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DOES TQM LEAD TO IMPROVEMENT IN QUALITY PERFORMANCE IN MANUFACTURING FIRMS? -SOME EMPIRICAL EVIDENCE

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ABSTRACT

Total Quality Management is a philosophy that involves everyone in an organization in a continual effort to improve quality and achieve customer satisfaction. There are two key philosophies in TQM. One is a never-ending push to improve and the other is a goal of customer satisfaction which involves meeting or exceeding customer expectations. This study makes an attempt to know the CSFs of TQM and its effect on quality performance, taking manufacturing facilities working in Gujarat. Primary data of the study are collected from 57 ISO 9001 certified facilities belonging to medium and large scale limited Indian companies in manufacturing sector. In this study CSFs of TQM are defined as independent variable and quality performance is defined as dependent variables. Findings show that process monitoring and control, fact-based management, employee involvement and customer focus play role in improving quality performance of the organization.

Keywords:
TQM (Total Quality Management), Critical Success Factors (CSFs) of TQM, Manufacturing sector.

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1. INTRODUCTION

Quality improvement has become a driving force throughout the world. No enterprise can survive in today's competitive environment with a "rework until its right" philosophy. Although methods to improve and manage quality are numerous, it can be said that TQM is a critical determinant in the success of manufacturing organizations (Massoud and Syed, 2013). Many organizations all over the world have implemented TQM to achieve increased competitiveness and improved financial result.

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The Indian industry is slowly reconciling to the fact that without improving products by cutting edge technology and exploring ways of reducing cost there is no future or else they may have to wind up one day. They have realized that without improving the competitive edge they may not last for long. The practices of the quality management system toward TQM are undertaken by Indian manufacturing companies as evidence by ISO 9000 certification and various National Quality Awards.

There are several studies, e.g. Mehmet Demirbag & S.C. Lenny Koh (2006), Therese A. Joiner (2006), Shahab Alam Malik, et al. (2010), Fuzi Abusa (2011), Musran Munizu (August 2011), Andre Dwijanto Witjaksono (2012), Ali Bakhit Jaafreh, et al. (2013) examining the relationship between CSFs of TQM and its effect on performance of organization. There are authors, like Enrique Clever & Juan Jose Tari (2007), Hayat M. Awan, et al. (2010), Veeri Chettiar Arumugam & Rouhollah Mojtahedzadeh (2011) and Badir Mohammed Alwan (2012), who have studied effect of TQM on quality performance such as defect rate; rework; cost per product; customer complaint; cycle time and delivery time. There are also few similar studies among these studies (Harjeev Kumar Khanna, et al. (2010), Singla Nitin, et al. (2011), Vijaygiri Bikshapathi (2011), Neha Kalra & Anoop Pant (2013)) in Indian context taking a particular region or industry. This study makes an attempt to know the CSFs of TQM and its effect on quality performance, taking manufacturing facilities working in Gujarat. Accordingly it is entitled as "Does TQM lead to improvement in quality performance in manufacturing firms?- Some empirical evidence".

RESEARCH OBJECTIVE

Objective of the study is to empirically examine the relationship between CSFs of TQM and quality performance in selected ISO 9001 certified manufacturing facilities in Gujarat.

TOTAL QUALITY MANAGEMENT (TQM)

Total Quality Management is a philosophy that involves everyone in an organization in a continual effort to improve quality and achieve customer satisfaction. There are two key philosophies in TQM. One is a never-ending push to improve (i.e. continuous improvement or Kaizen in Japanese) and the other is a goal of customer satisfaction which involves meeting or exceeding customer expectations (Abusa, 2011). Total quality management now become an established field of study where academics, consultants, engineers and quality practitioners have contributed their ideas towards its advancement.

2. REVIEW AND HYPOTHESIS DEVELOPMENT

CRITICAL SUCCESS FACTORS (CSFS)

There are empirical studies on identifying CSFs of TQM (Saraph et al. (1989); Flynn et al. (1995); Ahire et al. (1996); Powell (1995); Antony Jiju, et al. (2002); Bayazit (2003); Z. Irani, et al. (2004); Phan Chi Anh & Yoshiki Matsui (2006); Karuppusami and Gandhinathan (2006); Abdullah et al. (2008); Salaheldin (2009); Singla Nitin, et al. (2011); Faisal Talib, et al. (2011); Neha Kalra & Anoop Pant (2013); Massoud M. Rshida & Syed omar Agil (2013)). Researcher identified following CSFs of TQM as most common amongst all above studies.

