The Impact of Total Quality Management and Supply Chain Integration on Firm Performance in Container Shipping

Dr Vinh V. Thai
Division of Infrastructure Systems & Maritime Studies
School of Civil & Environmental Engineering
Nanyang Technological University, Singapore
Email: vvthai@ntu.edu.sg

Dr Hai T. Tran
Department of Maritime & Logistics Management
Australian Maritime College, University of Tasmania
Tel: +61 63249648  Fax: +65 63266493
Email: tranth@amc.edu.au
The Impact of Total Quality Management and Supply Chain Integration on Firm Performance in Container Shipping

ABSTRACT: Shipping is the backbone facilitating international trade and globalization, and container shipping has grown tremendously bringing with it an expanded network of suppliers and customers being integrated more intensively into supply chains. In this context, Total Quality Management (QM) and Supply Chain Integration (SCI) have become common strategic moves by many container shipping companies so as to provide better service quality (SQ) to their customers and improve firm performance (FP). In this research, a survey was conducted with 159 container shipping companies with office in Singapore to examine the interrelationships between these constructs. It was found that both TQM and SCI practices have positive effects on SQ and FP but at different extents, while TQM also contributes positively to SCI.

Keywords: Total Quality Management, Supply Chain Integration, service quality, firm performance, container shipping

INTRODUCTION

With more than 90% of world trade by volume being transported by sea, shipping remains the backbone facilitating international trade and globalization (International Maritime Organisation 2014). It is the major transportation provider of large volume shipments over long distances at low costs. In recent years, container shipping has grown tremendously bringing with it an expanded network of suppliers, customers, and is being integrated more intensively into supply chains (Yang, Yeo and Thai 2014). Unlike other types of cargo ships, containerships sail according to published schedules to named ports and require huge logistics supports from a wide network of agents, ports and other suppliers such as bunker and parts suppliers, as well as other immediate customers such as freight forwarders (Stopford 2009). Regardless whether there is sufficient amount of cargo in the next port of call, the containership still has to follow its published schedule, and therefore it is essential to maintain a good plethora of interrelationships with both suppliers and customers in container shipping so as to deliver a reliable service. As all these players are intertwined in a supply network which is required for
the performance of the industry, and this gives rise to the importance of supply chain integration in container shipping. This is supported by Frémont (2009) who argued that containerisation prepares the ground for the full vertical and horizontal integration of transport chains, while Panayides (2006) also suggested integration to be a central tenet in maritime logistics, particularly of the transportation modes and organisations along the global supply chain. In recent years, shipping companies have integrated horizontally through mergers, acquisitions, strategic alliances, and vertically through operating dedicated terminals and by providing integrated logistics and intermodal services (Gao and Yoshida 2013, Merikas et al. 2011, Agarwal and Ergun 2010, Van De Voorde and Vanellander 2008, Midoro et al. 2005, Notteboom 2004, Panayides and Cullinane 2002).

Like any other industries, service quality in shipping plays a critical role, contributing to customer satisfaction and thus retention, leading to other business success (Thai et al. 2014). Quality management is therefore essential to ensure that quality service and other business results are delivered to customers. This applies in many manufacturing and service sectors, and equally in the shipping industry, especially in container shipping. This is due to the characteristics of container shipping which are different from other sectors of the shipping industry. Specifically, containerships carry various types of cargo which are of high value but low volume, and thus the transport requirements are more on timeliness, reliability, connectivity, etc. rather than cheap freight rate. In other words, customers using container shipping are more concerned with quality aspects of the service, and therefore implementing quality management practices to ensure the delivery of quality shipping service is essential in container shipping. This is partly reflected through the existence of ISO and other industry standards in container shipping companies.

Although there have been lots of research on the influence of TQM and SCI practices on firm performance (FP), they were mostly conducted in separation (for example, see Chopra and Mendel 2013, Huo 2012, Agus and Hassan 2011, Abdullah and Tari 2012). In fact, it is possible that the implementation of some TQM practices would facilitate the conduct of specific aspects of SCI at the same time. For instance, if the firm implements supplier quality management practices such as seeking
long-term relationships with their suppliers, it is likely that they would take actions to integrate further with their suppliers by sharing necessary information through information and communication technologies (ICT). In addition, such studies on the impact of TQM and SCI practices on FP of container shipping lines are surprisingly scant, given the importance of the maritime supply chain in which container shipping companies are an integrated component. This paper therefore addresses the aforesaid research issue. The paper is organised as follows. First, a literature review is provided followed by the proposed conceptual model of TQM, SCI and FP. Methodologies are described next, followed by analyses and discussions of study findings. Finally, concluding comments, including implications for academic and management and future research directions are outlined.

