Development of Knowledge Management System for Determining Organizational Performances, Total Quality Management and Culture

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Abstract. Free market stipulated organizations to improve quality and competitiveness. To achieve this improvement, companies had to implement Total Quality Management so that the vision and mission of companies as one of the main competing factors in the free market were achieved. Many companies had problems in measuring and implementing the organizational performance and Total Quality Management because it needed enough budgets so that a system was needed to measure this organizational performance. The objective of this study was (1) to measure the organizational performance, (2) to measure the implementation of Total Quality Management, and (3) to measure the organizational culture by using Knowledge Management System (KMS)-based approach at Micro, Small & Medium Enterprises (MSMEs). The advantage of this study was to provide the best recommendations for companies. To develop this system, the writers conducted surveys to several MSMEs, invited experts and practitioners to acquire the knowledge, and carried out the literature study to obtain the recommendation about the best organizational culture at MSMEs. This study developed software used to measure the organizational performance, Total Quality Management, and organizational culture is seen from the Knowledge Management System (KMS) principles. The developed software had been examined to several companies and MSMEs with a very high level of accuracy in giving a recommendation.

Keywords: Organizational Performance, Total Quality Management, Organizational Culture, Knowledge Management System, MSMEs.

1. Introduction
The business competition is an unavoidable matter. The fluctuating changes in the business environment along with the development of technology and information required entrepreneurs to think creatively so that the company performance was improved. The success in implementing the Total Quality Management (TQM) and organizational performance was closely related to the organizational culture of companies in which the organizational culture played a role in determining the organizational direction and in allocating resources and processes to deal with internal and external problems. Improving the organizational culture was a very important aspect in organizations because every organization or company had its own organizational culture which was different from each other.
The Total Quality Management had certain values that had to be fulfilled and implemented in order to improve overall organizational performances seen on leaderships, visions and plan statements, customer focuses, educations and training, benchmarking, teamwork, continuous improvements, employee engagements, supplier quality management, and recognition and rewards [2].

The various needs for an integrated system to measure the organizational performance seen on financial and non-financial aspects were required [8]. By performing performance measurements and providing the right and best recommendations, they were able to maximize the development and existence of the company so that the company had continuous improvement.

2. Research Method

2.1. Knowledge Management System

The phases of this study were evaluating the existing infrastructure, organizing the knowledge management team, acquiring the knowledge, designing the KMS blueprint, verifying and validating the KMS, doing the correction, implementing the KMS, managing the changes, and evaluating the systems [1] [4]. The procedure of this study was illustrated in Figure 1.

![Knowledge Management System Life Cycle](image)

Figure 1. Knowledge Management System Life Cycle

This research used a frequency distribution method with 7 points Likert Scale to obtain information about the organizational performance, the TQM, and the organizational culture. This method results in particular scores upon recent organizational performance, TQM, and organizational culture. Knowledge mapping played important roles as a recommendation of the organizational performance, TQM, and organizational culture which led to the recommendation distribution so that companies was able to conduct a continuous improvement [6]. The procedure of knowledge mapping as illustrated in Figure 2.
3. Implementation of Algorithm

3.1. Calculation Scale

The type of study was a quantitative study. The quantitative study was the study involving quantitative data by using quantitative analysis (inferential analysis). The quantitative data was in the form of numbers on a scale of 1-7. The score 7 Very Strongly agreed (VSA); score 6 was Strongly Agree (SA); score 5 was Agree (A); score 4 was Adequately Agree (AA); score 3 was Less Agree (LA), score 2 was Disagree (D), score 1 Strongly Disagree (SD). The measurement method of this study was asking respondents with several statements and they answer with seven answer choices from which the answer scores had a different answer score.

