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An Empirical Investigation of the Impact of ISO 9001 Certification: A Comparative Study

C.P. Kartha[1]

[1] *Distinguished Prof. Emeritus, Quantitative Methods, School of Management, University of Michigan-Flint, USA*

Abstract

ISO 9001 Quality Standard is a series of internationally accepted guidelines as to how companies should set up their quality management systems. Certification to this quality standard is accepted worldwide and helps companies to operate successfully in a global economy. There has been considerable debate in the literature as to whether or not the certification has a positive impact on the organizational effectiveness. The objective of this study is to empirically estimate the impact of certification on the performance of factors that measure organizational effectiveness such as profitability, productivity and customer satisfaction. Survey data was used for this study. Samples of 500 companies each from US, and the BRIC nations Brazil, Russia, India and China were selected for this study. Hypotheses on the impact of certification on individual factors were tested and the results presented in the paper.

Keywords: ISO 9001, Quality Management Systems, International Standards

Introduction

ISO 9001 is an international standard on quality management and quality assurance developed and published by the International Organization for Standardization (ISO). The standard provides guidelines as to how organizations should set up their quality assurance systems. Organizations use the standard to demonstrate the ability to consistently provide products and services that meet customer requirements. The standard has earned a global reputation as a basis for establishing effective and efficient quality management systems. Organizations with ISO 9001 certifications have been formally recognized to follow a set of internationally accepted quality guidelines that determines the requirements of their Quality Management Systems. Certification to this quality standard is accepted worldwide and helps organizations to operate successfully in a global economy by selling or buying products and services from sources outside their domestic markets.

ISO 9001 certification can open up new markets since several industries have been making certification as a requirement to do business with them in recent years. The process of obtaining ISO certification can be long and expensive and depends on the quality improvement efforts that exist in an organization. It requires a significant investment of both human as well as financial resources of the organization. A majority of organizations make this decision because many customers require certification as a pre-condition to do business with them. After a significant initial investment of several thousand dollars for getting the certification, the organization still has to spend substantial amounts annually to maintain its certification status There have been questions raised as to the worthiness of making such investments by organizations for obtaining certification in relation to the financial and other related organizational outcomes such as profitability, quality and customer satisfaction. Even though the nature and the scope of ISO 9001 are well researched and understood, there has been considerable debate in the literature as to whether or not ISO certification has a positive impact on the organizational effectiveness. These studies typically compare financial outcomes before and after implementation of the ISO standard. However, there is a lack of sufficient research in the area of direct comparisons of companies with and without certification to study the impact of certification and the current study attempts to fill that gap.

The objective of the study is to empirically estimate the impact of certification on the performance of factors that measure organizational effectiveness such as customer satisfaction, profitability and productivity. The study consists of a survey of companies from the US and the BRIC nations Brazil, Russia, India and China. Samples of 500 companies each representing multiple sectors of business were selected. A questionnaire was developed that consists of questions related to various aspects of quality management as well as quality outcomes and is used to evaluate the differences between certified and noncertified firms within each country. This study uses ISO 9001:2008 version of the standard.

Literature Review

A majority of the literature on ISO 9001 discuss the general aspects of the standard. The research done in this area fall generally under three categories. The first category deals with the specific requirements mandated by the standard and what organizations need to do for compliance (Clements, 1993; Carter & Pasqual one, 1995; Hoyle, 1998; Haiyan & Alma, 2005). The intent as well as the details of specific requirements are discussed in these papers. The second category involves implementation issues. They provide specific steps for implementation including how to develop individual procedures to satisfy specific requirements mandated by the standard. A few of these papers also discuss the implementation of ISO 9001 as a vehicle for implementing Total Quality Management. Studies also show that the commercial aspects constitute a determining factor in the decision to implement the standard (Vloeberghs& Bellens, 1996); Quazi & Padibjo ,1998; Brown, Van der Wiele & Loughton, 1998; Douglas, Coleman & Oddy, 2003; Costa, Martinez-Lorente & Choic, 2008).

