

THE RELATIONSHIP BETWEEN TQM AND PERFORMANCE IN SMALL MANUFACTURING ENTERPRISES: THE MEDIATION EFFECT OF FAILURE

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This paper investigates the relationship between TQM elements, failures and firm performance. The paper presents an alternative methodology to assess not only the direct impact of TQM on firm performance, but the indirect impact of TQM on performance via internal and external failures. The results of the study revealed that there is a significant relationship between the TQM practices and internal and external failure and firm performance. Customer focus and participation are important predictors for internal failure. Customer focus and quality system are found to be important predictors for external failure. In addition some of the internal and external failure elements are particularly strong predictors of firm performance. They are reworking from internal failure and warranties from external failure that have significant impact on firm performance. Employee involvement, customer focus and quality system are found to be significant predictors for the direct relationship between TQM practices and firm performance.

Keywords: TQM Practices; Internal Failure; External Failure; SME; Manufacturing Performance

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1. INTRODUCTION

To provide a basis for the survival and success today and in the future, firms have to pay more attention to the needs of customers as competition intensifies, and offer them quality products to satisfy their increasing expectations. TQM as a potential source to achieve this objective produces value, through improved understanding of customers' needs, improved customer satisfaction, improved internal communication, better problem solving, greater employee commitment and motivation, stronger relationships with suppliers, fewer errors, and reduce waste (Juran, 1988; Feigenbaum, 1991). Although there is a tremendous interest in total quality management subject lately relevant literature reveals gaps in research in this area of quality/operations management (Samson and Terziovski, 1999). Some of the studies also lack objective data backed by statistical evidence to support their claims (Hendricks and Singhal, 2001). In addition, in spite of the wide range of literature that emphasize the positive contribution of TQM to firm performance, there are evidences suggest the negative aspects of TQM such as TQM entails substantial time investments from managers, it is expensive, it rarely produces short-term results, it makes unrealistic assumptions about most organizations' capacities to transform their cultures (Benner, Veloso, 2008).

On the other hand, in TQM literature many studies have investigated the relationship between TQM factors and firm performance based on different models. However the mediating role of internal and external failures in the relationship between TQM elements and firm performance has not been extensively explored in the literature. Therefore the purpose of this study is to present an alternative methodology to assess not only the direct impact of TQM on firm performance, but the indirect impact of TQM on performance via internal and external failures in manufacturing SMEs. This relationship is important to create a deeper understanding of the nature of TQM and the business value of each of the TQM elements in manufacturing environment. In addition this model provides important information about the cost of poor quality that is particularly important for SMEs because they have limited resources. It will be examined by testing the hypothesized relationships between total quality management factors, internal and external failures and firm performance by means of an empirical research.

The remainder of this paper is organized as follows. A research model and related hypotheses are offered based on the review of the literature in the next section. Section 3 describes the research design, including measures, sample and the survey procedure, the tests for reliability and validity. Section 4 presents the factor analysis for the constructs and the five regression analyses to test each hypothesis. The results are discussed in Section 5. The paper concludes with further research implications of this study.

2. THEORETICAL BACKGROUND AND HYPOTHESES

Some of the studies treated TQM elements as independent variables and tried to establish a relationship with firm performance (i.e. Samson and Terziovski, 1999). On the other hand there are relatively less literature that use a mediational model of TQM in that quality related dimensions intermediate between TQM practices and firm performance. For example, TQM, flexibility and performance (Gomez-Gras and Verdu-Jover, 2005), TQM, culture and market share (Jabnoun and Sedrani, 2005), TQM, organizational strategy and innovation (Prajogo and Sohal, 2004). Similarly, the current study seeks to examine the relationship of TQM factors and internal and external failures that have the mediating effect and firm performance. This model provides important information about the cost of poor quality that is particularly important for SMEs because they have limited resources. This is also important for these firms in the sense that while many SMEs have implemented ISO 9000, the benefits of TQM are mainly realized by larger organizations. More recently, SMEs have begun to realize that they too can benefit from implementing TQM initiatives (Mcadam and Mckeown, 1999). In addition the results are expected to provide information about the indirect effect of TQM on performance that may not be seen through a direct relationship analysis between the two variables. In a mediational relationship failures may provide an effective mechanism to transmit the effect of TQM factors on firm performance (James and Brett, 1984). In literature there are some studies also mention the mediation role of failures. Juran (1988) and Feigenbaum (1991) emphasize the importance of the mediating effect of failures in production systems. Sterman et al. (1997) in their works suggest a link between the implementation of TQM methods and financial performance based on the factors associated with internal and external failures. They claim that in essence, improving quality should actually reduce failures, and therefore have a positive effect on financial performance. In addition to the mediational model, an investigation that includes the direct relationship between TQM factors and firm performance is also included into the study. By means of this analysis it is aimed to see the direct effect that is also valuable particularly for practitioners. As a result, both direct and indirect effects of TQM practices on quality performance will be tested. The model used in this study is expected to help untangling the complexity of TQM practices - performance relationships. The major conclusions on the effect of TQM on firm performance based on the relevant literature are summarized below in Table 1 and discussed below.

