THE CORRELATION BETWEEN TQM CONSTRUCTS AND SUPPLIER PERFORMANCE

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ABSTRACT
In today’s highly competitive environment, it is imperative to develop strong relationships with suppliers in order to improve the quality of products and services provided. The purpose of this paper is to present the correlation between total quality management (TQM) constructs of (i) leadership, (ii) employee involvement, (iii) customer focus, (iv) supplier relations, in terms of supplier performance with the aim of improving organisational performance.
Current research in both the manufacturing and service industries in South Africa reveal that TQM does have a visible influence on supplier performance, which in turn plays an important role in the continued improvement and success of an organisation. A multiple regression analysis and Pearson’s correlation analysis was conducted to determine the relationship between the TQM constructs and supplier performance.

The results of the research have shown a strong positive significance level between the TQM constructs and supplier performance. Research has shown that this positive significance level has contributed to the improvement of supplier performance and overall organisational performance and success.

Key Words: Total Quality Management (TQM), Supply Chain Management (SCM), Supplier Performance, Correlation

INTRODUCTION
Organisations globally are increasingly adopting supply chain management (SCM) in order to utilise their resources more efficiently. Total quality management (TQM) and SCM play a significant role in strengthening organisational performance as well as gaining a competitive advantage. An organisation is as successful as its ability to coordinate the efforts of its key suppliers. It is noted that SCM and TQM efforts improve one another’s performance and that the integration between the two functions can be beneficial for an organisation in a plethora ways [9]. It is also important to integrate SCM and TQM because both functions are interrelated. Better quality products and services for instance cannot be achieved without supply chain amalgamation and efforts to improve quality on a continual basis.

One of the objectives of the research was to draw a comparison/correlation of the use of TQM practices by manufacturing and service organisations, to enhance organisational performance.

LITERATURE REVIEW
The quality of suppliers has a great impact on the quality of final products and services. This means that the emphasis of TQM constructs has shifted to the supply chain. Recent research conducted explores the relationship between TQM practices and the quality of supplier performance [2]. The findings reveal that TQM practices partially correlated with quality performance. This paper explores the application of four TQM constructs in the supply chain and the impact it has on supplier performance.
OVERVIEW OF TQM CONSTRUCTS AND THE SUPPLY CHAIN

The following sections highlight the role of TQM constructs in the supply chain.

Leadership

Leadership must establish unity of purpose and provide direction in an organisation. Gonzalez and Guillen [10] agree that “management commitment and leadership” are two of the most important factors for the successful implementation of TQM. Leadership has to create and maintain an environment that enables the involvement of all employees to achieve the quality objectives of the organisation. In the supply chain context, leadership establishes the development of strategies and operational objectives of the supply chain, which have a direct impact on the efficiency and effectiveness of the quality of the efforts of the entire organisation [5], [8], [15].

Furthermore, leadership generates a trustworthy environment that is to influence employees and suppliers to bring about intense changes. Therefore, the quality improvement process begins with leadership’s commitment to quality performance [22], [31].

Employee Involvement

Employee involvement is a process designed to empower members of an organisation to make decisions and to solve problems appropriate to their level in the organisation. The importance of employee involvement in the organisation is well established in TQM. Employee involvement can take a variety of forms such as job participation, teamwork, employee empowerment, training and development, to name a few [30].

Employee involvement is regarded as the most important ingredient to achieve quality performance. This means that every employee within an organisation is involved in the quality improvement of products and processes within the organisation, along the supply chain [25]. Employee involvement is the key link in the successful implementation of TQM. In the supply chain context, a working environment should be established to encourage and motivate the creativity and eagerness of all its employees. Employees should be competent in their roles and accept responsibility for their roles in the supply chain. Furthermore, employees can participate in SCM and strive to ensure customer satisfaction [5], [8], [29].
**Customer Focus**

Quality specialists such as Deming, Juran and Crosby, have recognised customer focus as the key to continuous quality improvement in organisations. In their comprehensive review of literature, Sila and Ebrahimpour [26] report that customer focus had received the widest coverage. The importance of customer focus is the principal point of any quality initiative. The goal of satisfying customers is fundamental to TQM, and the goal could be achieved by an organisation’s attempt to design and deliver products and services that fulfil customer needs [4], [27], [32]. In the supply chain context, customers do not only include end-users, but also the customers (backward users) within the supply chain process [5].