The third category focuses on the financial rewards of certification to ISO 9001 standard. With a few exceptions, generally the literature supports increased financial rewards for organizations with certification as a result of implementing quality procedures required by the standard. Though the majority of papers in this category focus on the financial impact of ISO certification there are also studies that seek evidence that firms can achieve internal benefits such as quality, productivity, and market share improvements (Quazi, Hong & Meng, 2002;Corbett,Montes-Sancho & Kirsh,2005; Terlaak & King; 2006; Koc, 2007; Sampaio, Saraiva & Rodrigues, 2010). An empirical study (Kartha, 2016) compared the impact of certification on a number of productivity measures between the US and India based on survey data. The study is extended here to a comparison between the US and the BRIC nations in this paper. Other studies explored relationships between TQM factors and several key business factors as well as their impact on firm performance (Calvo-Mora etal. 2013, 2014; Dubey & Gunasekaran (2015); Bayo-Moeores etal. 2011). In general, results among studies in the third category showed mixed results on significant improvements achieved due to certification. Majority of these studies focus on certification to ISO 14000 which is primarily concerned with environmental systems management. The current investigation specifically addresses the impact of ISO9001 certification on organizational effectiveness

Methodology

Survey data was used for this study. A questionnaire that consisted of questions related to various aspects of quality management and quality outcomes was developed. Samples of 500 companies each from US and the BRIC nations Brazil, Russia, India and China were selected for the study. The companies were selected from publicly available data resources categorized by sectors. The surveys were sent by email with a link to the appropriate questionnaire depending on whether a company is certified or not. They were sent to the individual in charge of quality management programs in each organization. The questionnaire was designed to measure the differences between ISO certified and non-certified companies in specific areas related to various quality outcomes. The surveys were sent by email with a link to the appropriate questionnaire depending on the certification status of the company. The responses were entered automatically onto an SPSS file for analysis.

The questionnaire contains two sets of questions. Depending on the ISO certification status the respondent is directed to the appropriate set of questions. The first part of the questionnaire deals with the demographics. These questions refer to whether the company is in manufacturing or service, the age, the number of employees, annual sales, its multinational status as well as information regarding the major foreign markets the company is doing business with. For certified companies specific questions related to the various implementation issues. These questions seek details regarding the number of years since receiving ISO certification was achieved as well as information on quality results. Specific information is sought on the quality improvements achieved as a result of satisfying requirements by the ISO standard related to a number of quality outcomes. They include areas such as improvement in scrap/rework, customer satisfaction as well as overall profitability. For companies without certification the second part of the questionnaire deals with information on .the current status of quality. The questions refer to areas of customer satisfaction, management of customer complaints and recent market performance. The questions on quality results are identical to that of the companies with certification. Measurable improvements achieved as a result of their quality management policies are rated in this section. Also all variables are measured by a five-point Liker scale with higher numbers representing better quality improvements. The responses were automatically entered into an SPSS file for analysis.

Research Hypotheses

The primary intent of the study is to assess the impact of certification on a number of quality-related factors such as customer satisfaction, profitability and productivity. Since the specific quality system requirements mandated by the standard are aimed at preventing non-conformities at all stages from design to servicing, certified companies do have an advantage by having an effective quality management system already in place. They have procedures for

monitoring all major functions that affect quality. As an example, let us consider the "Purchasing" element from the standard. The standard specifies how an organization should control the purchasing function. The requirements dictate that the organization must establish and maintain documented procedures to ensure that the products purchased from suppliers must meet specified purchase requirements. The standard specifies that the organization shall evaluate and select suppliers on their ability to supply product in accordance with the organization's requirements. It requires that the criteria for selection, evaluation and re-evaluation of suppliers must be established and records of evaluations and any necessary actions resulted from evaluation must be maintained. Procedures should provide, for example, that all purchasing documents should include data which completely describe the product such as name, type, class, grade, specifications, drawings and other relevant data. The standard dictates that purchasing documents are required to be reviewed to make sure that they are acceptable and meet customer's specified requirements.