Table 1. The summary of major conclusions on the effect of TQM on firm performance variables

TQM factor	Dependent variable	Relationship	Relevant literature
TQM implementation	Firm performance	+ Significant	(10,25)
	Internal and external failures	- Significant	(24,5)
	Production downtime	- Significant	(11,5)
	Warranty level	- Significant	(5)
Top management support	Firm performance	+ Significant	(3)
Personal involvement	Firm performance	+ Significant	(11)
Empowerment in decision making	Firm performance	+ Significant	(3,6)
Reward and recognition	Firm performance	+ Significant	(11,6)
Teams work	Firm performance	+ Significant	(11,6,3)
Quality data reporting	Firm performance	+ Significant	(23,19)
Quality system	Firm performance	+ Significant	(1)
Supplier relationship management	Firm performance	+ Significant	(4)
Customer focus	Internal failure	- Significant	(4,39,16)
Customer focus	External failure	- Significant	(4)
Training	Internal failure	- Significant	(10,24)

Based on the literature review, in order to realize the purpose of the study a research model based on a conceptualized relationship among TQM factors, internal and external failures and firm performance was developed and shown in Figure 1 and the hypotheses developed based on this framework are discussed below.

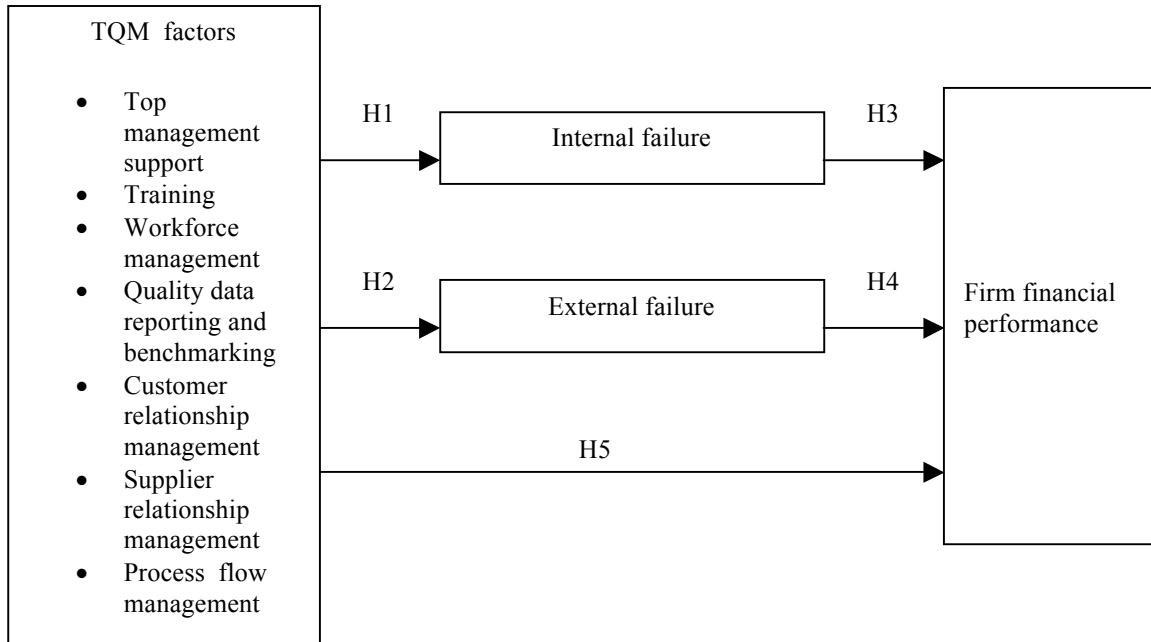


Figure 1. The conceptual framework

Internal failure occurs prior to delivery or shipment of the product and is associated with the processes, products, components and materials that fail to meet quality requirements. It has a significant negative impact on a company’s internal quality performance indicators such as defect, error, scrap and rework, production lead time, cost and productivity (Deming, 1986). It is incurred as a consequence of identifying defective products during the appraisal process (Claver et al., 2003) and includes reworking and scraping the nonconforming units before they are shipped to customers. On the other hand external failure associated with warranty of repairs and replacements, product recall and legal actions taken by customers (Abrunhosa and Sá, 2008). It occurs when defective products have been delivered to customers. It seriously hurt a firm's reputation and profitability. Hence external failure costs are usually the most substantial part of the total costs of quality. This is not just because of the huge magnitude in the amount of external failure costs that might incur but also the actual and potential losses in a firm's sales or profits due to poor quality of product or services it provided (Lin and Johnson, 2004). Despite the wide range of studies about the relationship between TQM factors and firm performance literature about the relationship between TQM factors and internal and external failures is relatively scarce. The exploitation of TQM practices is expected to generate new capabilities that influence firm performance through internal and external failures. Therefore the first set of the hypotheses is concerned with investigating the nature of the relationships between TQM elements and internal and external failures.