Identifying the needs of customers is the starting point of establishing quality goals for organisations. In addition, planning and the assurance of quality begin with a focus on the needs of customers and ends when those needs are satisfied [19]. Therefore, the core element is to be very attentive to the needs and expectations of end users as well as all members within the supply chain, known as backward users. This will result in the improvement of the supply chain process by satisfying end-users [8].

**Supplier Relations**

TQM is not complete if it does not address supplier relations [11]. The supplier relationship is the supply chain process that provides the structure for managing relations with suppliers. Supplier relationship is the discipline of strategically planning for, and managing all interactions with third party organizations that supply goods and/or services to an organization in order to maximize the value of those interactions [8]. A competitive business environment puts pressure on organisations to improve quality, deliver performance and responsiveness while continuing to reduce costs. For some organisations this means reducing the supplier base and developing closer relationships with suppliers [21], [25].

Fifty percent of an organisation’s non-conformances are due to defective incoming material and resources. The relationship between supplier and buyer is one of the most important parts of the quality improvement process. Therefore, organisations are now implementing supplier relationship management (SRM). The SRM strategically aims to achieve collaboration with suppliers in order for organisations to develop new products competitively and produce goods efficiently. In this situation long term supplier relationships with suppliers need to be established [24], [31], [20]. In a supply chain context, the organisation and supplier are
mutually dependent. Maintaining the supplier relationship can improve the quality of organisational performance as well as supplier performance.

Supplier Performance
TQM has for years been the key to the globalisation of the manufacturing and service industry for years. Some techniques have been adopted across the world, which have improved the supply chain of today by raising the performance of suppliers. Customer satisfaction depends on supplier performance. In the past twenty years, supplier performance has played a crucial role in the supply chain. This is due to suppliers being one of the major components of an organisation’s policy and procedures [3]. It was found that the will and capacity of suppliers sharing information has a significant impact on their performance [13].

The result of good supplier performance can be determined through reliability, competence and cooperation. This performance essentially affects the quality of goods and services provided to customers, which in turn has an impact on organisational performance [14].

Figure 1 represents a conceptual model developed to identify the relationship between TQM constructs and supplier performance.

![Conceptual framework](image)

**Figure 1 – Conceptual framework**

RESEARCH METHODOLOGY AND DESIGN

Research Objective and Methodology
The objective of the research was to identify the correlation between the four TQM constructs and supplier performance. Therefore hypothesis was developed in terms of the four TQM
constructs of (i) Leadership, (ii) Employee involvement, (iii) Customer focus, and (iv) Supplier relations.

Research Instrument

The research instrument utilised in the research was a questionnaire, which consisted of three sections. The first section identified biographical details, the second identified and measured the seven constructs of TQM practices, and the third identified and measured the five organisational performance measures. The instrument was developed using the five-point Likert scale which represents a range of attitudes. This helps to ensure consistency and allows for easy completion and data coding as well as analysis of the results.

The self-administered questionnaire was personally delivered to 90 randomly selected manufacturing and service organisations. Thirteen of the organisations declined to participate due to confidentiality of the information which would be obtained from the organisation. Eight questionnaires were not returned and of the 69 that were returned, 4 were discarded because they were incomplete. Therefore, the sampling frame consisted of 65 respondents, which comprised 33 manufacturing organisations and 32 service organisations. For detail of the organisational types see the breakdown in Table I.

<table>
<thead>
<tr>
<th>ORGANISATIONAL INDUSTRY TYPE</th>
<th>Number</th>
<th>Service type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food and beverage</td>
<td>3</td>
<td>Financial/banking</td>
<td>3</td>
</tr>
<tr>
<td>Petroleum, chemical, rubber, plastic</td>
<td>3</td>
<td>Retail</td>
<td>4</td>
</tr>
<tr>
<td>Basic iron and steel, metal products</td>
<td>4</td>
<td>Warehousing/logistics</td>
<td>4</td>
</tr>
<tr>
<td>Electrical machinery and equipment</td>
<td>0</td>
<td>Wholesalers/supermarkets</td>
<td>2</td>
</tr>
<tr>
<td>Automotive parts and accessories</td>
<td>3</td>
<td>Hospitality</td>
<td>3</td>
</tr>
<tr>
<td>Construction</td>
<td>5</td>
<td>Education</td>
<td>2</td>
</tr>
<tr>
<td>Engineering</td>
<td>4</td>
<td>Telecommunications</td>
<td>3</td>
</tr>
<tr>
<td>Automotive</td>
<td>3</td>
<td>Automotive (car dealerships)</td>
<td>2</td>
</tr>
<tr>
<td>Printing and packaging</td>
<td>3</td>
<td>Health care</td>
<td>3</td>
</tr>
</tbody>
</table>
### Data Analysis and Discussions

The research examined a linear relationship between TQM constructs and supplier performance measures. A hypothesis was developed, tested and computed by means of Cronbach’s Alpha coefficient in order to determine if any relationship exists.