LITERATURE REVIEW

Supply chain integration and firm performance

In recent years, SCI has received much attention due to its key contribution towards firm’s competitive advantage and performance (for example, see Liu et al. 2013, Moshkdanian and Molahosseini 2013, Huo 2012, Al-Sagheer and Ahli 2011, Li et al. 2006). It was argued that firms that achieve the highest degree of integration would also have the strongest association with their performance (Frohlich and Westbrook 2001). SCI refers to coordination mechanisms in the form of business processes that should be streamlined and interconnected both within and outside company boundaries (Romano 2003). Pagell and Krause (2004) and Flynn et al. (2010) defined SCI as the strategic collaboration of both intra-organizational and inter-organizational processes. Supply chain management philosophy emphasizes on SCI that links a firm with its customers, suppliers and other channel members (Eng 2006, Mason and Lalwani 2006). Recent practitioners and academic researchers such as Sahin and Robinson (2005), Watson and Zheng (2005), Kulp et al. (2004) also emphasized the role of SCI among partners as an important determinant of value creation. In essence, SCI centres on coordination and requires all business processes to be streamlined internally within the firm and externally among firms (Cagliano, Caniato, and Spina 2006). In this respect, SCI is mainly conceptualised by two key dimensions; internal and external integration (Tessarolo 2007). Internal integration refers to the
coordination, communication, and cooperation among functional groups within the organisation (Lin and Chen 2008) which involves breaking down functional silos, reducing role conflicts among functions, facilitating team work and communications, and cohesive sharing of resources and information to maximise firm’s performance (Gimenez and Ventura 2005, Topolsek, Lipicnik and Gajsek 2009). Meanwhile, external integration relates to any coordination mechanisms that aim at improving inter-firm communications, relationships, logistical activities, product design and development, and sharing of assets and resources to maximise overall supply chain value (Dröge, Jayaram and Vickery 2000; Lee 2000; Stock, Greis and Kasarda 1999).

The influence of SCI practices on firm performance has been researched in many previous studies. It has always been known that there exist conflicting objectives of functional departments or business units within the same firm which may hinder organisational performance (Simchi-Levi et al. 2003). Efforts, therefore, have been taken by firms to integrate internally. Stevens (1989) argued that the concept of internal integration requires a radical shift from being functional to process-oriented, and this shift in perspective has a positive effect on firm’s performance through the elimination of functional barriers. This is because being functional-oriented would create barriers within the organization wherein functions are oblivious to each other’s objectives. This reduces the ability of the organisation to fulfil customer requirements effectively since the completion of a customer requirements often necessitates the joint effort of several departments (Huo 2012). Secondly, being functional-oriented increases intra-firm conflicts since overlapping activities or responsibilities were noted to exist between key functions (i.e. production, logistics, and marketing) of an organization (Casanovas and Arbós 2001). Such an integration within the firm would therefore reduce transaction cost (Zajac and Olsen 1993) and improve productivity since functional objectives are eliminated. Greater customer satisfaction and larger profits would also be generated since strategic goals, supply chain goals, and supply chain drivers are aligned (Chopra and Mendl 2013). The emphasis on integrated information systems, information sharing, goals alignment through the implementation of customer-centric performance metrics and incentives further boosts firm’s operational and financial performance (Lee et al. 2007).
Apart from internal integration, how firms within the same supply chain eliminate or reduce external barriers between them and integrate well with each other would also contribute to their performance. This is evidenced in earlier studies in the literature. In essence, the positive effects that external integration has on performance can be analysed from the strategic and tactical level. At the strategic level, external integration involves the full cooperation of all supply chain members to structure their processes to achieve the desired level of efficiency or responsiveness, which is determined by their end customers. Proper configuration of the supply chain drivers and structures provides maximum value for customers and hence, maximises profits (Beamon 1998). From the resource-based-view perspective (Thompson et al. 2012), the ability of the supply chain to coordinate and to look beyond individual’s profits is a valuable competitive advantage since competition today is between supply chains and not between firms (Christopher 2000).