Hypothesis 1. There is a negative and significant relationship between TQM elements and internal failure

Hypothesis 2. There is a negative and significant relationship between TQM elements and external failure

The relationships illustrated in Figure 1 also give rise to a second set of hypotheses. It is concerned with the relationship between internal and external failures and firm financial performance. The literature emphasizes the supportive role of the reductions in internal and external failures to firm performance improvement (Kaynak, 2003). However rarely does one find their application in industries (Slater and Narver, 1995) and they are rarely used as constructs in empirical studies (Meirovich, 2006). Therefore it is an important field to search and requires further investigation and this provides a basis for developing the following hypotheses:

Hypothesis 3. There is a negative and significant relationship between internal failure and firm financial performance

Hypothesis 4. There is a negative and significant relationship between external failure and firm financial performance

The TQM literature widely emphasizes the positive contribution of TQM to firm performance (e.g. Claver et al., 2003; Abrunhosa and Sá, 2008; Kaynak, 2003). Although it is intended to test the mediation role of internal and external failures between TQM factors and firm performance by the first two set of hypotheses, it is also important to test the relationship between TQM and firm performance to understand the direct impact of TQM on performance. As such, the following hypothesis was postulated:

Hypothesis 5. There is a positive and significant relationship between TQM practices and firm performance

3. RESEARCH DESIGN

3.1 Measures

The constructs and the items in each construct were extracted from the literature review discussed above on quality management theory. The survey instrument with 35 items was prepared accordingly and can be seen in Appendix A. The survey asks questions related to the ten constructs in the following areas:

TQM constructs

The relevant literature has identified different quality elements for effective quality management. Taking the initial research (Deming, 1986; Juran, 1988; Feigenbaum, 1991) as a basis, the elements in quality management found in the literature vary from one author to another, although there is a common core (Samson, Terziovski, 1999). There are a number of studies (e.g. Samson and Terziovski, 1999; Ahire et al., 1996) that yield valid, reliable measurement items to suitably assess these elements.

In this study the model that belongs to Dale et al. (2001) was selected as a framework for the TQM construct as shown below. The reason is that their model was based on a comparison of the perspectives about TQM dimensions of TQM experts, namely Crosby, Deming, Feigenbaum, Juran, Ishikawa, Shingo and Taguchi. These experts have a particular philosophy to explain the phenomena of quality and provide guidance on systematic thinking and the key steps for managing and improving quality in an effective and efficient manner. The TQM dimensions that were emphasized by these experts are top management support, training, customer relationship management, supplier relationship management, workforce management, process flow management and quality data reporting. Therefore in this study these dimensions were accepted as a common core and used as TQM constructs. Although the dimensions of TQM are similar to certain extent to some of the works in literature the variables used in each dimension are unique to this study. The items were selected on the basis of the model developed by (Dale et al., 2001) as well as the empirical works by (Samson and Terziovski, 1999; Kaynak, 2003; Ahire et al., 1996).

- Top management support
- Training
- Workforce management
- Quality data reporting
- Customer relations
- Supplier quality management
- Process flow management

The variables that belong to the construct of the total quality management were operationalized using a five-point Likert-type scale (strongly agree (5) to strongly disagree (1)). Respondents were asked to indicate how strongly they agree with each of the TQM statements.

Internal and external failure constructs

Internal and external failures are widely accepted factors in TQM literature and the items that belong to these constructs were selected based on (Deming, 1986 and Feigenbaum, 1991).

- Internal failure
- External failure

The internal failure has been measured in four dimensions and the external failure in three dimensions. For the measurement of the items perceptual data was used and operationalized by using a five-point Likert rating scale, which ranges from 1=very low to 5=very high. Respondents were asked to indicate their relative position on the failure variables compared to their main competitors.

Firm financial performance construct

Among various performance criteria the firm profitability performance was selected to operationalize firm financial performance. There were several reasons for this choice. Firstly, Feigenbaum (1991) states that quality costs are becoming an increasingly central factor in the determination of profitability. Because the expenditures for the installation of the quality program and the ongoing prevention activities are related to the return in lower internal and external failure costs. Secondly, during the exploratory interviews for content validity of the measurement instrument, the respondents informed that using profitability performance to measure the firm performance was suitable. The reasons were this measure was easy

to understand for them and quite common among firms as well as they could easily reach to the industry average of profitability value and compare with their performance by means of industrial data bases of organized industrial zones. Thirdly, firm profitability was commonly used in TQM related literature (e.g. Handfield et al., 1998; Abrunhosa and Sá, 2008, Kaynak, 2003).

The access to accurate financial and other performance data often pose real challenges to the researchers that execute empirical studies. It is widely reported in the literature that the objective data are more sensitive for managers concerned about revealing confidential data and therefore they are reluctant to share objective data (Kaynak, 2003; Singh, 2008; Stanley, 2001). In addition most of the SMEs lack archival data. Although objective data are preferable to perceived data, it was because of these difficulties and the recommendation of literature (Kaynak, 2003; Singh, 2008; Stanley, 2001) perceptual data was preferred in this study. Firm profitability performance was operationalized by using a five-point Likert rating scale, which ranges from 1=very low to 5=very high. Respondents were asked to indicate their relative position on profitability performance compared to industrial average.

