the successful influence of TQM depends on cultural background embedded in the company [6].

2 | Literature Review

Total Quality Management is the relationship between quality systems and applications that is closely related to competitiveness and performance in a company [7]. Technical competencies related to TQM include technical aspects that refer to management tools, techniques and practices. High leadership efficiency in implementing the nine principles of TQM effectively is capable of producing better quality products [8]. Competency -based training has a positive correlation with 5S and TQM approach Improvement, advantage, R&D and quality performance as intermediaries in the influence of TQM, while competition and industry entry are barriers in TQM [9]–[11]. TQM provides practical practices in management, processes and human resources to improve material services at all processes and levels to meet current and future customer needs [12], [13]. Strategic planning and development in production management is related to process strategy i.e. the approach of the organization to convert resources to goods and services with the aim of creating a process that can produce products that meet customer needs in cost and other management constraints [14]. Meanwhile, leadership style is more likely to impact continuous improvement and is considered the dominant TQM approach rather than innovation [15]. Causes of lack of leadership in the implementation of TQM programs include lack of involvement and commitment of senior managers; the combination of leadership that takes place in the organization; and the influence of foreign political leadership. Managers must be aware of cultural values in organizations as these values influence TQM practices and organizational performance [16]. Types of adhocracy and group culture are the cultures that most support the influence of TQM practices [17]. Organizational culture is the part of factor in improving the adoption of TQM practices [3]. Leadership and competency variables are interrelated in improvement in an effort to promote improved employee and company performance [18]. Leadership has a close relationship with competence, as strong leadership can motivate employees to improve their competencies. TQM has consequences, namely strong leadership as it is the key to the success of strategic plans and achieving quality goals [19]. Transformational Leadership has a positive impact of influence TQM [20]. The most widely used Total Quality Management approach in the floor tiles industry is multifunctional workers and quality control, while the least used is group technology, reducing preparation time and kanban.

3 | Methods

The areas of research conducted in this research are the areas of management in particular leadership, technical competence, organizational culture, influence of TQM. The study design is designed as operational engineering so that it can be carried out perfectly to minimize the element of error, then in this study also formed a study design that contains the planning and implementation of the study.

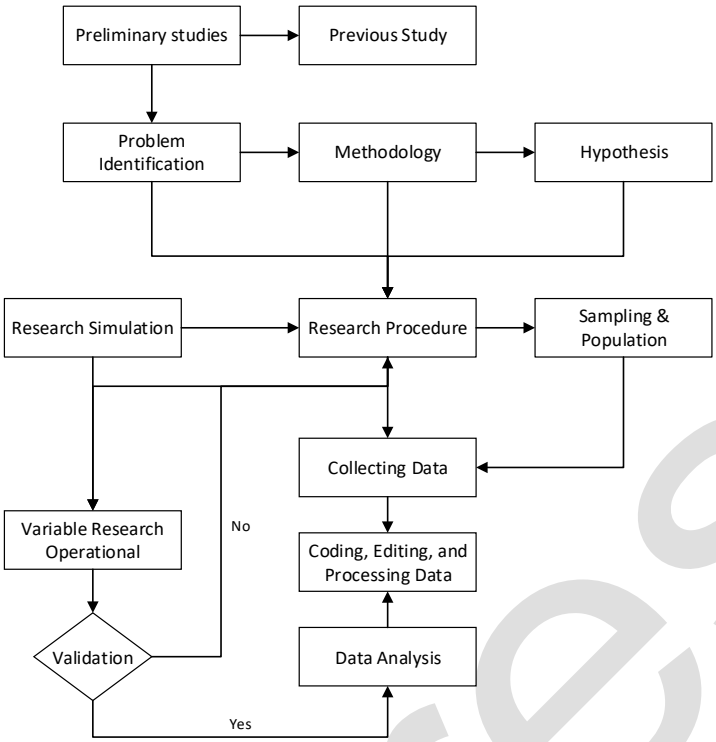

Fig. 1. Research framework

Research problems need to be answered with reference to references from the literature and previous research, so that a thinking framework is formed that then produces research hypotheses. To develop the thinking framework that has been formed, a research design is prepared that includes: operational variables, data collection instruments used that must be validated. Next, data collection is done through predefined instruments. The subjects of this study are operating workers in the Floor Tiles Industry. In this study, the method used is Structural Equation Modeling (SEM) technique. Some guidelines for determining the sample size for SEM are given as follows [18]:

- If parameter estimation uses the maximum probability estimation method, the recommended sample size is between 100 and 200, with a minimum sample of 50.
- As much as 5 to 10 times the number of parameters in the model.
- Equivalent to 5 to 10 times the number of real variables (indicators) of all latent variables.