At the tactical level, logistics initiatives such as vendor-managed inventory, just-in-time inventory, postponement and cross-docking are concepts of external integration that require the joint effort of more than one member of the supply chain (Wong et al. 2005). These initiatives are commonly linked with improving product flow and cost efficiency when successfully implemented (Giunipero et al. 2008). External integration is also associated with improving information flow (Lee 2002), which is primarily achieved from integrating information systems and sharing of demand information with upstream and downstream partners (Gunasekaran and Ngai 2004). Attaining full visibility of the supply chain signifies a reduction in cost due to improved accuracy in demand forecasting (Småros et al. 2003). Gaining access to end customer’s demands mitigates the bullwhip effect (Lee et al. 2004) which reduces product availability and ultimately, the profitability of the firm.

**Total Quality Management and firm performance**

TQM is said to help improve customer satisfaction, quality of goods and services, productivity, reduce waste, cost, time, and inventory level, among others (for example, see Fuzi and Gibson 2013, Oprescu 2012, Valmohammadi 2011, Pakdil 2010, Besterfield et al. 2003, Goetsch and Davis 2006). Research
on the relationship between TQM practices and firm performance is quite established in the literature since the earliest research in the 1990s about the critical factors of TQM and their impact on performance (for example, see Saraph et al. 1989, Flynn et al. 1994, Powell 1995, Ahire et al. 1996, Black and Porter 1996, Madhu et al. 1996). On this note, previous studies give mixed results about the relationship between TQM practices and firm performance (e.g. Kaynak 2003, Nair 2006, York and Miree 2004, Sadikoglu 2004, Prajogo and Sohal 2001, 2006, Rahman and Bullock 2005, Fuentes-Fuentes et al. 2004, Chong and Rundus 2004, Kannan and Tan 2005, Douglas and Judge 2001). For example, it was found that the relationship between the ‘hard practices’ of TQM – technical tools and techniques used in quality management, and performance is not significant (Ho et al. 2001), while others showed that some ‘soft practices’ – those dealing with people and relationships, and hard quality management practices are either directly or indirectly related to performance (Rahman and Bullock 2005). The relationship between TQM practices and firm performance was also suggested to be either direct or indirect (e.g. Kaynak 2003, Rahman and Bullock 2005). Meanwhile, Sila (2007) concluded that TQM and TQM – performance relationships are not context-dependent.

The relationship between TQM practices and firm performance has still been continuously researched in recent years. Examining this relationship from the country-specific perspective, for example, Prajogo and Hong (2008) found that TQM contributed significantly to R & D performance of Korean firms and that TQM as a set of generic principles can be adapted in environments other than manufacturing or production areas. Meanwhile, TQM and its adoptions were found to have significant correlations with production performance and customer-related performance in Malaysian manufacturing firms (Agus and Hassan 2011) while the research by Abdullah and Tari (2012) also revealed that soft quality management factors have a positive influence on hard quality management, and soft quality management factors have direct and indirect effects on performance of electrical and electronic firms in Malaysia. Industry-specific studies on the influence of quality management practices on performance have also been conducted recently in the petroleum industry by Parast, Adams and Jones (2011) who found that top management support, employee training, and employee involvement are significant variables explaining the variability of operational performance. In line
with these findings, the recent research in the shipping industry by Cheng and Choi (2013) also indicated that all four quality management practices of top management commitment and participation, quality information and performance measurement, employee training and empowerment, and customer focus are positively associated with the three empirically developed organizational performance measures of operational performance, financial performance and customer satisfaction.

In spite of the comprehensive research on the relationship between TQM and SCI on firm performance, it is the fact that majority of these studies were conducted separately in the literature. It is not until recently that a few scholars have noticed the similarities and differences between TQM and supply chain management (SCM) practices in which integration is identified as the common area. Specifically, Vanichchinchai and Igel (2009) found that TQM focuses more on internal participation, whereas SCM places more emphasis on external partnerships. Meanwhile, management support and commitment, customer focus, and supplier partnership are the most common practices found in both TQM and SCM literature (Talib, Rahman and Qureshi 2011). The interlink between TQM and SCI is however unclear and therefore also deserves further research. This study thus addresses the aforesaid gaps in the context of container shipping.