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1. Top Management Commitment
2. Customer Focus
3. Employee Involvement
4. Continuous Improvement
5. Fact-Based Management
6. Incentive and Recognition System
7. Process Monitoring and Control

QUALITY PERFORMANCE

Deming (1986) said that quality is major determinant of success in competitive environment. Firm must focus on quality and innovativeness in today's concurrent market place (Feng et al 2006). CSFs of TQM generally has strong and positive relations with Quality performance (Brah et al. (2002); Prajogo and Sohal (2003); Veeri Chettiar Arumugam & Rouhollah Mojtahedzadeh (2011); Zehir et al. (2012). Badir Mohammed Alwan (2012) noted that the issue of total quality in production costs is one of the issues that fall within the scope of the management agenda which focuses on reducing production costs and as one of the cornerstones of the organization in achieving profit and increase profits through the establishment of a relationship between quality and reduce the costs of production to achieve the desired goals. Also they found that the company used ISO 9000 follow certain strategies like improvement and continuous development, raising the efficiency of the performance of the sorts of training, the best use of resources, open new markets, the ability to continue to stay, meeting the aspirations of consumers, communicate with consumers and customers and reduce customer complaints. Objective of this study is to clarify the effects of CSFs of TQM on quality performance. Based on Talavera (2005) study this study takes defect rate, rework, cost per product, customer complaint, cycle time and delivery time as indicators for quality performance in this study.
Based on the above studies, to understand how the quality performance of Indian manufacturing firms is related to the CSFs of TQM, this study proposes main hypothesis taking all quality performance together and six sub hypotheses to check the relationship between individual quality performance indicators and CSFs of TQM, the following hypotheses are developed:

Main hypothesis:

$H1_0$: CSFs of TQM have no positive impact on quality performance of the organization.
$H1_1$: CSFs of TQM have positive impact on quality performance of the organization.

Sub hypotheses:

$H1a_0$: CSFs of TQM have no positive impact on defect rate.
$H1a_1$: CSFs of TQM have positive impact on defect rate.

$H1b_0$: CSFs of TQM have no positive impact on rework.
$H1b_1$: CSFs of TQM have positive impact on rework.

$H1c_0$: CSFs of TQM have no positive impact on cost per product.
$H1c_1$: CSFs of TQM have positive impact on cost per product.

$H1d_0$: CSFs of TQM have no positive impact on customer complaints.
$H1d_1$: CSFs of TQM have positive impact on customer complaints.

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$H1e_0$: CSFs of TQM have no positive impact on cycle time.
$H1e_1$: CSFs of TQM have positive impact on cycle time.

$H1f_0$: CSFs of TQM have no positive impact on delivery time.
$H1f_1$: CSFs of TQM have positive impact on delivery time.

FRAMEWORK OF THE STUDY

Based on above literature, the framework of the study proposes to identify empirically CSFs of TQM and examine the relationship with quality performance. The following diagram shows the framework of the study.

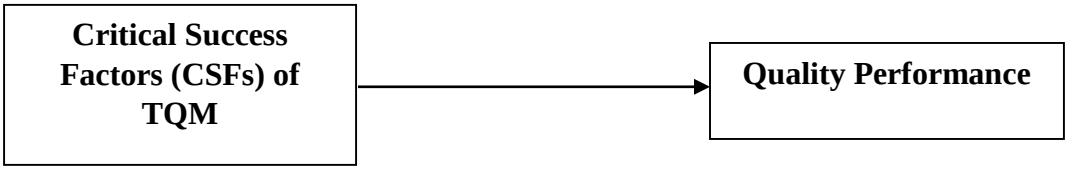

Figure 1: Figure showing Framework of the study

Source: Based on literature review

SAMPLE OF THE STUDY

Primary data of the study are collected from 57 ISO 9001 certified facilities in Gujarat belonging to medium and large scale limited Indian companies in manufacturing sector.