The Standard addresses in a similar way a set of important characteristics of good management practices in critical areas of operation including contract review, product identification and traceability, performing corrective and preventive actions as well as identifying training needs. The standard provides requirements to establish a more effective management system through a process approach and continuous improvement.

An organization that is certified to the standard is expected to have in place a structured and effective quality management system that is being improved continuously through routine internal audits and procedures for corrective and preventive actions and under a management leadership that is committed to customer satisfaction. Such an organization is more likely to produce better quality products which in turn increases customer satisfaction, increased sales and hence profitability.

Increased customer satisfaction also enhances improved market share. In addition, a certified organization is more likely to recognize the importance of meeting customer requirements and work towards understanding the customer needs to better customer satisfaction. Since in many ways certification to standard is a first step towards implementing TQM based policies, it is reasonable to expect more familiarity of TQM principles for certified organization compared to one that did not work towards achieving certification. Lastly, since certification is a requirement to do business with an increasing number of countries there is more pressure on manufacturing than service organizations to seek certified status in a global market. Accordingly the following hypotheses were developed:

Hypothesis 1 Organizations with certification are likely to achieve higher customer Satisfaction and improved productivity measures
Hypothesis 2 Certification has a positive impact on profitability
Hypothesis 3 Certification has a positive impact on market share.

These hypotheses were tested using survey data with appropriate statistical tools. The results are summarized in the following section.

Survey Results

Surveys were conducted based on random samples of 500 companies each from the US as well as from India. For the US survey, a total of 84 usable responses were obtained and 50 of these companies were ISO certified and the rest 34 were noncertified. For the BRIC nations, the certified and noncertified usable responses were 34 and 52 for Brazil; 44 and 61 for Russia; 56 and 30 for India; and 90 and 54 for China respectively. Analysis was carried out using both descriptive and inferential statistical methods. Table 1 below summarizes the demographic characteristics of the respondents.

Table 1: Summary of Selected Respondent Characteristics (%)

		USA (Certified n=50) (Noncertified n=34)	BRAZIL (Certified n=34) (Noncertified n=52)	RUSSIA (Certified n=44) (Noncertified n=61)	INDIA (Certified n=56) (Noncertified n=30)	CHINA (Certified n=90) (Noncertified n=54)
Manufacturing	Certified	46.0	41.2	38.5	60.7	65.6
	Noncertified	14.7	11.5	19.8	53.3	27.8
> 10yers of age	Certified	90.0	94.1	67.8	82.0	41.1
	Noncertified	91.2	57.7	45.5	76.7	11.1
Certified for > 5years	Certified	84.0	67.6	37.9	53.6	53.4
	Noncertified	na	na	na	na	na
< 500 employees	Certified	22.4	79.4	83.9	80.4	84.3
	Noncertified	20.6	94.2	91.4	90.0	94.4
Multinational	Certified	73.5	20.6	28.9	17.9	12.2
	Noncertified	66.0	5.8	26.7	6.7	13.0
% annual sales from foreign markets	Certified	75.5	85.3	62.5	72.0	63.3
	Noncertified	63.5	7.6	12.8	60.0	22.2

The profiles of certified and noncertified companies vary in certain characteristics while showing similarity in others. In general the majority of the companies from all countries in the sample were in manufacturing. In contrast, the number of manufacturing companies in the samples was relatively low from those without certification. A high percentage of firms in the samples were at least ten years old, had maintained their certification status for at least five years, and had their major portion of their sales from foreign markets. There was a significant difference with regard to the size of the firms. Except for the US, a vast majority of companies in the samples were smaller and employed less than 500 employees. Also there were a substantially higher proportion of multinational firms in the sample from the US compared to all other countries. Responses for the question regarding possible increase in the market share were also substantially different.