3.2 Sample

Empirical data was obtained through the survey of the manufacturing small and medium sized enterprises (SMEs) located in Turkey. Although there are numerous definitions and criteria to classify companies by scale such as number of employees, revenue, sales volume, in this research firms with less than 250 employees were considered as SMEs (Freel, 2003). The survey was conducted in the firms that were located in three organized industrial zones in Istanbul. The present sample consisted of 111 manufacturing SMEs that have implemented TQM practices to various degrees. The firms were randomly selected from the databases of these zones. The firms in these zones are generally familiar to the surveys about their operations. Therefore it was thought that this experience would encourage them to provide relatively more precise data. Personal interview was selected as the data collection method. Face to face interview helped to collect usable responses to a comprehensive questionnaire addressing characteristics of total quality management. Quality management managers were targeted as respondents from the firms for the survey. Table 2 presents the distribution of the sample population by firm size.

Table 2. Distribution of respondents by firm size

Number of Employee			Number of Company	%	Cumulative %
0	≤	25	9	8.1	8.1
26	≤	50	23	20.7	28.8
51	≤	75	16	14.4	43.2
76	≤	100	15	13.5	56.7
101	≤	125	10	9	65.7
126	≤	150	9	8.1	73.8
151	≤	175	8	7.2	81
176	≤	200	10	9.1	90.1
201	≤	225	7	6.3	96.4
226	≤	250	4	3.6	100

3.3 Reliability and validity tests

In an empirical research measurement analysis begins with assessing the instrument’s reliability. By means of reliability the degree of systematic variance in the survey instrument can be determined. Once a scale has been determined to be reliable, its validity can be assessed.

Reliability

Internal consistency was measured using the Cronbach's alpha reliability coefficient for each set of items of TQM. The alpha reliabilities are seen in survey instrument in Appendix A suggesting all measures are reliable (Cronbach, 1990) and can be used with confidence in the present study.

Validity

Validity refers to the degree to which the scale measures what it is designed to measure. The methods to test the validity can be grouped into three categories: Content validity, construct validity and criterion validity (Hair et al., 1995).

Content validity

The content validity measure was used for the instrument's adequacy for measurement. It was subjectively assessed by the researchers. For this study two methods were followed to assure content validity. Firstly, extensive literature related to the subject concerning each construct was reviewed and the measurement instrument was developed accordingly.

Secondly, to assure the adequacy of the instrument, exploratory interviews with quality managers of three manufacturing companies were conducted. The results of these interviews focused on three important points. They informed that the subject that the survey aimed to measure was very important and the items selected to assess the TQM related factors were sufficient. The third point is they were reluctant to provide exact financial data. Therefore perceptual data was decided to be used to measure the profitability performance of firms. In consequence the measures were considered to have content validity.

Construct validity

Construct validity is concerned with the questionnaire as a measurement of an underlying construct. It refers to the degree the scale measures what it is designed to measure. Construct validity was established by the three decision rules commonly employed (Nunnally and Bernstein, 1994) for factor identification through principal component factor analysis, which are: a. minimum eigenvalue of 1; b. minimum factor loading of 40 percent for each indicator item; and c. simplicity of factor structure. Eigenvalues were chosen over 1 and the measurement items for each of the constructs were factor analyzed. The results are shown in Table 3. Items that had a factor loading less than 0.450 were eliminated. All factors loaded acceptability well assuring construct validity.

Criterion validity

Criterion validity is also known as external validity. It refers to the extent to which the model is related to independent measures of each construct. It is determined by examining the multiple *R* coefficient computed for each model. The multiple *R* coefficients are 0.280 for the first model that tests H1, 0.386 for the second model (H2), 0.396 for the third model (H3) and 0.260 for the last model (H4). These values indicate that the constructs have reasonably high degree of criterion validity.

3.4 Factor Analysis

In order to investigate the statistical relationship between the internal and external failures and TQM variables to test H1 and H2, firstly factor analysis was employed to investigate the composite dimensions on the basis of 27 TQM related variables and to give the measurement instrument its final form. In order to measure the adequacy of the sample for extraction of the factors the Kaiser-Mayer-Olkin (KMO) measure of sampling adequacy was used. The KMO measure of sampling adequacy tests the reliability of the relationships between the pairs of variables in the correlation matrix. This test indicated the suitability of the matrix for factor analysis with a value of 0.815 indicating a high number of significant relationships. It shows that the set of variables collectively meets the necessary limit (0.50) of sampling adequacy (Hair et al., 1995). In addition, the Bartlett test of sphericity was found 1054.569 at the 0.000 significance level indicating that the overall correlations are significant.

The items assigned to TQM factors were submitted to Factor Analysis to determine the number of factors and factor loadings to be used in subsequent Multiple Regression Analysis. The following combinations of variables extracted will be used in subsequent analysis as independent variables. Based on the factor loadings in an unrotated factor matrix, the explanations of the factors were difficult. Therefore, the varimax rotation method was used to explain the factors. After factor analysis was conducted, 27 items of TQM constructs were reduced into seven factors explaining 60.85 % of the total variance of the items since each of their corresponding eigenvalues is greater than one. The factors were renamed by interpretation of the factor loadings for variables. The cutoff point for this process was selected 0.45 or above to screen out variables that are weak indicators of the constructs. The name of each common factor was given on the basis of factor loading as seen below:

Factor 1: Process management

Factor 2: Customer focus

Factor 3: Quality system

Factor 4: Top management involvement

Factor 5: Employee involvement

Factor 6: Participation

Factor 7: Supplier support

The items assigned to internal failure external failure were also submitted to Factor Analysis. The KMO values are 0.55 for internal failure and 0.71 for external failure. They show that the set of variables collectively meets the necessary limit (0.50) of sampling adequacy (Hair et al., 1995). The Bartlett test of sphericity was found 129.76 at the 0.000 significance level for internal failure and 1054.56 at the 0.000 significance level for external failure indicating that the overall correlations are significant.

