The relationship between QMS effectiveness and supplier relationship management

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Abstract

The effect of ISO 9001 certification on improving firms' supplier relationship management (SRM) is not clear. The success or failure of reaching the promised benefits of ISO 9001 is attributed to the degree of effective implementation rather than the certification by itself. Accordingly, this research aims to investigate the relationship between ISO 9001 effective implementation and SRM. A survey based approach was adopted and six regression models were developed. The results indicated that the effective implementation of the ISO 9001 standard partially affect SRM dimensions within manufacturing context.

Keywords: Quality management, supplier relationship management, ISO 9001 effectiveness

Introduction

In today's highly competitive era, organizations all over the world tend to apply different approaches to ensure providing high quality products and services for their customers. The number of certified ISO 9001 companies continues to increase as it is chosen by the majority of companies to develop their quality management system (Casadesús and de Castro, 2005). According to (ISO 9001:2015 standard), the ISO-based Quality Management System (QMS) should be built on a set of seven pillars/principles including; customer focus, leadership, engagement of people, process approach, improvement, evidence-based decision making, and relationship management. Putting these principles into practice helps organizations to ensure creating value for their customers consistently.

In accordance, Prajogo et al. (2012a) argued that ISO 9000 implementation does not only affect the firm internal processes, but also it should affect its supplier relationship management (SRM) activities. Therefore, identifying and managing the organization's relationships with external interested parties, in specific suppliers, will drive sustained success (ISO 9001:2015 standard).

Nevertheless, Casadesús and de Castro (2005) claimed that the effect of getting ISO 9000 certificate on improving firms' external relationships is no longer so clear, and deserves further analysis. Similarly, Prajogo et al. (2012a) demonstrated that there is a lack of empirical evidence regarding the relationship between ISO 9000 implementation and SRM activities. Moreover, the majority of the studies treated the ISO 9000

implementation as a dichotomous variable (certified firms versus non-certified firms). This make it difficult to recognize the real benefits of ISO 9000 implementation (Starke et al., 2012).

In conclusion, there is a gap in knowledge with respect to assessing the effect of ISO 9000 implementation on the relationship between certified companies and their suppliers. To fill this gap, this research aims to investigate the relationship between ISO 9000 effective implementation and SRM activities. This research takes into consideration measuring the effectiveness of implementing ISO 9000 standards rather than the mere compassion between certified and non-certified companies.

ISO 9000 Standards

The ISO 9000 standards has made the most influential contribution to the field of quality management (Casadesús and de Castro, 2005; Heras-Saizarbitoria, 2011; Kafetzopoulos et al., 2015). However, the ISO 9001 certification requires high investment of organizational time, effort and resources (Kafetzopoulos et al., 2015). Thus, many researchers intend to investigate the real benefits achieved from implementing ISO 9001. Unexpectedly, previous literature showed inconsistent results regarding these benefits (Marín and Ruiz-Olalla, 2011; Sampaio et al., 2011; Prajogo et al., 2012a; Kafetzopoulos et al., 2015). Although many studies (e.g. Marín and Ruiz-Olalla, 2011; Starke et al., 2012) confirmed that ISO 9000 implementers were better performers than non-implementers, other studies (e.g. Karapetrovic et al., 2010; Dick et al., 2008) could not substantiate real evidence on the relationship between ISO 9000 implementation and business results.

This might be attributed to the tendency of previous literature to treat the ISO 9000 implementation as a dummy variable (certified companies against non-certified companies). However, it should be noted that being certified in itself is not a sufficient condition to achieve the promised benefits of the ISO 9001 implementation (To et al., 2011; Kim et al., 2011). Accordingly, different authors (Boiral and Roy, 2007; Jang and Lin, 2008; Sampaio et al., 2011; Heras-Saizarbitoria, 2011) suggest conducting further research to examine the depth of ISO 9001 implementation and investigate its real value.

ISO 9001 effectiveness

ISO 9001:2000 (2000) defined the effectiveness of ISO 9001 implementation as the degree to which the standard expected objectives are achieved. Many authors (e.g. Psomas et al., 2012; Psomas et al., 2013; Kafetzopoulos et al., 2015; Sumaedi and Yarmen, 2015) also support this definition.

Through reviewing literature, implementing ISO 9001 has three main objectives; customer satisfaction (CS), prevention of nonconformities (PNC), and continuous improvement (CI) (Psomas et al., 2013; Psomas et al., 2012; Kafetzopoulos et al., 2015).