As an example, a typical company in the sample from US with certification was a multinational company in manufacturing, with at least 10 years of age, with over 1000 employees, with annual sales over 50 million dollars and was certified for at least five years. In contrast, the typical firm with certification from India was also in manufacturing and with at least ten years of age but was not a multinational firm and was smaller with less than 500 employees and with less than 20 million in annual revenues. In terms of their contributions from foreign markets in annual sales the firms were comparable. For the noncertified groups, the typical US firm in the sample was a matured large multinational firm in the service sector compared to the typical from India was a matured non-multinational manufacturing firm with less than 500 employees with almost half in annual sales compared to the US firms. Similar comparisons exist typically between US and other countries in the study,

For respondents without certification there were a few questions on the organization's quality status. These questions related to respondents clearly identifying both the internal and external customers, understanding the consequences of unmet customer expectations as well as seeking input from customers for improvement. A majority from both countries except Russia responded that they identified their internal and external customers and that they understood what the management expectations were in terms of quality. More than 70% of the respondents from these countries also felt that their management clearly understood the consequences of unmet customer expectations. For the question regarding the frequency by which the company would ask the customers to identify areas for improvement, the responses from the US firms were more than double compared to the firms from the other countries. About 55% of the US companies reported that their initial response time for customer complaints were less than 24 hours compared to less than 30% for the firms from the other countries. The companies that reported substantial (more than 40%) improvement in specific quality areas by both ISO certified and non-certified groups for the two countries are summarized in Table 2. In general the firms from the BRIC nations reported substantial improvements in all areas with higher percentages compared to that of the US firms. To a smaller extent, a similar trend was seen when Indian firms were compared with firms from China. The data also showed that a majority of the companies in the study adopted TQM based policies regardless of their certification status.

Analysis using cross tabulation between each of the demographic variables and the performance variables discussed above provided more insights into whether or not certification had an effect on the organization's overall performance. In general, there was no noticeable trend between manufacturing and service organizations when percentages of companies that reported substantial improvements in performance characteristics were compared. .

Analysis of variance tests on individual performance characteristics showed that within groups variation was consistently large which is indicative of the fact there is considerable variability in the data. In addition, tests of independence using Chi-square tests were also conducted for each performance characteristic.

Table 2: Summary of Respondents Reporting significant Improvements (%)

		USA (Certified n=50) (Noncertified n=34)	BRAZIL (Certified n=34) (Noncertified n=52)	RUSSIA (Certified n=44) (Noncertified n=61)	INDIA (Certified n=56) (Noncertified n=30)	CHINA (Certified n=90) (Noncertified n=54)
Scrap / Rework	Certified	54.0	64.7	59.8	63.3	65.6
	Noncertified	36.3	51.5	38.4	49.0	27.8
Customer Complaints	Certified	48.0	70.6	62.0	69.6	41.1
	Noncertified	53.0	75.0	54.2	50.0	11.1
On time Delivery	Certified	58.0	82.4	51.0	82.1	53.4
	Noncertified	54.0	73.1	46.6	86.7	na
Customer Satisfaction	Certified	70.0	85.3	73.6	86.3	84.3
	Noncertified	57.0	62.7	54.7	79.0	94.4
Employee Satisfaction	Certified	60.0	73.9	51.8	83.9	12.2
	Noncertified	56.0	71.8	46.2	86.7	13.0
Overall Profitability	Certified	64.0	76.9	64.5	82.1	63.3
	Noncertified	51.0	39.6	41.0	68.0	22.2

Tests of Hypotheses

Standard statistical tests were used to test each hypothesis. For hypothesis 1 independent t-tests were used to compare the average responses of companies with and without the certification for evaluating the improvements achieved in various performance categories. In each case the null hypothesis was that there is no difference in the average ratings in improvements between the certified and the noncertified companies.