RESEARCH METHODOLOGY

Measurement of constructs

Given that TQM and SCI are established research constructs in the literature, it is envisaged that items validated in previous studies which were used to measure these constructs in other sectors could be equally adopted in the shipping industry. In this respect, popular variables measuring TQM include management leadership (e.g. Saraph et al. 1989), training (e.g. Vanichchinchai and Igel 2009), customer focus (e.g. Kaynak and Hartley 2008), supplier quality management (e.g. Saraph et al. 1989, Kaynak 2003, Anderson et al. 1998), process management (e.g. Wang et al. (2012)) and employee involvement (e.g. Saravanan and Rao 2006). SCI is most frequently represented by internal integration (e.g. Flynn et al. 2010, Wong et al. 2011), supplier integration (e.g. Flynn et al. 2010) and customer integration (Flynn et al. 2010). Meanwhile, FP is can be measured by service quality (e.g. Thai 2007).
and other performance indicators (e.g., Flynn et al., 2010). Table 1 provides a summary of research constructs, variables, measurement items and the literature sources where they are adopted for this study.

Insert Table 1 about here

**Conceptual framework**

To address the research issues in this study, it is hypothesised that both TQM and SCI variables would have positive influences on FP variables, while TQM variables also positively influence SCI. Thus, specific hypotheses in this research are stated as follows:

- \( H_1: \) TQM practices, Management leadership positively influence service quality in container shipping.
- \( H_2: \) Training positively influences service quality in container shipping.
- \( H_3: \) Customer focus positively influences service quality in container shipping.
- \( H_4: \) Supplier quality management positively influences service quality in container shipping.
- \( H_5: \) Process management positively influences service quality in container shipping.
- \( H_6: \) Employee involvement positively influences service quality in container shipping.
- \( H_7: \) TQM practices, Management leadership positively influence other performance indicators in container shipping.
- \( H_8: \) Training positively influences other performance indicators in container shipping.
- \( H_9: \) Customer focus positively influences other performance indicators in container shipping.
- \( H_{10}: \) Supplier quality management positively influences other performance indicators in container shipping.
- \( H_{11}: \) Process management positively influences other performance indicators in container shipping.
- \( H_{12}: \) Employee involvement positively influences other performance indicators in container shipping.
- \( H_{13}: \) Internal integration, SCI practices positively influence service quality in container shipping.
- \( H_{14}: \) Supplier integration positively influences service quality in container shipping.
- \( H_{15}: \) Customer integration positively influences service quality in container shipping.
\( H_1: \) SCI practices (internal integration) positively influence other performance indicators in container shipping.

\( H_2: \) Supplier integration positively influences other performance indicators in container shipping.

\( H_3: \) Customer integration positively influences other performance indicators in container shipping.

\( H_4: \) TQM practices (management leadership) positively influence supply chain integration in container shipping.

\( H_5: \) Training positively influences supply chain integration in container shipping.

\( H_6: \) Customer focus positively influences supply chain integration in container shipping.

\( H_7: \) Supplier quality management positively influences supply chain integration in container shipping.

\( H_8: \) Process management positively influences supply chain integration in container shipping.

\( H_9: \) Employee involvement positively influences supply chain integration in container shipping.

---

**Data collection, population and sampling**

Survey was selected as the method of data collection in this study. As this research involves the population of container shipping lines with registered offices in Singapore, the mailing list should cover all of these categories. This mailing list was constructed with 159 container shipping lines from the member directory of Singapore Shipping Association (SSA) and Singapore Maritime Directory.

Given the small number of samples, total population sampling was adopted for this study. The survey questionnaire, which is preceded by a cover letter using the letterhead of the authors’ institution, employs both fixed-alternative and open-ended response questions. It consists of two sections. In the first section, respondents were asked to indicate their attitude towards statements describing the TQM and SCI variables in their organisations. Respondent’s attitude is measured using the five-point Likert scale, ranging from 1 as ‘strongly disagree’ to 5 being ‘strongly agree’. The other question in this section explored respondents’ evaluation of their organisations’ performance relative to the industry’s average in terms of service quality and other performance indicators on the five-point categorical scale, ranging from 1 as ‘worst’ to 5 being ‘best’.
The second section asked demographic questions such as the types of company ownership of the respondents, their designation and work experience. Upon completion, the questionnaire was pre-tested with a small group of academics and container shipping professionals to ensure the language clarity and face validity of the measurement constructs. The questionnaire survey was then administered by post with a follow-up mailing two weeks after the first wave of postage. By the cut-off date, a total of 55 usable questionnaires were returned, yielding a response rate of 35%. Majority of respondents (98%) hold middle and senior managerial positions and 40% of them have more than 10 years of work experience in the shipping industry. It can be therefore concluded that the respondents are appropriate for this study given the strategic nature of TQM, SCI and FP. Table 2 provides a summary of demographic statistics.

