

The Relationship between TQM Practices with TQM Tools and Techniques in Small and Medium Enterprise (SMEs)

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Abstract. Total Quality Management (TQM) is an approach which enforcing continuous improvement in all aspects in an organization for long term achievement. However, small and medium enterprises (SMEs) have limited resources for implementing TQM tools and techniques in their organisation. Hence, the purpose of this research is to identify the extent level of TQM practices and TQM tools and techniques and to examine their relationship. Research hypotheses were examined while considering six dimension of TQM practices which considered important in TQM tools and techniques implementation. Random sampling and survey have been used by distributing questionnaire to 200 respondents for final study. The study result shows that the extent level in TQM tools and techniques is in high and moderate level. Furthermore, there is a significant relationship between TQM practices and TQM tools and techniques in SMEs. The study is important for SMEs to gain insight on the effect of TQM practices towards TQM tools and techniques in organizational performance and identify the most important tools and techniques for their companies in future implementation.

1 Introduction

Small and medium enterprises (SMEs) are playing important role in developing a country [1]. In the developing countries, SMEs constitute as a main sources of national income and create an important area for business activity [2]. In recent decades, SMEs in all sectors have done breakthrough by creating and ensuring their product quality or service quality in every complexion of daily operations because quality is a key to gain competitive advantage. Hence, total quality management (TQM) had become a widespread practice in SMEs. According to Ahmad [3], a successful TQM implementation can create sustainable quality and productivity in long term by developing continuous improvement. TQM

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practices included top management, customer satisfaction, employee improvement, continuous improvement, supplier partnership and performance measures. Moreover, continuous improvement is important when an organisations begin to start implement TQM in organizations [4][5]. TQM tools and techniques are important to maintain SMEs' quality and productivity performance. Furthermore, TQM tools and techniques defined by the Deming Prize Committee of the Union of Japanese Scientists and Engineers [6] as: "a set of systematic activities carried out by the entire organization to effectively and efficiently achieve the organization's objectives so as to provide products and services with a level of quality that satisfies customers at the appropriate time and price. Both TQM practices and TQM tools and techniques are playing important role in maintaining a good quality and productivity performance of SMEs.

In fast-speeding global era, TQM tools and techniques are commonly implementing in SMEs. TQM is a multidimensional approach [7][8]. It integrates fundamental approach can lead to a dynamic capability of SMEs. The purpose of implementing TQM is to provide quality products or services to customers, which will, in turn, increase productivity and decrease costs. SMEs use the basic tools like check sheet, flow chart and control chart which is simple and easy to carry out in order to operate their daily process for the past decade. SMEs are using most basic tools because implement new tools to evaluate their daily processing need some professional knowledge, skills and training nowadays [9]. However, SMEs required high investment such as man power, skill and financial to implement TQM tools and techniques [10]. In this situation, limited TQM tools and techniques usage had affected poor quality and productivity performance of SMEs [5]. Hence, this research helps to investigate the most related tools and techniques for TQM implementation by analysing the extent level and the relationship to TQM. SMEs implement TQM tools and techniques to enhance their quality and productivity performance and maintain close relationship with supplier and customer [7][3]. Hence, SMEs should focus more on TQM practices, as this may support both knowledge management practices and performance of the firms.

The following research questions will be examined in the study:

1. What is the extent level of TQM tools and techniques?
2. What is the relationship between TQM practices with tools and techniques?

The hypothesis is set to test the relationship and the extent level between TQM practices with TQM tools and techniques. Quality tools act as an important role for product development process from commence phase until the very hindmost phase of production process [11]. The tools divided into basic tools and new basic tools. The basic tools which most implement by previous organization are flow chart, check sheet, histogram, Ishikawa diagram, scatter diagram and control chart. TQM practices as basis for implementing tools and techniques. By implementing quality tools, it can enhance business performance [11]. Based on the theoretical framework, the research hypotheses are formulated by:

H1: There is significant relationship between TQM practices and TQM tools and techniques

2 Methodology

The population is observed from small and medium enterprise (SMEs). The unit of analysis is organisation. There are total of 400 samples have been selected for this study. Random sampling is used for this research. Survey method was used in this research. Finally, 80 questionnaires were received for final study. It represented 20.0% of response rate. Statistical Package for Science Social (SPSS) was used to analyse the data being collected. Descriptive and correlation test have been carried out to answer the research questions. Pearson and Spearman test have been used for correlation test.