The criteria used in the selection of the sample for this research is the number of operating employees in the Floor Tiles Industry, so the number of samples using the Slovin's formula is:

$n = N/(1 + Nx(e\text{^}2))$

Of these techniques with a 95% confidence level, the minimum number of samples obtained is:

$$n = \frac{1140}{(1 + 1140 \times 0{,}05^2)} = \frac{1140}{3{,}82} = 298{,}42$$

Thus, the minimum sample required in this study is 298 operating workers in the Floor Tiles Industry.

4 | Result

This research was conducted on four floor tiles companies in Indonesia with 368 employees. These employees come from a variety of educational backgrounds, years of service and positions. The educational demographics of employees who are the sample of this study are divided into 3 categories, namely high school, Diploma and bachelor. Based on the observation, it is known that a total of 324 employees or 88.04% of the sample of employees are high school graduates, 16 employees (4.35%) are Diploma graduates and 28 employees (7.61%) are Bachelor graduates. This shows that most of the operating division workers have no education below secondary school (primary and secondary school) and the average is secondary school education so the operations division workers already have relatively good basic skills and have good work motivation, as well as easier to adapt. The results showed that the majority of the sample of employees involved in this study have a working more than 15 years is 46.74%, employees with 10 -15 years is 5.98%, employees with 5-10 years is 11.41%, employees with 1-5 years is 22.55%, and 13.32% of employees with less than 1 year of service. Based on the position, it is known that 74.46% of the respondents are operator; 16.03% of respondents are leaders; 7.07% of respondents were supervisors; 1.36% are superintendent; and 1.09% were managers. Measurement of the validity of the questionnaire was conducted using the Pearson product moment method, which is the result of all questionnaires in the form of correlation scores, if there is a correlation between total score and the score of each question greater than 0.3 then it is valid [14].

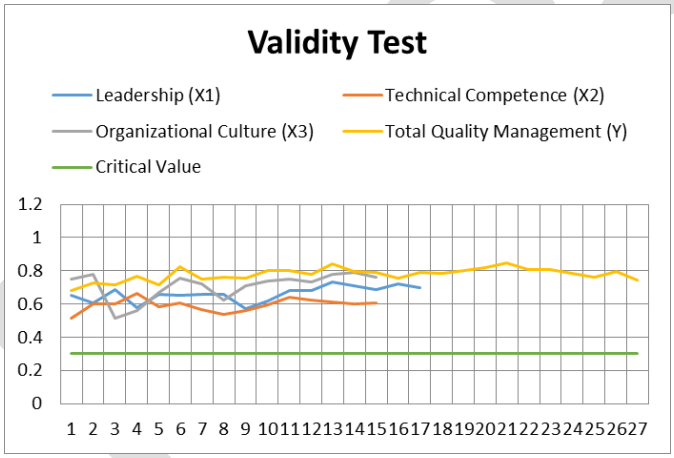

Fig. 2. Validity Test

The reliability of the instruments in this study was estimated using Cronbach's Alpha Formula and assisted with the help of SPSS software. The reliability of the instrument is based on validated data that is 89 question items given to 369 respondents showed an average reliability coefficient of 0.979 for variable X_1 of 17 items, average reliability coefficient of 0.899 for variable X_2 as of 15 items, average reliability coefficient of 0.912 for variable X_3 of 15 items, an average reliability coefficient of 0.806 for variable Y of 27 items. The reliability coefficient is quite high. **Table 1** shows the results of the reliability estimates that have been carried out.

Table 1. Results of the reliability estimates

Variable	Cronbach' Alpha	Critical Value	Information
Leadership	0,979	0,700	Reliable
Technical Competence	0,899	0,700	Reliable
Organizational Culture	0,912	0,700	Reliable
Total Quality Management	0,806	0,700	Reliable

Based on test results with a significance level of 0.05, Asymp values were obtained. Significance for X_1 = 0.072; X_2 = 0.532; X_3 = 0.347; Y = 0.232; for each variable is greater than the significance value of 0.05.