Customer satisfaction is the ultimate goal of implementing ISO 9001-based QMS. This goal can be achieved through identifying customers' needs and expectations and then, using the organization's processes to achieve these needs (Psomas et al., 2013). Thus, organizations are required to measure and monitor customer satisfaction to evaluate their QMS effectiveness (Psomas et al., 2012).

Nonconformities are the deviations from the desired pre-established characteristics of products and/or processes (Kafetzopoulos et al., 2015). Thus, implementing ISO 9001-based QMS seeks to prevent nonconformities with the aim to enhance customer satisfaction (Psomas et al., 2012).

ISO 9001 standard clauses embrace a set of requirements that supports the principle of continuous improvement. These requirements include establishing a quality policy and objectives, audits, monitoring and measurements, corrective and preventive actions and management reviews. Besides, results of measuring customer satisfaction should provide a basis for identifying continuous improvement opportunities (Psomas et al., 2012).

Recently, some researchers (e.g. Psomas et al., 2012; Psomas et al., 2013; Kafetzopoulos et al., 2015) have tried to propose measurement instruments for ISO 9001 implementation effectiveness within different contexts. For the purpose of this study, the scale developed by (Kafetzopoulos et al., 2015) is used for measuring ISO 9001 effectiveness. This scale has three main features. First, indicators used for measuring each of the three ISO objectives have been drawn from reviewing recent studies. Thus, it could be argued that these indicators capture all the distinctive elements that should be considered in evaluating the main objectives of ISO 9001 QMS. Second, this scale was tested for uni-dimensionality, reliability and construct validity and, in addition, the structural relationships between the ISO 9001 objectives and its effectiveness were confirmed by a second-order CFA (Kafetzopoulos et al., 2015). Third, this scale was developed within manufacturing context which is similar to that of the current study.

Supplier Relationship Management

Managing the relationships with key suppliers helps organizations to ensure a reliable supply of input materials that meet quality requirements in order to produce quality products (Chen and Paulraj, 2004; Li et al., 2005; Truong, et al., 2017). In addition, these relationships support organizations in improving their performance through achieving cost efficiency and developing innovative new products (Lambert and Schwieterman, 2012).

Several previous studies examined and concluded that the main dimensions of SRM are; strategic long-term relationship, supplier integration, communication/information sharing, supplier selection and assessment, supply base reduction, and supplier development (Prajogo et al., 2012b; Prajogo et al., 2012a; Chen and Paulraj, 2004; Theodorakioglou et al., 2006; Truong, et al., 2017; Lo and Yeung, 2006; Park et al., 2010).

Building strategic long-term relationship with key suppliers is the primary SRM activity in order to continually improve the strategic and operational capabilities of all partners to achieve mutual benefits (Li et al., 2005). Another core activity of SRM is supplier integration which refers to the participation of both parties in conducting development activities jointly. These activities aim to improve products quality, increase processes efficiency and develop new products competitively (Lo and Yeung, 2006; Park et al., 2010). Joint activities include involvement of key suppliers in design and development process (Chen and Paulraj, 2004), joint quality and production planning (Theodorakioglou et al., 2006), sharing ideas and information for improvement, solving problems jointly with suppliers (Li et al., 2005), and developing joint continuous improvement programs (Hosseini et al., 2012; Prajogo et al., 2012a).

Chen and Paulraj (2004) demonstrated the importance of creating two-way communication channels with suppliers among different functions rather than the traditional purchasing-sales interface. These communication channels help partners to share critical information in a timely manner to jointly solve problems and enhance their quality performance.

Supplier selection and assessment is another critical area for sustaining long-term partnership with suppliers. Lo and Yeung (2006) declared that organizations should consider quality as the basic selection criteria for their suppliers. In addition, systematic assessment of supplier performance helps organizations to ensure the ability of their suppliers to continuously meet their current and future needs (Prajogo et al., 2012b).

Another important phase in SRM is supplier development which refers to a set of activities taken by the organizations to assist their suppliers for continually improve their processes and products (Lo and Yeung, 2006). Such activities may include providing technical support and training and encouraging achievement.