3.2. Calculation of Algorithm

The development of the algorithm was conducted by several phases as follow:

- Filling Questionnaire. Respondents filled out the questionnaires on the scale of 1-7 with a total of 92 questionnaires divided into 11 items of organizational performance, 57 items Total Quality Management and 24 items of organizational culture.
- Finding the organizational culture score. Finding the organizational culture score was through an algorithm developed by Aziz [3].
- Finding Total Quality Management (TQM) and Organizational Performance score. Total Quality Management (TQM) and Organizational Performance. Finding the Total Quality Management and Organizational Performance score was based on the following below:

1. Finding the frequency score of each variable on Total Quality Management and Organizational Performance.

\[ F = \sum_{i=1}^{s} X \]  

\( F \) : Frequency  
\( X \) : Variable  
\( S \) : Scale 1-7

Figure 2. Knowledge Mapping Procedure
2. Finding the score of Frequency x Scale It was the phase to multiply the score of the frequency with the scale of each variable of Total Quality Management and Organizational Performance.

3. Finding the index score, It was the phase to divide each score of frequency x scale with a total of respondents

\[
Index = \frac{\sum \text{Total of Frequency} \times \text{Scale}}{r}
\]  

\[\text{Index Score} : \text{Number of respondents} \]
\[\sum \text{Total of Frequency} : \text{Total of Frequency} \]
\[\text{Scale} : \text{Score of scale 1-7} \]

4. Finding the median score, it was the phrase, to sum up, the Index score and dividing it with the total of questions on each variable of Total Quality Management and Organizational Performance.

5. Summing up the index score which was divided by the number of questions on each variable of Total Quality Management and Organizational Performance.

\[
NT = \frac{\sum \text{Index}}{\sum \text{Activities}}
\]  

\[\text{NT} : \text{Median} \]
\[\sum \text{Index} : \text{Number of Index Score} \]
\[\sum \text{Activities} : \text{Number of Questions} \]

6. Scoring phase, It was the phase to determine the score using the statistical approach (class interval) and to calculate the score based on the results of interviews with experts and practitioners through the statistical approach by dividing interval classes 1-7 into 4 classes (Good, Good Enough, Enough, Bad) with the equation as follows.

\[
Ci = \frac{\text{Measure Distance (R)}}{\text{Number of Intervals (N)}}
\]  

\[\text{Ci: Interval Width} \]
\[\text{N: Number of Frequency} \]
\[\text{R: Measure Distance} \]

The further phase was determining the recommendations in the form of suggestions used for improvement for companies based on the results of the score.

**Implementation of Algorithm**

Respondents filled out the questionnaires on a scale of 1-7 with Strongly Disagree (SD) to Very Strongly Agree (VSA). It was seen in Table 1.

**Table 1. Filling out Questionnaire**
Furthermore, it was the phase to find the score of the frequency of each variable on Total Quality Management and Organizational Performance. It was seen in Table 2.

**Table 2. Finding Score of Frequency**

| No. | Variable 1 | \( \ldots \) | \( \ldots \) |
|-----|------------|-------------|-------------|
| 1   | \( r_1 \)  | \( \sum \)   | \( \sum \)   |
| 2   | \( r_2 \)  | \( \sum \)   | \( \sum \)   |
| \( \ldots \) | \( \ldots \) | \( \sum \)   | \( \sum \)   |

The further phase was finding the score of frequency x scale, multiplying the score of the frequency with the Scale of each of Total Quality Management and Organizational Performance. It was seen in table 3.

**Table 3. Finding Score of Frequency * Scale**

| No. | Variable 1 | \( \ldots \) |
|-----|------------|-------------|
| 1   | \( F \times S \) | \( \sum \) |
| 2   | \( F \times S \) | \( \sum \) |
| 3   | \( F \times S \) | \( \sum \) |
| 4   | \( F \times S \) | \( \sum \) |
| 5   | \( F \times S \) | \( \sum \) |
| 6   | \( F \times S \) | \( \sum \) |
| \( \ldots \) | \( \sum \) |

The next phase was finding the index score by dividing each score of Frequency multiplied by Scale with the total respondent. It was seen in table 4.