METHOD OF DATA COLLECTION

Primary data are obtained through survey questionnaires, which have been sent through mail to be responded by any of the production and quality staff of the respected manufacturing facilities using a single-respondent approach. The survey instrument adapted is pre – tested questionnaire that has been used in similar earlier studies (Gloria Talavera, 2005). Total 120 ISO 9001 certified facilities belonging to large and medium scale companies were sent the questionnaire. These facilities carried out their activities in the area of Surat, Ahmedabad, Jamnagar, Vadodara city in the state of Gujarat. Total 60 questionnaires were received; hence response rate of the study is recorded as 50%. Out of 60 questionnaires 3 questionnaires were rejected due to incomplete answers. Finally 57 useable questionnaires have been used for the study. These research units are varied in industry type such as petrochemical, pharmaceutical, fertilizer, textile etc.

MEASUREMENT INSTRUMENT

In this study CSFs of TQM are defined as independent variable and quality performance is defined as dependent variables. Independent variables have been measured by using primary data collection techniques with questionnaire survey on 5 point Likert Scale (5= Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Strongly Disagree). Quality performance has been measured by using 6 performance measurement indicators (defect rate; rework; cost per product; customer complaints; cycle time and delivery time). This scale is measured on 7 point Likert Scale (7=Decline>20%; 6=Decline 10-20%; 5=Decline 1-10%; 4=No Change; 3=Increase 1-10%; 2=Increase 10-20% and 1= Increase >20%). For the simplicity of analytical purpose, each variable

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of CSFs of TQM has been coded as TMC1, TMC2 and so on and each indicators of the quality performance has been coded as QP1, QP2 and so on.

DATA ANALYSIS TOOLS AND TECHNIQUES

Statistical techniques of descriptive statistics, factor analysis, reliability and validity analysis, correlation, multiple regression analysis are used to analyze data by using SPSS (Statistical Package for Social Science) Software version 17.0.

DEMOGRAPHIC PROFILE OF THE SAMPLE UNITS

Analysis of the sample unit in the basis of business entity shows that majority of the unit of the sample 93% belonged to the public ltd sector where as only 7% of the sample belonged to co-operative sector. Analysis of the sample unit in the basis of type of manufacturing shows that 40.4% manufacturing units represents the petrochemical industry, whereas 22.8% units represent the heavy engineering industry. 8.8% units belong to the fertilizer industry. 5.3% units belong to both pharmaceutical industry and chemical industry whereas 3.5% units belong to both electrical & electronics industry and textiles. 10.6% units belong to other industry and other industry includes Food Processing, Glass Manufacturing, Paper Manufacturing, Machine tools.

3. RELIABILITY AND VALIDITY

RELIABILITY TEST

The internal consistency of a set of two or more construct indicators is commonly measured by Cronbach's alpha. According to Hair et al., (1998), Alpha values range between 0 and 1.0 with higher values indicating higher reliability among the indicators. Nunnally (1978) pointed out that alpha value of 0.600 is sufficient in exploratory research. An internal consistency analysis has been performed separately for each CSFs of TQM and performance measures. The alpha value of all variables is more than 0.600.

VALIDITY TEST

The researcher used Principal Component Analysis for dependent variable to test the construct validity means whether data are significant or not. The general accepted criteria for factor analysis in our study is Eigen Values of greater than 1.0 and factor loading is 0.55 based on Comrey's guideline (Jiju Antony et al. 2002). Based on these criteria Principal Component Analysis is done for each variable. All items here had factor loading more than 0.55.

4. FINDING OF THE STUDY

Table 1 shows correlation among variables. A correlation is a measure of the linear relationship between variables. The correlation coefficient is a commonly used measure of the size of an effect. This study provides the correlation matrix among the seven CSFs of TQM (independent variables) and quality performance measure (dependent variables). It also shows the relationship between independent and dependent variables. Correlation matrix shows that all seven CSFs are significantly correlated with QP. Among all independent variables CF is highly correlated with QP (r= .483).