#### Reliability Analysis

According to Maree [17], the reliability coefficient of 0.70 reflects a low reliability, 0.80 a moderate reliability and 0.90 a high reliability. Therefore, a reliability coefficient of 0.70 and higher is considered “acceptable”. Cronbach’s Alpha coefficients for the TQM practices are shown in Table II.

All the TQM constructs as well as supplier performance, which constituted this research, had reliability coefficients that were greater than 0.80. This indicates that the reliability of the questionnaire and the research is fairly high.

### Table II – Reliability analysis

<table>
<thead>
<tr>
<th>TQM practices</th>
<th>Cronbach's Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>0.904</td>
</tr>
<tr>
<td>Employee involvement</td>
<td>0.901</td>
</tr>
<tr>
<td>Customer focus</td>
<td>0.927</td>
</tr>
<tr>
<td>Supplier relations</td>
<td>0.866</td>
</tr>
<tr>
<td>Supplier performance</td>
<td>0.862</td>
</tr>
</tbody>
</table>

### ANALYSIS AND FINDINGS

#### Independent and Dependent Variables

An independent variable (predictor variable) is a variable that is manipulated by the researcher to determine the effect it has on
another variable. The variable that is influenced by the independent variable is known as the dependent variable (criterion or response variable) [23].

In testing the hypothesis, the TQM constructs identified are independent variables whilst the dependent variable being the supplier performance.

Multiple regression analysis was been applied to test the hypothesis. This method is a useful technique that can be utilised to analyse the relationship between a single dependent variable and several independent variables [10].

**Correlation Analysis**

Pearson’s correlation analysis was applied to determine the relationship between the constructs (variables). The result of the correlation analysis is displayed in Figure II. The highest correlation exists between the TQM constructs of supplier relations and supplier performance. This indicates that supplier relations play a vital role in the performance of suppliers in order to enhance organisational performance. Strong supplier relations would thus lead to improved supplier performance.

![Figure II – Correlation of supplier performance](image-url)

*Correlation is significant at 0.05 level (1-tailed)*

Figure II shows a summary of the positive significant impact that the four TQM constructs have on supplier performance as $r > 0.400$. This is based on the conceptual framework identified in Figure 1.
Multiple Regression Analysis

The relationship between the independent variables (TQM constructs) and the dependent variable (Supplier Performance) results is summarised in Table III.

<table>
<thead>
<tr>
<th></th>
<th>Unstandardised Coefficients</th>
<th>Standardised Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>0.790</td>
<td>0.430</td>
<td>1.840</td>
<td>0.071</td>
</tr>
<tr>
<td>Leadership</td>
<td>-0.272</td>
<td>0.150</td>
<td>-1.814</td>
<td>0.075</td>
</tr>
<tr>
<td>Employee Involvement</td>
<td>0.161</td>
<td>0.152</td>
<td>1.055</td>
<td>0.296</td>
</tr>
<tr>
<td>Customer Focus</td>
<td>0.070</td>
<td>0.150</td>
<td>0.464</td>
<td>0.644</td>
</tr>
<tr>
<td>Supplier relations</td>
<td>0.515</td>
<td>0.133</td>
<td>3.888</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table III display the results of regression analysis in terms of the relationship between the predictors (TQM constructs) and the dependent variable supplier performance. Where the Predictors (Constant) are identified as: (i) Leadership, (ii) Employee involvement, (iii) Customer focus, (iv) Supplier relations, and the Dependent variable as - Supplier performance

The contribution of the predictor variable, leadership was not significant (t = - 1.814) to the variation of the dependent variable, supplier performance. Therefore, leadership was excluded since it did not contribute significantly to the change in supplier performance. Using the information in Table IV, the estimated regression model is as given in the following regression equation formula adapted from Levine [16]:

\[ y (SP) = 1.026 + 0.130(x_1) + 0.172(x_2) + 0.373(x_3) + 0.089(x_4) + 0.085(x_5) \]

Where \( SP \) = Supplier Performance

\[ x_i \] = relates to each element

\[ i = 1, 2, 3, 4, 5, 6, 7 \]

\[ x_1 \] = Leadership

\[ x_2 \] = Employee Involvement
Hence,

i. For every unit increase in the employee involvement variable, a (0.161) unit increase in SP is predicted, while the other independent variables are held constant.

ii. For every unit increase in the customer focus variable, a (0.070) unit increase in SP is predicted, while the other independent variables are held constant.

iii. For every unit increase in the supplier relations variable, a (0.515) unit increase in SP is predicted, while the other independent variables are held constant.