Effective SRM also depends on selecting a few suppliers to develop long-term relationship with them. Reducing the number of key suppliers guarantees having the stable supply and control variations in supply side aspects such as; quality, price, logistical costs and delivery time (Truong, et al., 2017). In addition, supply base reduction helps to improve trust and performance (Chen and Paulraj, 2004).

For measuring these dimensions, a total of 37 items were drawn from the previous studies of (Chen and Paulraj, 2004; Li et al., 2005; Hosseini et al., 2012; Prajogo et al., 2012a and Prajogo et al., 2012b) that considered capturing the salient activities of SRM.

Research Framework and Hypotheses Development

The implementation of the ISO 9001 improves organizational performance (Starke et al., 2012). Besides, the ISO 9000 standards emphasize that organizations should build mutually beneficial relationships with suppliers (Singh et al., 2006; Singh, 2008). Thus, the ISO 9000 implementation contribute to the betterment of supplier relationships (Prajogo et al., 2012a).

Nevertheless, the mere implementation of ISO 9000 is not sufficient to reach the promised benefits. Rather, these benefits require effective implementation of the ISO 9000 standard. Accordingly, it is expected that the effective implementation of ISO will lead to better supplier relationship management. Thus, the following research hypothesis is proposed:

RH. ISO 9001 effectiveness has a positive influence on supplier relationship management activities.

Research Methodology

This research begins with investigating the relevant literature around two main topics; ISO 9001 effectiveness and SRM activities. It explores the criteria that may be used to assess the degree of the effective implementation of ISO 9001-based QMS. In addition, the salient activities of SRM were identified.

Following this, a questionnaire was designed to measure the research variables and a survey based approach was adopted to collect data from a sample of ISO 9001-certified manufacturing companies in Egypt.

Research instrument

The survey questionnaire contains 52 questions. The independent variable (ISO 9001 effectiveness) is measured by using 15 questions adopted from the scale developed by (Kafetzopoulos et al., 2015) to cover the three main objectives of ISO 9001. A five-point Likert scale (1 = very low to 5 = very high) is used to measure the respondents' perceptions regarding the degree of achieving each item.

The dependent variable (SRM activities) was measured by using 37 questions adopted from the previous studies of (Chen and Paulraj, 2004; Li et al., 2005; Hosseini et al., 2012; Prajogo et al., 2012a and Prajogo et al., 2012b) to cover the main

dimensions of the SRM mentioned in literature. Another five-point Likert scale (1 = totally disagree to 5 = totally agree) is used to measure the degree of implementing each item.

After designing the questionnaire, it was reviewed through interviews with 5 ISO-9001 QMS consultants and academics to judge its face and content validity.

Sample and Data Collection

The questionnaire was sent by e-mail to 420 ISO 9001-certified Egyptian manufacturing organizations that were recorded in the database of one of the largest management systems consultancy and training institutes in Egypt. A reminder e-mail was sent to non-respondents after two weeks. Finally, a total of 137 valid questionnaires were received representing 32.5 percent response rate.

Data analysis

At first, exploratory factor analysis (EFA) was conducted to uncover the underlying structure of the SRM dimensions. Then, Cronbach's Alpha coefficients were calculated to assess reliability for both the SRM dimensions and ISO 9001 effectiveness. Finally, the impact of ISO 9001 effectiveness on SRM dimensions is determined through multiple linear regression analyses. The statistical package SPSS 21 is used for data processing.

Results

Exploratory Factor Analysis and reliability

The sample size for this study (137) lies within the acceptable range (100 – 500) for EFA and exceeds the minimum ratio of sample size to the number of items (3:1). In addition, results of the Kaiser-Meyer-Olkin (KMO) measure of sampling efficiency (0.825) and Bartlett's Test of Sphericity ($\chi 2$ = 3683.827, p-value = 0.000) reveal the adequacy of the data for conducting EFA.

EFA is carried out through using the principal component extraction analysis followed by varimax rotation method. Five items out of the 37 items are excluded due to their high cross-loadings (> 0.40) on more than one factor (Hair et al., 2010). The remaining 32 items are grouped under six factors (dimensions) which explain 71.048% of the total variance. Cronbach's Alpha coefficients for all dimensions are higher than 0.7 which confirm that all the dimensions are measured with reasonably reliable items. Table I demonstrates results of EFA and reliability tests for SRM dimensions.