3.5 Regression analysis

In order to investigate the statistical relationships between TQM variables, internal and external failures and firm performance separate Multiple Regression Analyses were employed. The impact of multicollinearity is very important in regression analysis since highly collinear variables can distort the results substantially or make them not generalizable. As a formal method of detecting the presence of multicollinearity, the variance inflation factor (VIF) was calculated for each regression model of the study. By way of review, a VIF equal to one indicates that there exists no linear relation between that independent variable and any of others in the regression model. The average score of variance inflation factor (VIF) was found 1 for each regression model and therefore the effects of multicollinearity was ignored (Neter et al., 1996).

The predictor relations with dependent variables tested to provide better evidence of predictor significance and relative strength. The stepwise procedure was employed for the models to select variables with the significance level at 0.05. This method selects variables for inclusion in the regression model that starts with selecting the best predictor of the dependent variable. Independent variables are added to the regression model as long as their partial correlation coefficients are statistically significant (Hair et al., 1995). The results of the multiple regression analyses were discussed below.

4. RESULTS AND DISCUSSION

4.1 The relationship between TQM factors and internal failure

In order to determine the relative effect of TQM variables on internal failure multiple regression analysis was employed. TQM variables were selected as independent variables and internal failure was selected as dependent variable. Table 3 shows the results from the regression model. According to the results, the adjusted R-Square is 0.078 for the model indicating the percentage of total variance of internal failure explained by independent variables. Although R square value for this model is relatively low indicating a low explanatory power, the results are examined below since they still provide value (Neter et al., 1996).

Table 3. Regression results for TQM factors and internal failure

	Sum of Squares	df	Mean Square	F	Sig.
Regression	8.620	2	4.310	4.591	0.012
Residual	101.380	108	0.939		
Total	110.000	110			
Unstandardized Coefficients					
	B	Std. Error	Std. Coef. Beta	t	Sig.
(Constant)	8.213	0.092		0.000	1.000
Customer focus	-0.203	0.092	-0.203	-2.195	0.030
Participation	-0.193	0.092	-0.193	-2.089	0.039

The F-tests show that the effects of the two independent variables on internal failure are significant and that provides support for H1. In order to assess the relative importance of the individual variables in the overall prediction of internal failure beta values are used. The standardized regression coefficients (beta values) for predictor variables are -0.203 for customer focus and -0.193 for participation.

Customer focus

One of the outcomes of this study is the sample firms state that customer focus has a significant and negative impact on internal failure. In line with this finding, Hackman and Wageman (1995) also find that implementation of TQM elevates the focus on customer satisfaction and that provide defect preventions. In order to increase customer satisfaction the customers' current and future requirements should be known by the organization. This information help firms prepare themselves to produce products and services that precisely fit to customer requirements. In addition uncertainty is reduced and that help production system prepare itself for future conditions resulting in lower internal failure.

Sampled firms also state that using the customer complaints as a method to initiate improvements in current processes is also critical to reduce possible failures in production. Collecting information from customers by the organization helps measuring customer satisfaction and shows direction for necessary corrective actions. Especially when the employees are provided with this information they can respond to customer requirements more effectively. Supporting this finding Fuentes et al., (2004) also claim that firms emphasizing activities that seek to understand customer needs and satisfy those needs produce products with lower defects.

Participation

Another outcome of this research is that reviewing quality issues frequently in the top management meetings has a significant and negative impact on internal failure. This result is important since it implies that top management is committed and they accept maximum responsibility for the product offerings. In line with this perspective Samson and Terziovski (1999) also emphasize the role of top management during creation of unity of purpose, encouragement of change and they claim that particularly using operator ideas have an affect on internal failure and facilitate high level of organizational performance.

The result of the study also reveals that training is found significantly important to reduce internal failure. This finding shows the need for a training system based on quality principles, problem solving skills and teamwork, in order to increase employees' knowledge and, in turn, increase their involvement in the firm's objectives and plans (Claver et al., 2003). In parallel with this finding, Kaynak (2003) also find that an organization wide training program is required to equip employees with proper skills so that they can participate in quality management practice. Especially when the training is based on the quality data and information is exchanged with customers internal failure is reduced. This also helps organization use customer requirements as a basis for quality.

On the other hand, the variables other than customer focus and participation are also important and should be worked well but because their contribution to dependent variables are marginal firms can benefit more if they base their strategies on the variables that make significant contribution on the reduction of internal failure.