Table 2 shows the overall regression model CSFs of TQM and quality performance. Table 3 shows Separate regression models of CSFs of TQM and indicators of quality performance. Stepwise Multiple Regression has been used to perform analysis of CSFs of TQM as an independent

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variable. The analysis is done using average score of dependent variables indicators for overall model and individual dependent variables indicators for separate model. It should also be noticed that only those statistical significant variables at a level of significance less than 0.05 are reported.

Table 1: Correlation of variables

	Mean	SD	CSFs of TQM	TMC	CF	EI	CI	FBM	IRS	PMC	QP
CSFs of TQM	4.1086	.35374	1								
TMC	4.5579	.38123	.604**	1							
CF	4.2710	.43594	.741**	.438**	1						
EI	4.2485	.51862	.805**	.388**	.705**	1					
CI	4.2211	.53942	.562**	.223	.561**	.553**	1				
FBM	3.8570	.66179	.698**	.412**	.230	.330*	0.052	1			
IRS	4.3553	.48169	.659**	.258	.455**	.596**	.692**	.191	1		
PMC	4.3649	.49731	.654**	.312*	.506**	.630**	.647**	.126	.649**	1	
QP	4.9503	.55363	.623**	.309*	.509**	.479**	.348**	.428**	.433**	.417**	1

** .Correlation is significant at the 0.01 level (2-tailed).
* .Correlation is significant at the 0.05 level (2-tailed).

Note: TMC- Top Management Commitment, CF- Customer Focus, EI- Employee Involvement, CI- Continuous Improvement, FBM- Fact-based Management, IRS- Incentive and Recognition System, PMC- Process Flow Management and QP- Quality Performance.

Table 2: Significant relationship between CSFs of TQM of TQM and quality performance (Overall model)

No.	Critical Success Factors	Quality Performance			
		B	**Std. Error**	**Beta**	**t**
	Constant	1.539	.633		2.432***
1	TMC				
2	CF			.433	3.879*
3	EI				
4	CI				
5	FBM			.329	2.941**
6	IRS				
7	PMC				
R					.601
R^2					.361
F					15.275
Sign. (P value)					0.000

Note: TMC- Top Management Commitment, CF- Customer Focus, EI- Employee Involvement, CI- Continuous Improvement, FBM- Fact-based Management, IRS- Incentive and Recognition System, PMC- Process Flow Management.
Note: Significance: * p< .001; ** p < .01; *** p< .05.

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Table 3: Significant relationship between CSFs of TQM and quality performance (Separate model)

No.	Critical Success Factors	Defect rate				Rework			
		B	**Std. Error**	**Beta**	**t**	**B**	**Std. Error**	**Beta**	**t**
	Constant	1.042	.877		1.189	2.914	.558		5.221*
1	TMC								
2	CF								
3	EI								
4	CI								
5	FBM					.568	.143	.473	3.983*
6	IRS								
7	PMC	.915	.200	.526	4.584*				
R					.526				.473
R^2					.276				.224
F					21.013				15.864
Sign. (P value)					0.000				0.000
No.	**Critical Success Factors**	**Cost per product**				**Customer complaints**			
		B	**Std. Error**	**Beta**	**t**	**B**	**Std. Error**	**Beta**	**t**
	Constant	.989	.891		1.110	1.618	.962		1.681
1	TMC								
2	CF								
3	EI	.490	.205	.291	2.392***				
4	CI								
5	FBM	.478	.160	.363	2.977**				
6	IRS								
7	PMC					.827	.219	.454	3.776*
R					.535				.454
R^2					.286				.206
F					10.823				14.256
Sign. (P value)					0.000				0.000
No.	**Critical Success Factors**	**Cycle time**				**Delivery time**			
		B	**Std. Error**	**Beta**	**t**	**B**	**Std. Error**	**Beta**	**t**
	Constant	.630	.898		.701	2.552	.545		4.686*
1	TMC								
2	CF	.650	.201	.378	3.228**				
3	EI								
4	CI								
5	FBM	.358	.133	.316	2.701**	.539	.139	.463	3.875*
6	IRS								
7	PMC								
R					.546				.463
R^2					.298				.214
F					11.468				15.014
Sign. (P value)					0.000				0.000

Note: TMC- Top Management Commitment, CF- Customer Focus, EI- Employee Involvement, CI- Continuous Improvement, FBM- Fact-based Management, IRS- Incentive and Recognition System, PMC- Process Flow Management.