Table I: EFA and Reliability results of SRM dimensions

Items Description		Factor Loadings for SRM Dimensions					
#	Items	SRMD 1	SRMD 2	SRMD 3	SRMD 4	SRMD 5	SRMD 6
33	We help suppliers to improve their process to better meet our needs	0.794					
37	We maintain close relationship with a limited pool of suppliers.	0.768					
35	We have continuous improvement programs that include our key suppliers	0.765					
32	We regularly solve problems jointly with our suppliers	0.691					

Items Description		Factor Loadings for SRM Dimensions					
#	Items	SRMD 1	SRMD 2	SRMD 3	SRMD 4	SRMD 5	SRMD 6
31	We use supplier involved teams based on our strategic objectives.	0.666					
34	We have helped our suppliers to improve their product quality	0.659					
36	We rely on a small number of high quality suppliers.	0.659					
30	We share ideas and information with our supplier through cross-functional teams.	0.627					
24	We develop long term partnership with suppliers for mutual benefits		0.818				
25	We allow key suppliers to involve in continuous improvement programs		0.741				
2	We Develop joint improvement programs for reducing costs		0.680				
23	Our suppliers see our relationships as a long-term alliance		0.675				
22	There is a strong consensus in our firm that supplier involvement is needed in product design/development		0.585				
1	We expect our relationships with key suppliers to last a long time		0.552				
7	We share sensitive information (financial, production, design, research, and/or competition)		0.487				
6	We enhance confidence on supplier and reducing incoming inspection		0.466				
26	We include our key suppliers in our planning and goal-setting activities			0.780			
28	We coordinate joint planning committees with our suppliers.			0.774			
29	We promote task force teams with our suppliers			0.722			
20	We have key supplier membership / participation in our project teams			0.635			
21	Our key suppliers have major influence on the design of new products			0.602			
19	We involve key suppliers in the product design and development stage			0.581			
13	We have a formal supplier assessment system to determine their capabilities				0.835		
14	We set a clear metric for measuring performance of our suppliers				0.784		
5	We collaborate with key suppliers to improve their quality in the long run				0.744		
4	We view our suppliers as an extension of our company				0.691		
11	We have frequent face-to-face planning/communication					0.838	

Items Description		Factor Loadings for SRM Dimensions					
#	Items	SRMD 1	SRMD 2	SRMD 3	SRMD 4	SRMD 5	SRMD 6
9	We exchange information frequently, informally and/or in a timely manner					0.744	
10	We keep each other informed about events or changes that may affect the other party					0.740	
12	We continuously improve information sharing with suppliers					0.695	
17	We improve supplier selection criteria						0.855
16	We compare our supplier performance with other similar companies						0.656
	Initial Eigenvalues	12.830	2.938	2.183	1.992	1.660	1.132
	% Variance Explained	14.990	14.211	12.336	11.900	11.779	5.832
	Cumulative % of Variance Explained	14.990	29.201	41.537	53.437	65.216	71.048
	Reliability Test (Cronbach's Alpha)	0.906	0.892	0.903	0.890	0.874	0.750

According to items loadings, the extracted six dimensions can be labelled as follows: supplier development (SRMD1), supplier long-term partnership (SRMD2), supplier integration (SRMD3), supplier evaluation (SRMD4), supplier communication (SRMD5), and supplier selection (SRMD6).

Cronbach's Alpha coefficients for all the three objectives of ISO 9001 effectiveness are 0.801, 0.850, and 0.860 for customer satisfaction, prevention of nonconformities, and continuous improvement respectively. These results confirm that all these objectives are measured with reasonably reliable items.

Based on the EFA results, the main research hypothesis is divided into six sub-hypotheses as follow:

RH1. ISO 9001 effectiveness has a positive influence on supplier development activities.

RH2. ISO 9001 effectiveness has a positive influence on supplier long-term partnership activities.

RH3. ISO 9001 effectiveness has a positive influence on supplier integration activities.

RH4. ISO 9001 effectiveness has a positive influence on supplier evaluation activities.

RH5. ISO 9001 effectiveness has a positive influence on supplier communication activities.

RH6. ISO 9001 effectiveness has a positive influence on supplier selection activities.

5.2. Regression Analysis

To test research hypotheses, six multiple regression models were constructed using the stepwise method. The three ISO objectives (customer satisfaction (CS), prevention of nonconformities (PNC), and continuous improvement (CI)) are the independent variables for all models. Each one of the SRM dimensions is used as the dependent variable for each of the six regression models as shown in table II.