4.2 The relationship between TQM factors and external failure

A multiple regression analysis was employed to analyze the relative effect of TQM variables on external failure. TQM variables were selected as independent variables and external failure was selected as dependent variable. The results from the regression analysis are shown in Table 4. The adjusted R-Square of 0.1498 is interpreted as indicating a relatively strong relationship.

Table 4. Regression results for TQM factors and external failure

	Sum of Squares	df	Mean Square	F	Sig.
Regression	8.620	2	4.310	4.591	0.012
Residual	101.380	108	0.939		
Total	110.000	110			
	Unstandardized Coefficients		Std. Coef.		
	B	Std. Error	Beta	t	Sig.
(Constant)	6.799	0.088		0.000	1.000
Customer focus	-0.287	0.089	-0.287	-3.236	0.002
Quality system	-0.257	0.089	-0.257	-2.900	0.005

As a result of the regression analysis, the research reveals that most of the companies regard two basic predictors significantly important for external failure: Customer focus ($\beta=-0.287$), quality system ($\beta=-0.257$). Therefore this result provides support for H2.

Customer focus

One of the outcomes of this study is the sample firms stated that customer focus has a significant and negative impact on external failure. In parallel with this finding, Samson and Terziovski (1999) and Fuentes et al. (2004) in their works also claim that customer focus proved to be strongly significant and positively related to performance through lower external failures. In addition, both Deming (1986) and Juran (1988) promote customer satisfaction as the ultimate goal of TQM. Good quality practices resulting in the improvement of internal quality performance will lead to the improvement of external performance, such as customer satisfaction.

Quality system

Accepted responsibility for quality by all major department heads within the organization has a significant negative impact on external failure. Juran (1988) also emphasizes the importance of functional managers for TQM and considers establishing a quality policy and quality goals as a part of the organizations strategy that reflect the organizational mission is important and this work is the part of the functional managers' responsibility. Functional management support and personal involvement in setting strategic directions in issues like TQM and building and maintaining a leadership in quality

system facilitate improving customer satisfaction, high organizational performance, individual development, and organizational learning (Samson and Terziovski, 1999).

The result of the study also reveals that collecting and evaluating quality performance data (defects, error, scrap, rework etc.) periodically in the organization has a significant negative impact on external failure. Establishing an effective system for collecting and disseminating quality information throughout the organization in a timely manner is necessary to realize improvements in external failure. Records about quality indicators have to be kept, including scrap, rework and cost of quality and reported on all functions and departments and the decision making based on fact involving analysis of information about customer needs, operational problems, and the success of improvement attempts should be emphasized to increase external performance (Samson and Terziovski, 1999).

However there are some studies in the TQM literature that contradicts this finding. They claim that information analysis and dissemination may be hazardous in some specific situations and negatively related to organizational performance (Dean and Bowen, 1994). As TQM moves from the original domain of application, manufacturing, towards use in research, marketing, and customer service activities, uncertain conditions are more likely (Samson and Terziovski, 1999). The TQM philosophy emphasizes decision making based on precise information from current situation and there are TQM techniques that are aimed at helping organizations to process information effectively. However in uncertain conditions it is hard to collect precise information and the information used for decisions may not be representative for the current and future conditions. Therefore the results may be misleading for organizational activities and inhibit organizational performance.

4.3 The relationship between internal failure and firm profitability performance

In order to show the relative effect of internal failure on firm profitability performance multiple regression analysis was employed. In the model variables related to internal failure were selected as independent variables and firm profitability performance was selected as dependent variable. Table 5 shows the results with the adjusted R-Square is 0.141 from the regression model.

Table 5. Regression results for internal failure and firm profitability performance

	Sum of Squares	df	Mean Square	F	Sig.
Regression	10.419	1	10.419	19.072	0.000
Residual	59.545	109	0.546		
Total	69.964	110			
	Unstandardized Coefficients		Std. Coef.		
	B	Std. Error	Beta	t	Sig.
(Constant)	4.972	0.237		20.949	0.000
Corrective actions	-0.335	0.077	-0.386	-4.367	0.000

As seen in Table 5 the variable corrective actions proved to be strongly significant and negatively related to profitability performance. The beta value for predictor variable is -0.386 and the F-tests show that the effect of the independent variable on firm performance is significant providing support for H3.

In line with this finding Shrivastava et al., (2006) also find that waste caused by rework and scrap that requires corrective action reduces company performance. Rahman and Bullock (2005) also emphasize the importance of corrective action and claim that the proportion of defects and the percentage of products requiring rework are the most common type of quality indicator employed in corrective action process. Eliminating scrap and rework during corrective action requires additional effort that increases cost and thus reduces the performance of firms (Nada et al., 2006). The reason is rework and scrap will increase the cost structure of a firm, which makes the firm to offer higher prices for products and services denting the profitability performance. For the corrective actions, reworkable parts can either be sent to a special rework process or back to the regular process, where the respective quality feature has been generated. Rework delays the subsequent machining of a work order until the reworked parts are either scrap or conforming to specifications. Accordingly, rework increases not only manufacturing costs due to repeated manufacturing processes and inspections, but also the lead time of the considered work order. In addition, the work in process inventory in the queue in front of the particular machine increases (Mayer and Nusswald, 2001). These factors altogether contribute to reduction in firm performance.