ANALYSIS AND FINDINGS

The influence of TQM on FP

Since the research constructs, variables and measurement items in this study were adopted from previous well-established studies examining the same research issues and they were also checked for validity with container shipping professionals, they were used as is in the statistical analyses in this study. In addition, given the small sample collected from the survey, a series of regression analyses were conducted to test the proposed hypotheses at 95% confidence level. To examine the causal relationship between TQM variables and FP, regression analyses were used with service quality and other performance indicators as the dependant variables and TQM variables as predictors. First, the influence of TQM variables on service quality of container shipping lines is examined. The results of this analysis are summarised in Table 3 and Table 4. The first observation is that all six TQM variables met the entry requirements to be included in the regression equation. The multiple R ($R = 0.747$) shows that there is a substantial correlation between the dependant variable (service quality) and six predictors mentioned earlier, and this is statistically significant ($p = .000$). In this respect, about 50% of the variance in service quality is explained by the six predictor variables (adjusted $R^2 = 0.502$). Among the six predictors, two have statistically significant positive influence on service quality;
specifically, employee involvement has the greatest positive influence on service quality ($\beta = .391$), followed by customer focus ($\beta = .274$). Hence, $H_3$, $H_4$, and $H_6$ are partly accepted.

The influence of SCI on FP

As indicated in the literature review, the influence of SCI practices on FP has been intensively examined with mixed results. In this research, the causal relationship between SCI practices as predictors and FP in terms of service quality and other performance indicators as the dependant variable is examined through regression analysis. The results are summarised in Tables 7 and 8 for the analysis of SCI influence on service quality of container shipping companies. In line with earlier regression analyses, there is a substantial causal correlation between SCI practices and service quality (adjusted $R^2 = 0.809$). Specifically, two among three SCI variables have statistically significant positive influence on service quality, in which the strongest impact is from internal integration ($\beta = .475$), followed by supplier integration ($\beta = .460$). Hence, $H_1$, $H_3$, and $H_5$ are partly accepted.

Meanwhile, SCI practices as predictors also have a positive influence on other performance indicators of container shipping lines as the dependant variable as reflected in Tables 9 and 10. Specifically, more than 70% variance of the latter can be explained by those of the former (adjusted $R^2 = 0.728$).
However, among the three SCI variables, only supplier integration has the statistically significant positive influence on other performance indicators of container shipping lines ($\beta = .738$). Therefore, only $H_{17}$ is partly accepted.

Insert Tables 9 & 10 about here

**The influence of TQM on SCI**

One of the objectives of this paper is to examine whether the implementation of TQM practices has a positive connection with SCI, especially in the context of container shipping industry. This is based on the observation from the literature that the connection between TQM practices and FP may not be so evident compared with that between SCI and FP, and thus TQM may influence FP through SCI should there is a connection between TQM and SCI. To examine this, a regression analysis was conducted with SCI as the dependant variable and TQM variables as predictors. Tables 11 and 12 present a summary of this analysis. In this respect, there is a strong causal positive relationship between TQM variables and SCI (adjusted $R^2 = 0.847$) in container shipping companies. However, among the six TQM variables, only process management ($\beta = .256$) and employee involvement ($\beta = .625$) have a statistically positive influence on SCI. Hence, $H_{23}$ and $H_{24}$ are partly accepted.

Insert Tables 11 & 12 about here

**The combined influence of TQM and SCI on FP**

To have an overall view of the influence of TQM and SCI as a whole on FP, it is necessary to conduct a regression analysis in which all TQM and SCI variables are treated as predictors and FP constructs of service quality and other performance indicators are dependant variables. Table 13 summarises the results of TQM and SCI impact on service quality of container shipping companies. It is interesting to note that there is a strong positive causal relationship between TQM and SCI practices and service quality, in that more than 90% variance of the latter can be explained by those of the formers (adjusted $R^2 = 0.924$). This adjusted $R^2$ is higher than those of the influence of TQM and SCI on service quality when they are examined separately (adjusted $R^2 = 0.502$ and 0.809 respectively). Together with the
earlier finding that TQM has a positive influence on SCI, this result implies that service quality can be positively enhanced when TQM and SCI practices are implemented in synergy.