Note: Significance: * p< .001; ** p < .01; *** p< .05.

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Hypothesis $H1_0$ states that CSFs of TQM have no positive impact on quality performance of the organization. The result of regression analysis shows that quality performance is explained by the regression model as evident from R^2 value of 0.361. The model shows 36.1% of the variations in quality performance can be explained using CSFs of TQM. The p-value is less than 0.05 which shows that the model is valid for using linear regression. The p-value is less than 0.05 which means that null hypothesis have been rejected and there exist the relationship between quality performance and CSFs of TQM. The regression coefficient shows whether CSFs of TQM are having capacity to predict quality performance and the extent of the contribution power. Customer Focus and Fact-based Management are statistically significant with p-value less than 0.05 so at 5% significance level of significance null hypothesis is rejected which shows that there is a relationship between these two factors and quality performance and alternative hypothesis is accepted which is as under.

H1: There is statistically significant effect of CSFs of TQM on quality performance.

Hypothesis $H1a_0$ states that CSFs of TQM have no positive impact on defect rate. The result of regression analysis shows that defect rate is explained by the regression model as evident from R^2 value of 0.276. The model shows 27.6% of the variations in defect rate can be explained using CSFs of TQM. The p-value is less than 0.05 which shows that the model is valid for using linear regression. The p-value is less than 0.05 which means that null hypothesis have been rejected and there exist the relationship between defect rate and CSFs of TQM. The regression coefficient shows whether CSFs of TQM are having capacity to predict defect rate and the extent of the contribution power. Process flow management statistically significant with p-value less than 0.05 so at 5% significance level of significance null hypothesis is rejected which shows that there is a relationship between this factor and defect rate and alternative hypothesis is accepted which is as under.

H1a: There is statistically significant effect of CSFs of TQM on defect rate.

Hypothesis $H1b_0$ states that CSFs of TQM have no positive impact on rework. The result shows that rework is explained by the regression model as evident from R^2 value of 0.224. The model shows 22.4% of the variations in rework can be explained using CSFs of TQM. The p-value is less than 0.05 which shows that the model is valid for using linear regression. The p-value is less than 0.05 which means that null hypothesis have been rejected and there exist the relationship between rework and CSFs of TQM. The regression coefficient shows whether CSFs of TQM are having capacity to predict rework and the extent of the contribution power. Fact-based Management is statistically significant with p-value less than 0.05 so at 5% significance level of significance null hypothesis is rejected which shows that there is a relationship between this factor and rework and alternative hypothesis is accepted which is as under.

H1b: There is statistically significant effect of CSFs of TQM on rework.

Hypothesis $H1c_0$ states that CSFs of TQM have no positive impact on cost per product. The result shows that cost per product is explained by the regression model as evident from R^2 value of 0.286. The model shows 28.6% of the variations in cost per product can be explained using CSFs of TQM. The p-value is less than 0.05 which shows that the model is valid for using linear regression. The p-value is less than 0.05 which means that null hypothesis have been rejected and there exist the relationship between cost per product and CSFs of TQM. The regression coefficient shows whether CSFs of TQM are having capacity to predict cost per product and the extent of the contribution power. Employee involvement and fact- based management are statistically significant with p-value less than 0.05 so at 5% significance level of significance null hypothesis

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is rejected which shows that there is a relationship between these two factors and cost per product and alternative hypothesis is accepted which is as under.
H1c: There is statistically significant effect of CSFs of TQM on cost per product.

Hypothesis $H1d_0$ states that CSFs of TQM have no positive impact on customer complaint. The result shows that customer complaint is explained by the regression model as evident from R^2 value of 0.206. The model shows 20.6% of the variations in customer complaint can be explained using CSFs of TQM. The p-value is less than 0.05 which shows that the model is valid for using linear regression. The p-value is less than 0.05 which means that null hypothesis have been rejected and there exist the relationship between customer complaint and CSFs of TQM. The regression coefficient shows whether CSFs of TQM are having capacity to predict customer complaint and the extent of the contribution power. Process monitoring and control is statistically significant with p-value less than 0.05 so at 5% significance level of significance null hypothesis is rejected which shows that there is a relationship between this factor and customer complaint and alternative hypothesis is accepted which is as under.
H1d: There is statistically significant effect of CSFs of TQM on customer complaint.