Table 2. Results with a significance level of 0.05

One-Sample Kolmogorov-Smirnov Test					
		X_1	X_2	X_3	Y
N		151	151	151	151
Normal Parameter S a,b	Mean	-,4120	-,1450	-,8660	-,5460
	Std. Deviation	4,122	6,182	3,455	4,852
		58	76	67	89
Most Extreme Difference S	Absolute	,105	,435	,176	,132
	Positive	,105	,563	,799	,246
	Negative	-,103	-,764	-,235	-,463
Kolmogorov-Smirnov Z		1,288	1,358	1,685	1,246
Asymp. Sig. (2-tailed)		,072	,532	,347	,232
a. Test distribution is Normal.					
b. Calculated from data.					

Variable of leadership is an exogenous variable that is the process of directing and influencing activities that are related to the work of group members, the leader has a task to strive to make the group achieve its goals well in optimal cooperation. The Leadership variable (X_1) consists of 4 dimensions namely Director, Communicator, Decision Making and Motivation. Respondents' response to leadership on average is 4.10, it is known that the Leading dimension is 4.10, the Communicator dimension is 4.13, the Decision Making dimension is 4.12 and the Motivation dimension is 4.04. Based on these values, the four dimensions of the leadership variable are in the Good category.

Table 3. Responses to Leadership (X_1)

Dimension	Response						Average	Categories
	1	2	3	4	5	TOTAL		
Leading	1	5	50	215	97	368	4.1	Good
Communicator	1	4	48	210	105	368	4.13	Good
Decision Making	0	5	43	224	96	368	4.12	Good
Motivator	0	5	57	224	82	368	4.04	Good
Total Score							16,39	
Average							4,10	
Standard Deviation							0,03	
Range							4,07-4,13	
Categories							Good	

Next, Respondents' response regarding Technical Competence has an average value of 4.20 in in the very good category, it is known that the Knowledge dimension 4.27 is in the very good category, the Expertise dimension 4.04 is in the good category, and the Attitude Dimension 4.29 is in the very good category.

Table 4. Responses to Technical Competence (X_2)

Dimension	Response						Average	Categories
	1	2	3	4	5	TOTAL		
Knowledge	1	1	25	210	131	368	4.27	Very Good
Expertise	0	3	59	234	72	368	4.04	Good
Attitude	0	1	31	208	128	368	4.29	Very Good
Total Score							12,6	
Average							4,20	
Standard Deviation							0,113	
Range							4,09-4,31	
Categories							Very Good	

Next, Respondents' response regarding Organizational Culture has an average value of 3.98 in the good category, known Innovation dimension 3.81 included in the good category, Outcome Orientation dimension 4.11 included in the good category, Aggressive dimension. Attitude is 4.07 referenced in good category, Stability dimension 3.93 is in good category, and Attention dimension to item 3.96 is in good category.

Table 5. Responses to Organizational Culture (X_3)

Dimension	Response						Average	Categories
	1	2	3	4	5	TOTAL		
Innovation	4	20	79	206	59	368	3.81	Good
Outcome Orientation	1	3	52	211	101	368	4.11	Good
Aggressive	2	3	52	218	93	368	4.07	Good
Stability	2	4	76	220	66	368	3.93	Good
Attention	0	5	75	218	70	368	3.96	Good
Total Score							19,88	
Average							3,98	
Standard Deviation							0,11	
Range							3,87 – 4,09	
Categories							Good	

The influence of TQM is an endogenous variable 1, which is an approach in adapt of an organization. Respondents' feedback on influence of TQM (Y) has a mean value of 4.02 in good category, it is known that Organizational Leadership dimension 4.02 is in good category, Customer Satisfaction & Relationship dimension 4.06 is in good category, and Human Resource Management dimension 3.96 is in good category, the Strategic Planning and Development dimension 4.04 is in the good category, and the Supplier Management dimension 4.00 is in the good category.

Table 6. Total Quality Management (Y)

Dimension	Response						Average	Categories
	1	2	3	4	5	TOTAL		
Organization Leadership	1	4	66	212	85	368	4.02	Good
Costumer Satisfaction & Relationship	0	3	61	214	90	368	4.06	Good
Human Resource Management	1	6	74	213	74	368	3.96	Good
Strategic Planning and Development	0	3	62	220	83	368	4.04	Good
Supplier Management	0	6	64	223	75	368	4	Good
Total Score							20,08	
Average							4,02	
Standard Deviation							0,03	
Range							3,98 – 4,05	
Categories							Good	

Correlation coefficient analysis was used to determine the degree of intimacy of the relationship between the independent variables. Using the application assistance of the SPSS program, the output of the correlation coefficients of leadership, technical competence and organizational culture are as follows, as shown in the following **Table 7**.