4.4 The relationship between external failure and firm profitability performance

The relative effect of external failure on firm profitability performance was analyzed by multiple regression analysis. In the model external failure variables were selected as independent variables and firm profitability performance was selected as

dependent variable. Table 6 shows the results from the regression model. According to the results, the adjusted R-Square is 0.067 for the model indicating the percentage of total variance of firm performance explained by independent variables.

Table 6. Regression results for external failure and firm profitability performance

	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.714	1	4.714	7.875	0.006
Residual	65.250	109	0.599		
Total	69.964	110			
Unstandardized Coefficients					
	B	Std. Error	Std. Coef. Beta	t	Sig.
(Constant)	4.463	0.186		23.948	0.000
Warranty	-0.227	0.081	-0.260	-2.806	0.006

The result of regression analysis indicates that warranty has a negative significant impact on profitability performance. The beta value for predictor variable is -0.386 and the F-tests show that the effect of the independent variable on firm performance is significant and that provides support for H4.

Rahman and Bullock (2005) also find that the level of warranty is another common, though slightly less popular measure of quality. George and Weimerskirch (1994) state that the TQM practices lead to decreased internal and external product reject rates and production downtime that will, in turn, reduce the warranty level and increase customer satisfaction. Customer satisfaction is an important indicator of a firm's overall financial health, largely because it is perceived to be a key indicator of a firm's market share and profitability. Simply stated, a satisfied customer will repeat his or her purchases of the goods or services, increasing the firm's profitability (Choi and Eboch, 1998). As a firm acquires a reputation for delivering high quality products and services, the elasticity of demand can decrease, which, in turn, can enable the firm to charge higher prices and earn higher profits.

On the other hand, there are also some works that contradict to our finding such as (Lin and Johnson, 2004). They find in their study that a considerable portion of the respondents has not sufficiently recognized the effects of warranty as an external failure on firms' profitability.

4.5 The relationship between TQM factors and firm profitability performance

In order to show the relative effect of TQM factors on firm profitability performance multiple regression analysis was employed. In this model variables related to TQM factors were selected as independent variables and firm profitability performance was selected as dependent variable. Table 7 shows the results with the adjusted R-Square is 0.155 from the regression model.

Table 7. Regression results for TQM factors and firm profitability performance

	Sum of Squares	df	Mean Square	F	Sig.
Regression	12.427	3	4.142	7.703	0.000
Residual	57.537	107	0.538		
Total	69.964	110			
Unstandardized Coefficients					
	B	Std. Error	Std. Coef. Beta	t	Sig.
(Constant)	3.982	0.070		57.211	0.000
Employee involvement	0.218	0.070	0.274	3.122	0.002
Customer focus	0.192	0.070	0.241	2.752	0.007
Quality system	0.168	0.070	0.211	2.405	0.018

As a result of the regression analysis, the research reveals that most of the companies regard three basic predictors significantly important for firm performance: Employee involvement ($\beta=0.274$), Customer focus ($\beta=0.241$), Quality system ($\beta=0.211$). Therefore this result provides support for H5. In parallel with this finding, several authors in their works find a significant positive relationship between TQM practices and firm performance. For example Chonga and Rundus (2004) find in their work that companies with high TQM implementation will show high levels of profitability performance outcomes.

Employee involvement is found as one of the TQM factor that has a significant impact on firm performance. Similarly Ahire et al. (1996) and Rahman and Bullock (2005) also find that employee involvement is significantly correlated with firm performance. Taylor and Wright (2003) further state that deriving success from TQM has been shown to be associated with the need for management of firms to ensure that the majority of employees are involved in its implementation.

Customer focus is another factor that has a significant positive impact on firm performance. This outcome has also support from the work of (Rahman and Bullock, 2005) in that customer focus has a significant positive association with performance. The reason may be that SMEs are closer to their customers and they make use of their proximity to market demand (Vossen, 1998). This advantage help understanding customer better provide a greater capacity for customization. However there is a risk in that the principles of customer focus could trap organizations into captive markets where they will focus on meeting the needs of existing customers and therefore view their business only through their current customers' eyes. As a result, these companies could fail to drive the search for innovative and novel solutions by ignoring the 'un-served' potential in their markets (Wind and Mahajan, 1997).

5. CONCLUSION

The study presents an alternative methodology to assess not only the direct impact of TQM on firm performance, but also the indirect impact of TQM on performance via internal and external failures in manufacturing SMEs. It assumes the positive effect of TQM factors on firm performance is mediated through the improvements on internal and external failures.

In literature there are some works that question the business value of TQM. Some of them lack objective data backed by statistical evidence to support their claims (Hendricks and Singhal, 2001). The model developed in this study identifies the most important elements of TQM to reduce internal and external failures and improve firm performance. The managers and the policy makers of SMEs can use the results to identify the problems related to internal and external failure and define solutions to improve quality and thus firm performance. The empirically validated positive relation of TQM to firms' performance such as that documented in this study, can be useful for them to promote and obtain the resources needed for TQM implementation.