Hypothesis $H1e_0$ states that CSFs of TQM have no positive impact on cycle time. The result shows that cycle time is explained by the regression model as evident from R^2 value of 0.298. The model shows 29.8% of the variations in cycle time can be explained using CSFs of TQM. The p-value is less than 0.05 which shows that the model is valid for using linear regression. The p-value is less than 0.05 which means that null hypothesis have been rejected and there exist the relationship between cycle time and CSFs of TQM. The regression coefficient shows whether CSFs of TQM are having capacity to predict cycle time and the extent of the contribution power. Customer focus and fact-based management are statistically significant with p-value less than 0.05 so at 5% significance level of significance null hypothesis is rejected which shows that there is a relationship between these two factors and cycle time and alternative hypothesis is accepted which is as under.
H1e: There is statistically significant effect of CSFs of TQM on cycle time.

Hypothesis $H1f_0$ states that CSFs of TQM have no positive impact on delivery time. The result shows that delivery time is explained by the regression model as evident from R^2 value of 0.214. The model shows 21.4% of the variations in delivery time can be explained using CSFs of TQM. The p-value is less than 0.05 which shows that the model is valid for using linear regression. The p-value is less than 0.05 which means that null hypothesis have been rejected and there exist the relationship between delivery time and CSFs of TQM. The regression coefficient shows whether CSFs of TQM are having capacity to predict delivery time and the extent of the contribution power. Fact-based Management is statistically significant with p-value less than 0.05 so at 5% significance level of significance null hypothesis is rejected which shows that there is a relationship between this factor and delivery time and alternative hypothesis is accepted which is as under.
H1f: There is statistically significant effect of CSFs of TQM on delivery time.

5. DISCUSSION

In this study improvement in Quality performance is measured by reduction in defect rates, reduction in rework, reduction in cost per unit, reduction in customer complaint, reduction in cycle time and improvement in delivery time. Fact-based management positively affect improvement in quality performance in terms of reduction in rework, reduction in cost per product, reduction in cycle time and improvement in delivery time. Process monitoring and control positively affect

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improvement in quality performance in terms of reduction in defect rates and reduction in customer complaint. Employee involvement positively affects improvement in quality performance in terms of reduction in cost per product. Customer focus positively affects improvement in quality performance in terms of reduction in cycle time.

Thus, these findings show that out of 7 CSFs of TQM 4 play role in improving quality performance of the organization. They are process monitoring and control, fact-based management, employee involvement and customer focus. This is also confirmed by the overall regression model which shows that customer focus and fact-based management are most significant for improvement in overall quality performance.

6. CONTRIBUTION OF THE STUDY

The main contribution of this study is that it adds to the present literature of evaluation of performance of TQM in context of Indian manufacturing firms. The findings of the study are consistent with prior studies by Masood, 2011; Talavera, 2005 and Abusa, 2011. The study conducted by Massod Ul Hassan et al. (2011) showed that 13.3% improvement in quality performance is significantly associated with CSFs of TQM. This study shows that 36.1% improvement in quality performance can be attributed to TQM practices. The study by Fusi Abusa (2011) showed that 11.3% changes in defect rate are significantly associated with TQM elements, whereas this study showed 27.6% changes in defect rate.

7. LIMITATION OF THE STUDY

The findings of the study are based on 57 manufacturing facilities. As the sample size is small conclusive inference cannot be made on the basis of findings of the study.

8. SCOPE FOR FURTHER RESEARCH

The limitation of the study suggested that a performance study can be conducted with large sample size hypothesis testing.

9. CONCLUSION

Based on the findings of the study, the overall conclusion of the study can be made that adoption of TQM results in overall quality performance and therefore all Indian incorporate to achieve customer satisfaction must adopt TQM.

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