Table 7. Correlation Coefficients between Correlation Independent Variables

		Leadership (X_1)	Technical Competence (X_2)	Organizational Culture (X_3)
Leadership (X_1)	Pearson Correlation	1	,668**	,701**
	Sig. (2-tailed)		,000	,000
	N	368	368	368
Technical Competence (X_2)	Pearson Correlation	,668**	1	,655**
	Sig. (2-tailed)	,000		,000
	N	368	368	368
Organizational Culture (X_3)	Pearson Correlation	,701**	,655**	1
	Sig. (2-tailed)	,000	,000	
	N	368	368	368

Questionnaire data processing with Structural Equation Modeling (SEM), the communicator dimension has the largest loading factor compared to other dimensions of 0.90. It can be interpreted that the communicator dimension makes the greatest contribution to enhancing leadership. The Expertise dimension has the largest loading factor compared to the other dimensions, which is 0.86. This means that the Expertise dimension makes the greatest contribution to improving the technical competence of operating employees. The yield orientation and stability dimension had the largest loading factor compared to the other dimensions, namely 0.85. It can be interpreted that the dimensions of Orientation and Decision Stability make the greatest contribution in improving organizational culture. The dimension of Organizational Leadership and Strategic Planning and Development has the largest loading factor compared to other dimensions of 0.93. This means that the dimensions of Organizational Leadership and Strategic Planning and Development make the greatest contribution in improving the influence of TQM. And finally, the productivity dimension has the largest loading factor compared to the other dimensions, which is 0.91. It can be interpreted that the productivity dimension makes the biggest contribution in improving the influence of TQM in the floor tiles industry as shown in the following **Table 8**.

Table 8. Correlation Coefficients between Correlation Independent Variables

Factor	Dimension	Loading Factor	t- value	Error	Information
Leadership (X_1)	Director ($X_{1.1}$)	0,84	19,41	0,29	Valid
	Communicator ($X_{1.2}$)	0,90	21,62	0,19	Valid
	Decision Making ($X_{1.3}$)	0,80	10,11	0,35	Valid
	Motivator ($X_{1.4}$)	0,89	21,20	0,21	Valid
Technical Competence (X_2)	Knowledge ($X_{2.1}$)	0,79	17,50	0,38	Valid
	Skill ($X_{2.2}$)	0,86	19,90	0,27	valid
	Attitude ($X_{2.3}$)	0,83	18,92	0,31	Valid
Organizational Culture (X_3)	Innovation ($X_{3.1}$)	0.8	17,92	0,37	Valid
	Result orientation ($X_{3.2}$)	0.85	19,71	0,29	Valid
	Aggressive ($X_{3.3}$)	0.83	19,18	0,31	Valid
	Stability ($X_{3.4}$)	0.85	19,98	0,28	Valid
	Attention to details ($X_{3.5}$)	0.8	18,18	0,36	Valid
Total Quality Management (Y)	Organization Leadership (Y_1)	0,93	0,00	0,20	Valid
	Costumer Satisfaction & Relationship (Y_2)	0,92	24,77	0,15	Valid
	Human Resource Management (Y_3)	0,91	23,99	0,18	Valid
	Strategic Planning and Development (Y_4)	0.93	25,62	0,13	Valid
	Supplier Management (Y_5)	0.9	23,72	0,19	Valid

In this analysis, the value of the model fit indicator (Fit Index) as a LISREL output will be discussed. In this analysis, to see whether the model obtained has met the model accuracy measure (Goodness of fit measures/ GoF) so that it can be said that the model obtained from the comparison between the data and the model is good, it can be seen based on the following criteria.

Table 9. Results of Analysis of Variable Measurement Model

No	Indicator	Standard	Value	Model Fit Criteria
1	Chi-Square	< 2df	212,89 < 2 -182	Model Fit
2	Probability (p-value)	≥ 0,05	0,0582	Model Fit
3	Root Mean Square Error of Approximation (RMSEA)	≤ 0,08	0,036	Model Fit
4	Normed Fit Index (NFI)	≥ 0,90	0,98	Model Fit
5	Comparative Fit Index (CFI)	≥ 0,90	1,00	Model Fit
6	Incremental Fit Index (IFI)	≥ 0,90	1,00	Model Fit
7	Goodness of Fit Index (GFI)	≥ 0,90	0,96	Model Fit

Based on the **Table 9**, it appears that in general Goodness of Fit requirement has been met because the values obtained are within the required interval, so that it is said that the model obtained is fit. The results of the model accuracy calculation (Suitability Benefit measure) show the Leadership, Technical Competence, and Organizational Culture model on influence of TQM and its effect at Floor Tiles Industry is a good model to explain the relationship of variables studied.