Table 3 below summarizes the averages and the standard deviations for responses for respondents from each country. The areas tested were scrap, customer complaints, on-time delivery, customer satisfaction, employee satisfaction and overall profitability. The questions in these specific areas were scored in such a way that the larger values were consistent with higher percentages of improvements achieved.

Table 3: Summary Statistics for Performance Characteristics

		USA (Certified n=50) (Noncertified n=34)		BRAZIL (Certified n=34) (Noncertified n=52)		RUSSIA (Certified n=44) (Noncertified n=61)		INDIA (Certified n=56) (Noncertified n=30)		CHINA (Certified n=90) (Noncertified n=54)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Scrap/Rework	Certified	2.66	1.45	3.23	1.36	1.92	1.32	2.82	1.38	2.41	1.41
	Noncertified	2.03	1.03	2.71	1.13	1.67	1.19	2.07	1.43	1.93	1.41
Customer Complaints	Certified	2.68	1.35	3.32	1.27	2.22	1.47	3.25	1.41	1.89	1.41
	Noncertified	2.66	1.25	3.37	1.31	1.80	1.22	2.72	0.82	1.87	1.29
On time Delivery	Certified	2.66	1.39	3.47	1.02	2.45	1.46	3.57	1.14	3.52	1.61
	Noncertified	2.94	1.46	3.18	1.32	2.61	1.35	3.70	1.18	3.30	1.49
Customer Satisfaction	Certified	3.22	1.45	3.85	1.18	3.45	1.01	4.03	1.08	3.66	1.42
	Noncertified	2.71	1.23	3.06	1.26	2.99	1.50	3.82	1.10	3.24	1.52
Employee Satisfaction	Certified	2.74	1.22	3.12	1.23	2.53	1.33	3.48	0.99	3.21	1.36
	Noncertified	2.60	1.31	3.35	1.25	2.46	1.02	3.43	0.97	3.11	1.13
Overall Profit	Certified	2.56	1.10	3.59	1.08	2.49	1.35	3.38	0.85	3.46	1.35
	Noncertified	2.01	1.33	3.02	1.25	2.11	1.22	2.94	1.17	3.02	1.12

The results of the t-tests are summarized in Tables 4. The t values for independent t-tests comparing the mean values corresponding to the certified and the noncertified groups for each characteristic and the corresponding probability values are presented in this table. From Table 4, at a 5% level of significance, we see that, for US and Brazil, the performance characteristics Scrap/Rework, Customer Satisfaction and Profitability are statistically significant. For Russia, the significant factors are Scrap/Rework and Customer Satisfaction. For India, we see that, the performance characteristics Scrap/Rework, Customer Complaints and Profitability are statistically significant. For China, Scrap/Rework and Profitability are the only significant performance characteristics. Based on these results, Scrap/Rework was the only performance characteristic that was significant for all the five countries. The next significant performance characteristic that was common to all except for Russia was Profitability. This shows that certification had a positive influence with regard to the significant characteristics in respective countries but in general no statistical evidence was observed to establish significant differences between certified and the noncertified firms for performance characteristics Customer Complaints, Customer satisfaction, On time Delivery and Employee Satisfaction in any countries.

Table 4: Tests of Hypothesis Results

	t/pv	USA	BRAZIL	RUSSIA	INDIA	CHINA
Scrap/Rework	t	2.1875	2.3152	1.9867	2.3734	1.9750
	pv	0.0316	0.0230	,0496	0.0200	0.0251
Customer Complaints	t	0.0570	1.1210	1.6703	2.2129	0.0790
	pv	0.9550	0.2654	0.0978	0.0296	0.9370
On time Delivery	t	-0.8910	1.8121	1.4644	-0.4942	0.8400
	pv	0.3750	0.0734	0.1462	0.6240	0.4030
Customer Satisfaction	t	2.0988	2.0340	2.1030	0.8617	1.657
	pv	0.0390	0.0452	0.0380	0.3910	0.1000
Employee Satisfaction	t	0.4860	1.0120	1.1210	0.2197	0.4540
	pv	0.6280	0.3144	0.2648	0.8266	0.6500
Profitability	t	1.9942	1.9981	1.9010	2.1020	1.9910
	pv	0.0494	0.0491	0.0604	0.0386	0.0482