Insert Table 13 about here

Table 14 presents the summary of regression analysis on the impact of TQM and SCI variables on other performance indicators of container shipping companies. Similar to the relationship between TQM and SCI and service quality, there is also a strong positive causal link between TQM and SCI practices and other performance indicators of container shipping lines with adjusted $R^2 = 0.767$. In line with the previous observation, this adjusted $R^2$ is higher than those of the relationship between TQM and SCI on other performance indicators when they are examined in separation ($R^2 = 0.595$ and 0.728 respectively). It is evident that, with the positive influence of TQM on SCI, the implementation of these practices as a whole would render stronger positive impact on other performance indicators of container shipping lines.

Insert Table 14 about here

**CONCLUDING REMARKS**

Although there have been studies which examined the impact of TQM and SCI practices on FP, they were often conducted separately and most of these researches are non-shipping related. This paper addresses these gaps in the contemporary literature. This research has generated some interesting findings. First, it was found that TQM has a positive influence on both service quality and other performance indicators of container shipping companies, especially those practices of employee involvement, customer focus, training, and supplier quality management. This is in line with many earlier studies in the literature. The same pattern was also observed about the relationship between SCI and FP, in that practices such as internal integration and supplier integration also have positive impact on service quality and other performance indicators of container shipping lines. This study is also one of the first researches which found that TQM practices have a positive impact on SCI, and the implementation of TQM and SCI practices as a whole would produce stronger positive influence on both service quality and other performance indicators of container shipping companies. This research
therefore contributes to enrich the contemporary literature on TQM and SCI and provides a more rounded understanding on how the performance of container shipping lines can be enhanced by the combined implementation of quality management and supply chain integration practices. This in turns provides guidelines for shipping managers on how to implement these practices appropriately to boost their firm performance to the fullest extent.

Despite the interesting findings of this research and its academic and managerial implications, the generalisation from this research should be done with caution. The major limitation of this research lies with its small sample size, which prevents the deployment of Structural Equation Modelling (SEM) as a more comprehensive data analysis technique for the purpose of this research. Hence, future research should employ SEM as well as apply the research model in other shipping sectors to validate the reliability and generalisation of this research.

References


### LIST OF TABLES & FIGURES

<table>
<thead>
<tr>
<th>Construct</th>
<th>Variables</th>
<th>Items</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>TQM</td>
<td>Management leadership</td>
<td>1. Degree to which organization top management (top organization executive and major department heads) is evaluated for quality performance. 2. Degree of participation by major department heads in the quality improvement process. 3. Extent to which the organizational top management has objectives for quality performance. 4. Degree to which the organizational top management considers quality improvement as a way to increase profits.</td>
<td>Saraph et al. (1989)</td>
</tr>
<tr>
<td></td>
<td>Training</td>
<td>1. Quality-related training given to hourly employees throughout the organization 2. Quality-related training given to managers and supervisors throughout the organization 3. Quality-related training is encouraged for active improvement teamwork 4. All employees are encouraged to attend quality-related training programs</td>
<td>Vanichchinchai and Igel (2009)</td>
</tr>
<tr>
<td>Customer focus</td>
<td>1. Extent to which customer satisfaction surveys are used in determining/identifying customers’ requirements 2. Extent to which managers have access to a summary of customer complaints 3. Extent to which the organization actively seeks ways to improve the primary service in order to achieve greater satisfaction 4. Extent to which customer satisfaction surveys are used in determining/identifying customers’ requirements</td>
<td>Kaynak and Hartley (2008)</td>
<td></td>
</tr>
<tr>
<td>Supplier quality management</td>
<td>1. Extent to which long-term relationships are offered to suppliers 2. Extent to which suppliers are evaluated</td>
<td>Saraph et al. (1989), Kaynak (2003),</td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Measures</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>--------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
| Process management| 1. Extent to which services disruption prevented from occurring is a strong attitude  
2. Extent to which the processes include in-process measures of quality.  
3. Extent to which the explanation of the variation in processes is used as an analysis technique.  
4. Extent to which managers and supervisors continuously monitor and identify variation in work processes | Wang et al. (2012)             |
| Employee involvement| 1. Extent to which employees are involved in quality management programs.  
2. Effectiveness of Cross Functional Teams with respect to solutions to problems related to quality.  
3. Degree of importance given to employee suggestions and innovations.  
4. Extent to which employees are encouraged to identify loopholes in their work. | Saravanand and Rao (2006) |
| Internal integration| 1. Degree of responsiveness within the company to meet other department’s needs  
2. Degree of having an integrated system across functional areas under company control  
3. Degree of emphasis on information flows among functional departments  
4. Degree of utilization of periodic interdepartmental meetings among internal functions. | Flynn et al. (2010), Wong et al. (2011) |
| Supplier integration| 1. Degree of sharing information to major suppliers through information technologies  
2. Degree of strategic partnership with suppliers  
3. Degree of joint planning with suppliers to maintain rapid response ordering process  
4. Degree of suppliers’ involvement in work planning and development of services | Flynn et al. (2010) |
| Customer integration| 1. Degree of sharing with major customers about market updates  
2. Degree of sharing information to major customers through information technologies  
3. Degree of joint planning and design of work process with major customers  
4. Degree of customers’ involvement in work planning and service development | Flynn et al. (2010) |
| Service quality | 1. Timeliness (on-time delivery)  
2. Quick response time in case of emergency, problem or special request  
3. Speed of order handling  
4. Accuracy of shipment documentation  
| Other            | 1. Growth in profit | Flynn et al. |
2. Growth in market share  
3. Growth in sales  
4. Overall firm performance