**Table 4. Finding Index Score**

| No. | Variable 1 | \( \ldots \) |
|-----|------------|-------------|
| 1   | Index \( \frac{\sum \text{Total Of Frequency } \times \text{Scale}}{r} \) | \( \ldots \) |

The next step was finding the median score by summing the index score and dividing it with the total number of questions on each variable of Total Quality Management and Organizational Performance. It was seen in table 5.

**Table 5. Finding Median Score**

| No. | Variable 1 | \( \ldots \) |
|-----|------------|-------------|
The further phase was scoring step, determining scores with the statistical approach (interval class). Calculating the score based on the results of interviews with experts and practitioners with a statistical approach by dividing many interval classes 1-7 into 4 classes seen on Good, Good Enough, Fair, Bad. It was seen in table 6.

Table 6. Finding the Interval Class Distance Score

| Class          | Interval Class Distance |
|----------------|-------------------------|
|                | $\sum \frac{Index}{\sum \text{Activities}} \ldots n$ |

Furthermore, it was the phase of determining recommendations. It was in the form of suggestions for improvement for companies based on the scoring results.

3.3. Acquiring Knowledge

The phase of acquiring knowledge was conducted to acquire the knowledge from the experts and the literature about the organizational performance, the Total Quality Management Implementation, and the organizational culture. The phases to capture the knowledge involve the literature studies, surveys, and interviews on the experts to acquire knowledge of the best recommendations. The results of mapping and acquiring knowledge were in the form of organizational performance and Total Quality Management implementation in table 7.

Table 7. Knowledge Capture

| No | Variable          | Score  | Classes       | Recommendation |
|----|-------------------|--------|---------------|----------------|
| 1  | Variable Performance & TQM | 1.0 - 2.4 | Bad           | Improvement    |
| 2  | Variable Performance & TQM | 2.5 - 3.9 | Fair          | Improvement    |
| 3  | Variable Performance & TQM | 4.0 - 5.4 | Good Enough   | Enhancement    |
| 4  | Variable Performance & TQM | 5.5 - 7.0 | Good          | Good           |

3.4. Designing Use Case Diagram

The design of use case diagram about the implementation of organizational performance, total quality management, and organizational culture which described the interaction of actors in the system and access to the system was illustrated in Figure 3.
3.5. Designing the Database

The database was useful to describe the relationships between the data in the table and to provide information for the system. The first database was about Business Design process in Figure 4.

![Use Case Diagram](image)

**Figure 3. Use Case Diagram**

**Note:**
- Operator: Signing up, verifying account, and managing data.
- Manager: Viewing the report description of the questionnaires about the organizational culture profile, the total quality management, the organizational culture.
- Employee: Filling out the questionnaire about the organizational performance, the total quality management, and the organizational culture.

![Database Design](image)

**Figure 4. Database Design**

The database was useful to describe the relationships between the data in the table and to provide information for the system. The first database was about Business Design process in Figure 4.
4. Research Finding and Discussion
The implementation of this system was conducted after establishing the previous design. The implementation of the system was done to determine the organizational performance, the total quality management, and the organizational culture.

4.1. Register and Login Page
The register and login page was the first page functioned to register. It was also used to enter into the system. It was seen in figure 5.

![Figure 5. Register and Login Page](image)

4.2. Menu and Questionnaire Page
The menu and questionnaire pages were the pages containing the menu and questionnaire for being filled. It was seen in Figure 6.

![Figure 6. Menu and Questionnaire Page](image)

4.3. Organizational Performance, Total Quality Management, Organizational Culture Diagram Page
It was the page containing a diagram based on the input score of the questionnaire about the organizational performance, the total quality management, and the organizational culture. It was seen in Figure 7.
4.4. Scoring and Recommendation Page

This page showed the score of each variable obtained from the result of the calculation process. Moreover, it contained the recommendation page seen from the range of scores obtained in each variable. It was seen in Figure 8.