Table 10. Direct and Indirect Effects of Leadership (X_1), Technical Competence (X_2) and Organizational Culture (X_3) on TQM (Y)

	Path Coefficient	Direct Effect	Indirect Influence Through			Total Effect
			Leadership (X_1)	Technical Competence (X_2)	Organizational Culture (X_3)	
Leadership (X_1)	0,17	2,89%		3,31%	9,69%	15,89%
Technical Competence (X_2)	0,21	4,41%	3,31%		11,13%	18,86%
Organizational Culture (X_3)	0,62	38,44%	9,69%	11,13%		59,26%
		45,74%	13,00%	14,45%	20,82%	94,00%
Total Effects of X_1, X_2 and X_3 on Y						

Based on the table above, it can be seen that leadership, technical competence and organizational culture have a direct and indirect impact on the influence of TQM in the floor tiles industry. From the recapitulation of the influence between variables, it is found that the direct influence of leadership on TQM implementation is 2.89%, indirect effect through technical competence is 3.31% and indirect influence through organizational culture is 9.69%, so the total influence of leadership on TQM is 15.89%. The direct influence of technical competence on the of TQM is 4.41%, indirect influence through leadership is 3.31%, indirect influence through organizational culture is 11.13%, total of influence of technical competence on TQM is 18.86%. The direct influence of organizational culture on TQM is 38.44%, indirect influence through leadership is 9.69%, indirect influence through technical competence is 11.13%, and total of influence of organizational culture on TQM is 59.26%. Thus the proposed conceptual hypothesis has been tested and is acceptable. The computational results obtained show that the total variables of quality management implementation are influenced by leadership variables, technical competence variables and organizational culture variables either partially or simultaneously [21].

5 | Conclusion

Based on the calculation, the value of $F_{calculate}$ is 1900.889 where reject criterion is H_0 if $F_{calculate}$ is greater than F_{Table} or $F_0 > F_{Table}$, with degrees of freedom $v_1 = 3$ and $v_2 = 368–3–1$ and 95% confidence level, then from our F distribution table get the value of F_{Table} for F0.05,3,368 = 2.6484. Since 1900.889 is greater than 2.6484, then H_0 is subtracted, meaning it can be concluded that there is a positive influence between leadership variables, technical competence variables and organizational culture variables on the influence variables of in TQM. Based on the components that influence of TQM in Floor Tiles Industry, the variables of leadership, technical competence and organizational culture are closely related to certain factors. A leadership pattern that focuses on goals or targets determined and taken based on scientific thinking by taking into account the various parties involved will improve the quality of influence of TQM in the company. Education and training as well as employee involvement by providing controlled independence as well as improving the technical quality of employees is useful to maximize the influence of TQM. Similar to leadership and technical competencies, an organizational culture that focuses on customers, is committed, supports each other or works collaboratively and has a desire to maximize all facilities provided for self -empowerment will have a positive impact on the influence of TQM. By supporting the optimization of the variables of Leadership, Technical Competence and Organizational Culture, the influence of TQM in Floor Tiles Industry can be optimized as well. On the other hand, lack of attention to the aspects of leadership, technical competence and good organizational culture will hamper the influence process of TQM.

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Conflicts of Interest

This statement is to certify that all Authors have seen and approved the manuscript being submitted. We warrant that the article is the Authors' original work. We warrant that the article has not received prior publication and is not under consideration for publication elsewhere. On behalf of all Co-Authors, the corresponding Author shall bear full responsibility for the submission. This research has not been submitted for publication nor has it been published in whole or in part elsewhere. We attest to the fact that all Authors listed on the title page have contributed significantly to the work, have read the manuscript, attest to the validity and legitimacy of the data and its interpretation, and agree to its submission to the Journal of Applied Research on Industrial Engineering.

All authors agree that author list is correct in its content and order and that no modification to the author list can be made without the formal approval of the Editor-in-Chief, and all authors accept that the Editor-in-Chief's decisions over acceptance or rejection or in the event of any breach of the Principles of Ethical Publishing in the Journal of Applied Research on Industrial Engineering being discovered of retraction are final.

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