Table 2: Summary of demographic statistics

<table>
<thead>
<tr>
<th>Types of company ownership</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Local owned firm</td>
<td>60%</td>
</tr>
<tr>
<td>Joint-venture firms</td>
<td>15%</td>
</tr>
<tr>
<td>Foreign owned firm</td>
<td>25%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Designation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior management</td>
<td>53%</td>
</tr>
<tr>
<td>Middle management</td>
<td>45%</td>
</tr>
<tr>
<td>Lower management</td>
<td>2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work experience</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 5 years</td>
<td>51%</td>
</tr>
<tr>
<td>6 – 10 years</td>
<td>9%</td>
</tr>
<tr>
<td>11 – 15 years</td>
<td>2%</td>
</tr>
<tr>
<td>16 – 20 years</td>
<td>18%</td>
</tr>
<tr>
<td>&gt; 20 years</td>
<td>20%</td>
</tr>
</tbody>
</table>

Table 3: Coefficient of Determination – TQM Influence on Service Quality

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.747 a</td>
<td>.558</td>
<td>.502</td>
<td>10.082</td>
<td>.000</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Employee, leadership, SupQ, Cusfo, Process, training

Table 4: Regression Co-efficients - TQM Influence on Service Quality

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>.886</td>
<td>.490</td>
<td>1.808</td>
<td>.077</td>
</tr>
<tr>
<td>leadership</td>
<td>.071</td>
<td>.095</td>
<td>.094</td>
<td>.746</td>
</tr>
<tr>
<td>training</td>
<td>-.052</td>
<td>.109</td>
<td>-.071</td>
<td>-.475</td>
</tr>
<tr>
<td>1</td>
<td>.294</td>
<td>.129</td>
<td>.274</td>
<td>2.284</td>
</tr>
<tr>
<td>Cusfo</td>
<td>.006</td>
<td>.098</td>
<td>.007</td>
<td>.061</td>
</tr>
<tr>
<td>Process</td>
<td>.175</td>
<td>.092</td>
<td>.267</td>
<td>1.893</td>
</tr>
<tr>
<td>Employee</td>
<td>.278</td>
<td>.090</td>
<td>.391</td>
<td>3.104</td>
</tr>
</tbody>
</table>

a. Dependent Variable: ServQ

Table 5: Coefficient of Determination – TQM Influence on Other Performance Indicators
### Table 6: Regression Co-efficients - TQM Influence on Other Performance Indicators

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Constant)</td>
<td>-.133</td>
<td>.528</td>
<td>-.252</td>
</tr>
<tr>
<td></td>
<td>leadership</td>
<td>.109</td>
<td>.102</td>
<td>.120</td>
</tr>
<tr>
<td></td>
<td>training</td>
<td>.270</td>
<td>.117</td>
<td>.310</td>
</tr>
<tr>
<td>1</td>
<td>Cusfo</td>
<td>.268</td>
<td>.139</td>
<td>.208</td>
</tr>
<tr>
<td></td>
<td>SupQ</td>
<td>.284</td>
<td>.106</td>
<td>.281</td>
</tr>
<tr>
<td></td>
<td>Process</td>
<td>.009</td>
<td>.100</td>
<td>.011</td>
</tr>
<tr>
<td></td>
<td>Employee</td>
<td>.109</td>
<td>.096</td>
<td>.129</td>
</tr>
</tbody>
</table>

a. Dependent Variable: OtherP

### Table 7: Coefficient of Determination – SCI Influence on Service Quality

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.905</td>
<td>.820</td>
<td>.809</td>
<td>77.326</td>
<td>.000</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), CusIntegration, SupIntegration, InIntegration