4.5. Knowledge Management System Analysis

Knowledge Management System Analysis was used to meet the basic phase of Knowledge Management System Life Cycle, to evaluate Existing Infrastructure, to form KM-Team, to acquire knowledge, to create KMS blueprint, to verify and validate KMS [1]. Implementing a KM-system was done by adjusting the organizational performance system, the total quality management implementation, and the organizational culture. It was seen in table 8.
Table 8. Knowledge Management System Analysis

| Phases                              | Notes                                                                 |
|-------------------------------------|------------------------------------------------------------------------|
| Evaluate Existing Infrastructure    | Conducting Literature Study, Observation, Expert Consultation.          |
| Form the KM-Team                    | Making criteria and describing system; finding the Organization Performance; Implementation of TQM, and Organization Culture; Implementing Frequency Distribution Method; Conducting scoring phases by using Statistical Approach (Class Interval); Designing Diagram. |
| Knowledge capture                   | Validating and Verifying Knowledge through Journal, Books, Experts, and Practitioners |
| KMS Blue Print                      | Designing the Conceptual Model                                         |
| Verification and validation KMS     | Processing Data                                                        |
| Implementasi KMS                    | Web Mobile-based software for finding the organizational performance, Total Quality Management Implementation, Organizational Culture and for giving recommendation for companies |

5. Conclusion
Developing software to measure the organizational performance, the total quality management implementation, and the organizational culture for SMEs as supporting continuous company performance improvement.

Software Measurement on organizational performance, helping minimize company expenses used for measuring the cost of the organizational performance, total quality management, and organizational culture and for providing appropriate recommendations to companies with Knowledge Management System (KMS)-based approach.

Process of acquiring knowledge on Knowledge Management System (KMS) was conducted by applying the statistical approach (class interval). The result of this process was that there were 4 classes with certain assessment i.e., the score 1-2.4 were bad; the score 2.5-3.9 was enough; the score 4.0 - 5.4 was good enough, and the score 5.5 - 7.0 were good.

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References

[1] Awad, E.M dan Ghaziri, H.M., 2010. Knowledge Management. Person Education Inc., New Jersey.

[2] Aziz, A. R., Sumantoro, I. B., & Maria, D. (2019). Total Quality Management of micro, small and medium enterprises (MSMEs), and the impact on organizational culture and performance: emerging country case. Polish Journal of Management Studies, 19.

[3] Aziz, RZ Abdul., Iriyanto, Suhendro Yusuf., Azima, Muhammad Fauzan, (2017) Development of Knowledge Management System for Determining Organizational Culture in Micro, Small and Medium Enterprises Using Organizational Culture Assessment Instrument. (Proceeding International Conference On Engineering and Applied Technology (ICEAT) 2017, Mataram, Indonesia).

[4] Fernandez IB, Sabherwal R., 2010. Knowledge Management: System and Processes. England: M.E. Sharpe.

[5] Introduction to Statistics "Center for Education and Culture Statistics of the Secretariat General, Ministry of Education and Culture 2014. https://scholar.google.co.id/scholar. (In Bahasa)

[6] Purnomo, Cynthia Agelina., Hadi. Yuswono, (2017) MSMEs Performance Measurement Using Performance Prism, Malang, East Java, Industrial Spectrum, 2017, Vol. 15, No. 2, 121 - 255., ISSN: 1963-6590 / 2442-2630. (In Bahasa)

[7] Quinn, K. S. C., & Robert, E., 2011. Diagnosing and Changing Organizational Culture: Based on The Competing Values Framework-3/E.

[8] Salaheldin, S. I., 2009. Critical success factors for TQM implementation and their impact on the performance of SMEs. International Journal of Productivity and Performance Management, 58(3), 215-237. https:// dx.doi.org/10.1108/17410400910938832

[9] Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. (1993). Probability and statistics for engineers and scientists (Vol. 5). New York: Macmillan.