5.1. Insights for practitioners

The management of SMEs should focus particularly on customer focus and participation to reduce internal failure since these elements are important predictors for internal failure. Similarly, if these firms want to decrease external failure they should base their strategies on quality system establishment and customer focus. Because these strategies help SMEs increase firm performance through some elements such as reworking from internal failure and warranties from external failure. Another implication of the findings of this study is that some of the variables, particularly the ones related to top management participation and close relationship with customers are important to improve firm performance. These variables have behavioral aspect. Rothwell and Dodgson (1994) state that the relative strengths of SMEs lie in behavioral characteristic. Because SMEs are more likely to be people orientated than system orientated they have advantage in achieving quality activities that have behavioral characteristics. On the other hand, the other variables that sampled firms emphasized such as systematic data collection and training are more system oriented. Because for SMEs the operations often do not follow the formal path that is more recognizable in larger firms, these firms have difficulty in achieving the activities related to system oriented variables. Therefore the results create a resource enabling the decision maker to obtain information particularly about system oriented variables for the selection of the most suitable strategies to increase firm performance.

The finding related to customer focus for manufacturing firms are also worth examining further. It is emerged as a common predictor for both internal and external failures of the manufacturing system. Although this outcome is understandable and also proved to be important by the relevant literature the reason behind should be carefully examined. The customers of small and medium sized firms, that are the main focus of this research, are mostly large scale firms. These firms adopt TQM because it is usually requested by their customers. In other words the motivation to implement TQM may be external. If this is the case for the SMEs the real objective of TQM will never be achieved by them. Choi and Eboch (1998) also complain about the same problem and claim that when industrial customers promote TQM practices, plant managers succumb to this pressure and call for compliance. Because such changes were not driven by the internal needs justified by the technical reasoning but by external needs justified by the institutional reasoning, their impact on the plant performance occurs haphazardly. It may even lead to failure in long term. Therefore during the implementation of TQM

practices the relationship between plant performance and customer focus should be taken into account and plant needs and long term relationship expectation with the customers should be balanced.

One of the limitation of this study is it investigates the firms at one specific point in time. It does not account for changes over time. Therefore longitudinal studies that measure the TQM related elements across a certain period of time are required so that the development of TQM elements in time could be taken into account. Secondly, the sample data used in the study belongs to manufacturing small and medium sized firms in the industry of one particular country. Although the situation is somewhat similar for other countries, caution must be applied when considering to what extent these findings are applicable to organizations in other countries and scales.

In this study profitability performance is considered as firm performance factor. In future it would be interesting to investigate the effects of TQM practices on other performance criteria such as sales volume, revenue and market share. Secondly, it would also be worth devoting another study to evaluate and compare how the differences such as firm size and industry type would affect the implementation of TQM practices in companies.

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BIOGRAPHICAL SKETCH



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6. APPENDIX A: List of indicators included in the questionnaire

A. TQM elements

Please indicate how strongly you agree with each of the following statements (1=strongly disagree to 5=strongly agree).

Top management support ($\alpha=0.7396$)

- All major department heads within the organization accept their responsibility for quality
- Top management is personally involved in quality improvement projects
- Quality issues are frequently reviewed in the organizational top management meetings

Training ($\alpha= 0.7906$)

- Employees received training in quality principles
- Employees received training in problem solving skills
- Employee received training in teamwork

Workforce management ($\alpha=0.7423$)

- Employees receive feedback for their quality performance
- Employees are fully participated quality related decisions
- Employees' performance is measured and recognized to support quality programs
- Employees' satisfaction is continuously measured

Quality data reporting ($\alpha=0.8053$)

- Quality performance data (defects, error, scrap, rework etc.) are collected and evaluated periodically in the organization
- There is a written quality policy and quality goals
- The organization obtain and report quality data on all functions and departments

Customer relations ($\alpha=0.7521$)

- Customers' current and future requirements are known by the organization
- Customer complaints are used as a method to initiate improvements in current process
- Organization continuously collects information from customers to measure customer satisfaction
- Organization has an effective process to solve customer complaints
- Organization uses customer requirements as a basis for quality

Supplier quality management ($\alpha=0.7517$)

- Long term relationship is arranged with suppliers
- Suppliers are evaluated periodically according to quality
- Suppliers are selected based on quality rather than price and delivery performance
- Suppliers are trained and technical assistance is given by the organization
- Suppliers are involved in product and process development process

Process flow management ($\alpha= 0.8160$)

- Work and process instructions are clearly described
- Processes are continuously controlled and improved
- There are organizational structures like QC, teams for continuous quality improvement
- Best practices of other organizations are examined for continuous improvement

B. Internal and external failures

Please indicate the relative position of your organization on the following failure variables compared to main competitors (1=very low to 5=very high).

Internal failure ($\alpha=0.7529$)

- The amount of corrective actions
- The amount of scrap
- The amount of downtime due to failures
- The amount of loss due to work accidents

External failure ($\alpha=0.7502$)

- The amount of aftersale service caused by product repairs
- The amount products rejected and returned

- The amount of warranty claims

C. Firm performance

Please indicate the relative position of your organization on profitability performance compared to industry average (1=very low to 5=very high).

- Profitability performance