The coefficient of determination ($R^2$) is an estimate of the percentage variation in the dependent variable (SP) which can be predicted from the independent variable (TQM constructs). This coefficient shows how well the multiple regression model fits the data.

A value close to zero shows a weak fit whereas a value close to one implies a good fit. The $R^2$ value of 0.503 in Table III, indicates that 50.3% of the variation in SP can be explained by the four predictor variables identified in the regression equation.

The beta coefficients reflected in Table III are the values for the regression equation for predicting the dependent variable from the independent variable. The larger beta coefficient is 0.515, corresponding to supplier relations (independent variable), which means that one standard deviation increase in supplier relations is followed by a 0.515 standard deviation increase in SP. Similarly, the other positive beta coefficients corresponding to employee involvement (0.161), customer focus (0.070), means that one standard deviation increase in either one of the beta coefficients would result in a standard deviation increase in SP. It is evident that supplier relations ($t = 3.888$) has a slight significance on SP. Therefore, based on the above multiple regression analysis, the hypothesis ($H_1$) which relates the TQM constructs to SP, is partially supported. See Table IV.

**Table IV – Accepted hypothesis**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>$R$</th>
<th>$R$-squared</th>
<th>p-value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_1$</td>
<td>0.729</td>
<td>0.531</td>
<td>0.000</td>
<td>Accepted</td>
</tr>
</tbody>
</table>
COMPARATIVE RESEARCH USING T-TEST

A t-test was conducted to identify the mean differences between the manufacturing and service organisations in order to determine any differences or similarities in the implementation of TQM practices in these sectors.

One of the objectives of the study was to draw a comparison between manufacturing and service organisations on their use of TQM practices to enhance organisational performance. A t-test was conducted in Table V. It is evident that there are very low significant differences between the manufacturing and service industries. The results indicate that TQM practices are being implemented in both manufacturing and service industries. The largest difference is seen in leadership. This could imply that greater leadership commitment is achieved in manufacturing than in services. Manufacturing organisations would reflect a greater use of these quality practices than service organisations as TQM was initially developed for the manufacturing industry, as identified by quality experts such as Deming, Crosby and Juran.

CONCLUSION

This research has provided evidence that TQM constructs have a significant positive effect on Supplier Performance. In response to \( H_1 \), the four TQM constructs were found to have a fairly strong correlation with Supplier Performance. The main objectives of the study was to determine the correlation of TQM constructs on supplier performance and to identify the relationship between

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### Table V – Comparative analysis

<table>
<thead>
<tr>
<th>TQM practices</th>
<th>Manufacturing</th>
<th>Services</th>
<th>Mean differences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 33</td>
<td>n = 32</td>
<td></td>
</tr>
<tr>
<td>Leadership</td>
<td>4.104</td>
<td>3.594</td>
<td>0.510</td>
</tr>
<tr>
<td>Employee involvement</td>
<td>3.678</td>
<td>3.285</td>
<td>0.393</td>
</tr>
<tr>
<td>Customer focus</td>
<td>3.928</td>
<td>3.824</td>
<td>0.104</td>
</tr>
<tr>
<td>Supplier relations</td>
<td>3.823</td>
<td>3.625</td>
<td>0.198</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organisational performance measures</th>
<th>Manufacturing</th>
<th>Services</th>
<th>Mean differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier performance</td>
<td>3.424</td>
<td>3.516</td>
<td>-0.092</td>
</tr>
</tbody>
</table>
these variables. This objective was achieved by conducting a correlation analysis. A conceptual framework was developed to indicate this relationship. The results of the study showed that there are positive correlations amongst the constructs. A multiple regression analysis was conducted to prove the hypothesis of the study. The conceptual model could be utilised to integrate TQM practices into the supply chain in an effort to improve supplier performance which will enhance organisational performance as well.

The sub objective was to conduct a t-test to draw a comparison of manufacturing and service organisations with regard to the use of TQM constructs in these industries. The result of the study showed that there is no significant difference between the manufacturing and service sector. This indicates that the TQM constructs have more or less a significant influence on both manufacturing and services sectors with regard to supplier performance.

REFERENCES