3 Analysis Results and Discussion

3.1 Cronbach's alpha

Cronbach's alpha [12] was used to determine the reliability of the questionnaire as shown in Table 1. Cronbach's alpha is a measure of internal consistency, which able to determine how closely related a set of items are as a group.

Table 1. Cronbach's alpha result

TQM Practices	Cronbach's alpha
Training	0.886
Top Management Commitment	0.898
Customer Focus	0.885
Continuous Improvement	0.872
Employee Involvement	0.864
Process Management	0.882

3.2 Extent level of TQM tools and techniques

Table 2 shows Ishikawa diagram is the most welcomed by SMES and score the highest mean which is 5.3125 among the rest of TQM tools and techniques. However, bottom five TQM tools and techniques which less practiced by SMES are design for manufacturability (DFM), matrix data analysis, mass customization, relation diagram and matrix diagram. Design for manufacturability is the least conducted by Small and Medium Enterprise (SME) and score the lowest mean which is 3.1750 in between scale 1 to scale 7 among the rest of TQM tools and techniques.

Table 2. Extent level of TQM tools and techniques

	N	Mean	Interpretation	Standard Deviation	Rank
Flow Chart	80	4.8375	High	1.67969	4
Check Sheet	80	4.9125	High	1.59266	2
Histogram	80	4.8875	High	1.66873	3
Pareto Diagram	80	4.1500	Moderate	1.60773	10
Ishikawa Diagram	80	5.3125	High	1.66569	1
Scatter Diagram	80	3.8750	Moderate	1.66403	12

Control Chart	80	4.1625	Moderate	1.65693	11
Affinity Diagram	80	3.5625	Moderate	1.71990	15
Tree Diagram	80	4.8250	High	1.68219	5
Progress Decision Program Chart	80	3.7875	Moderate	1.74075	13
Matrix Diagram	80	3.4250	Moderate	1.71202	16
Relation Diagram	80	3.2875	Moderate	1.85686	17
Matrix Data Analysis	80	3.2125	Moderate	1.87383	19
Arrow Diagram	80	3.5949	Moderate	1.75791	14
FMEA	80	4.5875	High	1.61240	7
QFD	80	4.2875	Moderate	1.67781	9
SPC	80	4.7625	High	1.56095	6
Mass Customization	80	3.2875	Moderate	1.63965	18
Design For Manufacturability	80	3.1750	Moderate	1.69717	20
DOE	80	4.3500	Moderate	1.75816	8
		Total:		82.2824	
		Mean:		4.1141	Moderate

3.3 Correlation Test

From the Table 3, it shown the correlation coefficient, $r=0.716$, indicating a high positive correlation and significant where $p < 0.01$. Hence, H1 is accepted.

Table 3. Correlation between TQM practices and TQM tools and techniques

		TQM tools and techniques	Correlation
TQM Practices	Pearson Correlation	.716**	High
	Sig. (2-tailed)	.000	
	N	80	

The results demonstrated on Table 4, all the results are significant. Statistical process control (SPC), flow chart, histogram, pareto diagram and check sheet have high correlation between TQM practices and TQM tools and techniques which shown $r=0.623$, $r=0.618$, $r=0.605$, $r=0.601$ and $r=0.600$. TQM practices are considered to be a significant predictor of TQM practices across TQM tools and techniques. The most effectiveness TQM practices toward TQM tools and techniques are statistical process control (SPC), flow chart, histogram, check sheet and pareto diagram. The highest correlated tools and techniques toward TQM practices is SPC. The reason from Paiva (2013) states that SPC has significant advantage over inspection as quality control techniques such as it emphasize on prevention of problem. Montgomery (2009) states that SPC is a powerful collection of problem-solving tools to maintain process stability and enhance capability through reduction of variability. Alternatively, the least effectiveness TQM practices toward TQM tools and techniques are matrix data analysis, relation diagram, affinity diagram, matrix diagram and process decision program chart.