### Table 8: Regression Co-efficients - SCI Influence on Service Quality

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Constant)</td>
<td>.246</td>
<td>.253</td>
<td>.973</td>
</tr>
<tr>
<td></td>
<td>InIntegration</td>
<td>.429</td>
<td>.133</td>
<td>.475</td>
</tr>
<tr>
<td></td>
<td>SupIntegration</td>
<td>.444</td>
<td>.076</td>
<td>.460</td>
</tr>
<tr>
<td></td>
<td>CusIntegration</td>
<td>.063</td>
<td>.082</td>
<td>.098</td>
</tr>
</tbody>
</table>

a. Dependent Variable: ServQ

### Table 9: Coefficient of Determination – SCI Influence on Other Performance Indicators
<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.862*</td>
<td>.743</td>
<td>.728</td>
<td>49.229</td>
<td>.000</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), CusIntegration, SupIntegration, InIntegration

Table 10: Regression Co-efficients - SCI Influence on Other Performance Indicators

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>-.022</td>
<td>.361</td>
<td>-.060</td>
<td>.952</td>
</tr>
<tr>
<td>1</td>
<td>.141</td>
<td>.190</td>
<td>.130</td>
<td>.741</td>
</tr>
<tr>
<td>SupIntegration</td>
<td>.851</td>
<td>.108</td>
<td>.738</td>
<td>7.857</td>
</tr>
<tr>
<td>CusIntegration</td>
<td>.061</td>
<td>.118</td>
<td>.079</td>
<td>.516</td>
</tr>
</tbody>
</table>

a. Dependent Variable: OtherP

Table 11: Coefficient of Determination – TQM Influence on SCI

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.929*</td>
<td>.864</td>
<td>.847</td>
<td>50.805</td>
<td>.000</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Employee, leadership, SupQ, Cusfo, Process, training

Table 12: Regression Co-efficients - TQM Influence on SCI

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>.193</td>
<td>.290</td>
<td>.663</td>
<td>.510</td>
</tr>
<tr>
<td>leadership</td>
<td>.076</td>
<td>.056</td>
<td>.094</td>
<td>1.353</td>
</tr>
<tr>
<td>training</td>
<td>.004</td>
<td>.064</td>
<td>.005</td>
<td>.055</td>
</tr>
<tr>
<td>Cusfo</td>
<td>.142</td>
<td>.076</td>
<td>.124</td>
<td>1.859</td>
</tr>
<tr>
<td>SupQ</td>
<td>.071</td>
<td>.058</td>
<td>.079</td>
<td>1.231</td>
</tr>
<tr>
<td>Process</td>
<td>.179</td>
<td>.055</td>
<td>.256</td>
<td>3.267</td>
</tr>
<tr>
<td>Employee</td>
<td>.475</td>
<td>.053</td>
<td>.625</td>
<td>8.954</td>
</tr>
</tbody>
</table>

a. Dependent Variable: SCI

Table 13: Coefficient of Determination – TQM and SCI Influence on Service Quality
<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.747</td>
<td>.558</td>
<td>.502</td>
<td>10.082</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>.968</td>
<td>.937</td>
<td>.924</td>
<td>73.990</td>
<td>.000</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Employee, leadership, SupQ, Cusfo, Process, training
b. Predictors: (Constant), Employee, leadership, SupQ, Cusfo, Process, training, SupIntegration, CusIntegration, InIntegration

Table 14: Coefficient of Determination – TQM and SCI Influence on Other Performance Indicators

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.800</td>
<td>.640</td>
<td>.595</td>
<td>14.246</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>.898</td>
<td>.806</td>
<td>.767</td>
<td>20.801</td>
<td>.000</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Employee, leadership, SupQ, Cusfo, Process, training
b. Predictors: (Constant), Employee, leadership, SupQ, Cusfo, Process, training, SupIntegration, CusIntegration, InIntegration