The results of model (1) indicate that the supplier development dimension of SRM is positively affected by achieving both (CS) and (CI) objectives (p-value < 0.001) while the (PNC) objective is not related to this dimension. These results partially support hypothesis (RH1).

Table II: Regression Analysis results

Independent Variable (ISO Effectiveness)	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
	Dependent Variables (SRM Dimensions)					
	SRMD1	SRMD2	SRMD3	SRMD4	SRMD5	SRMD6
Constant	0.816** (2.700)	0.243 (0.822)	0.331* (2.489)	0.519 (1.357)	0.618* (2.446)	-0.366* (-2.098)
CS	0.599*** (9.597)	0.644*** (11.651)	0.995*** (35.091)	0.601*** (8.408)	0.788*** (11.950)	0.083* (2.557)
PNC		0.229*** (3.691)	-0.083* (-2.519)	0.204* (2.546)		0.987*** (27.001)
CI	0.241*** (5.321)	0.080* (2.122)		0.108* (2.206)		0.053* (2.384)
R^2	0.430	0.606	0.909	0.439	0.514	0.870
F	50.46***	68.07***	667.73***	34.69***	142.79***	295.59***

** p < 0.05, ** p < 0.01, *** p < 0.001*
t-value between parentheses

The research hypothesis (RH2) is totally supported as shown in model (2) results. These results indicate that achieving all the three ISO objectives (CS, PNC, and CI) has significant positive influence on supplier long-term partnership dimension of SRM (p-value < 0.001). Similarly, results of models (4) and (6) indicated the significant positive effect of all ISO objectives on supplier evaluation and supplier selection dimensions, respectively. Accordingly, hypotheses (RH4) and (RH6) are also totally supported.

Model (3) results showed that the supplier integration dimension of SRM is positively affected by (CS) objective (b=0.995, p-value < 0.001) while it is negatively affected by (PNC) objective (b=-0.083, p-value < 0.05). Thus, hypothesis (RH3) is partially supported.

Finally, model (5) results revealed that the supplier communication dimension of SRM is positively affected by (CS) objective only while the other two objectives (PNC and CI) are not related to this dimension. These results supported hypothesis (RH5) partially.

In conclusion, the research results indicate that not all ISO 9001 objectives have significant positive influence on all SRM dimensions within the manufacturing context. Accordingly, it could be concluded that the main research hypothesis is partially accepted.

Discussion and Conclusions

Although several researchers studied the effect of ISO 9001 certification on different dimensions of firms' performance, the relationship between ISO 9001 certification and SRM is not sufficiently investigated (Prajogo et al., 2012a). There seems to be a tendency in previous literature to assess the ISO 9000 implementation as a dichotomous variable by comparing non-certified firms versus certified firms (Starke et al., 2012). However, few studies highlighted the importance of measuring the ISO 9001 effectiveness and that the real benefits of the ISO 9000 are only achieved through the effective implementation of the standard (Kafetzopoulos et al, 2015). Therefore, this research attempts to understand how the effective implementation of the ISO 9001

standard could affect the external relations between the certified organizations and their suppliers.

The paper findings contribute to the existing literature through highlighting the importance of evaluating ISO 9001 effectiveness. Measuring ISO 9001 effectiveness by its objectives highlights the fact that achieving these objectives is the actual value of building QMS based on ISO 9001 standard instead of just being ISO certified. Besides, the research results revealed some interesting findings that will guide future research as well as provide practitioners with useful guide to better manage their business.

From a theoretical stance, the proposed relationship between ISO 9001 effectiveness and SRM activities opens new lens to better understand the effect of achieving ISO 9001 objectives on the organizations' external relations rather than the mere focus on the internal processes only. Besides, this research provided deep examination to the relationship between ISO 9001 effectiveness and SRM activities through the disentanglement of the ISO 9001 and SRM activities into their main constituents.

From a managerial point of view, this study provides useful insights for firms to magnify their benefits of getting ISO 9001 certificate. Practitioners should be aware that the real benefits of ISO 9001 implementation emanate from the effective implementation of the standard rather than the certification itself. Besides, they should be aware that the benefits of the ISO 9001 implementation should be extended to include external activities as well as internal activities. The research results provide practitioners with clear understanding regarding how to benefit from their QMS to improve their external relations, specifically with suppliers.

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