Table 4. Correlation between TQM practices and TQM tools and techniques

Hypothesis (H)	TQM tools and techniques		Mean TQM Practices (r)	Correlation	Result	Rank of Effectiveness
H1a	Flow Chart	Pearson Correlation Sig. (2-tailed) N	.618** .000 80	Moderate	Significant	2
H1b	Check Sheet	Pearson Correlation Sig. (2-tailed) N	.600** .000 80	Moderate	Significant	5
H1c	Histogram	Pearson Correlation Sig. (2-tailed) N	.605** .000 80	Moderate	Significant	3
H1d	Pareto Diagram	Pearson Correlation Sig. (2-tailed) N	.601** .000 80	Moderate	Significant	4
H1e	Ishikawa Diagram	Pearson Correlation Sig. (2-tailed) N	.569** .000 80	Moderate	Significant	6
H1f	Scatter Diagram	Pearson Correlation Sig. (2-tailed) N	.518** .000 80	Moderate	Significant	8
H1g	Control Chart	Pearson Correlation Sig. (2-tailed) N	.465** .000 80	Low	Significant	10
H1h	Affinity Diagram	Pearson Correlation Sig. (2-tailed) N	.403** .000 80	Low	Significant	18
Hypothesis (H)	TQM tools and techniques		Mean TQM Practices (r)	Correlation	Result	Rank of Effectiveness
H1i	Tree Diagram	Pearson Correlation	.463** .000 80	Low	Significant	11

Hypothesis (H)	TQM tools and techniques		Mean TQM Practices (r)	Correlation	Result	Rank of Effectiveness
		Sig. (2-tailed) N				
H1j	Progress Decision Program Chart	Pearson Correlation Sig. (2-tailed) N	.428** .000 80	Low	Significant	16
H1k	Matrix Diagram	Pearson Correlation Sig. (2-tailed) N	.411** .000 80	Low	Significant	17
H1l	Relation Diagram	Pearson Correlation Sig. (2-tailed) N	.400** .000 80	Low	Significant	19
H1m	Matrix Data Analysis	Pearson Correlation Sig. (2-tailed) N	.383** .000 80	Low	Significant	20
H1n	Arrow Diagram	Pearson Correlation Sig. (2-tailed) N	.441** .000 80	Low	Significant	14
H1o	FMEA	Pearson Correlation Sig. (2-tailed) N	.519** .000 80	Moderate	Significant	7
H1p	QFD	Pearson Correlation Sig. (2-tailed) N	.455** .000 80	Low	Significant	13
Hypothesis (H)	TQM tools and techniques		Mean TQM Practices (r)	Correlation	Result	Rank of Effectiveness
H1q	SPC	Pearson Correlation	.623** .000 80	Moderate	Significant	1

Hypothesis (H)	TQM tools and techniques		Mean TQM Practices (r)	Correlation	Result	Rank of Effectiveness
		Sig. (2-tailed) N				
H1r	Mass Customization	Pearson Correlation Sig. (2-tailed) N	.461 ** .000 80	Low	Significant	12
H1s	Design For Manufacturability	Pearson Correlation Sig. (2-tailed) N	.437** .000 80	Low	Significant	15
H1t	DOE	Pearson Correlation Sig. (2-tailed) N	.466** .000 80	Low	Significant	9

4 Conclusion

The study result shows that the extent level in TQM tools and techniques is in high and moderate level. Furthermore, there is a significant relationship between TQM practices and TQM tools and techniques in SMEs. The study is important for SMEs to gain insight on the effect of TQM practices towards TQM tools and techniques in organizational performance and identify the most important tools and techniques for their companies in future implementation.

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