Hypothesis 1 states that the organizations with certification are likely to achieve higher Customer Satisfaction and improved productivity measures. The results support this hypothesis only partially. For the US, Brazil and Russia, the difference in Customer Satisfaction levels of certified and noncertified firms showed significance at a 5% level while the same is not true for the Indian or the Chinese firms. For Indian companies the Customer Complaints showed statistically significant at 5% level but that was not the case for the rest of the countries. For all the countries, the performance characteristic Scrap/Rework was found to be statistically significant. Overall, the data supports Hypothesis 1 only partially.

Hypothesis 2 states that the certification has a positive impact on profitability. Based on the results, this hypothesis is supported at a 5% level of significance in all countries except Russia attesting to the fact that the certification did have a positive impact on profitability but once again it is supported partially.

For testing the hypothesis 3 which states that the certification enhances increase in market share, proportions of firms that reported an increase in market share were compared for certified and noncertified firms for each country. A z-test was performed to test the equality of proportions Results are summarized in Table 5. The proportions of firms surveyed who reported a significant increase are presented along with the z-values and the corresponding probability values for each country.

Country	Certified	Noncertified	z	p.v. (2-sided)
USA	0.6180	0.5801	0.3499	0.7264
Brazil	0.4250	0.4750	1.5239	0.1275
Russia	0.8070	0.7051	0.9392	0.3476
India	0.6430	0.2671	3.3200	0.0020
China	0.6331	0.2220	3.7586	0.0000

Table 5: Tests of Hypotheses for Market Share

The results show that, for the US, Brazil and Russia the hypothesis of equality of proportions was not rejected implying that there was no significant difference between firms with and without certification with regard to increase in market share. However, for India and China, this hypothesis was strongly rejected implying that the certification really had an impact in improving market share for these countries.

Discussion and Conclusions

A few studies in the past have shown mixed results on the benefits of certification. The current study perhaps belongs to this group. In general the results support the hypothesis that certification has a positive impact on factors that influence organizational effectiveness. However, specific comparisons between US and the BRIC nations Brazil, Russia, India and China show that the impact of certification is not consistent when individual factors are considered. Results show that certification had a significant impact generally in reducing Scrap/Rework. For all countries this factor was significant at 5% level. The factor Customer Complaints was significant for India but not for any of the other countries. Also Customer Satisfaction was significant for all countries except for India and China. For all the countries except Russia it showed that the certification had a significant positive impact on profitability supporting potential financial rewards of ISO 9001 certification.

Certification to ISO 9001 guarantees adoption of a process approach to developing a quality management system that enhances customer satisfaction. A certified organization will systematically collect, analyze and evaluate data in order to improve the quality management system on a continual basis. Specific procedures are in place for monitoring and measuring and controlling nonconformities. As a result, certified organizations are more likely to implement good practices to monitor and eliminate waste. It appears reasonable then to expect certified companies to do a better job dealing with problems arising from Scrap/Rework function. All the countries had significant results with regard to this factor. It may be noted that improvements in this performance characteristic enhance increased profitability which was found to be again a significant factor for most countries.

Customer Complaints was a significant factor for India. That was not the case for the rest of the countries in the study. The typical noncertified company from US in the sample was matured (a majority were 10-25 years of age) multinational, reporting significant improvements in dealing with customer complaints. These successful companies are likely to have good practices already implemented in this area and this could be the reason for the non-significance of this factor for the US. In contrast, noncertified companies in the sample from India were less matured and majority of them were not multinationals. Certification had a significant impact on addressing issues related to customer complaints in this case. A major aspect of implementation of procedures required by ISO 9001 standard is to enhance customer satisfaction. For the US, it shows that certification did help to achieve improvements in this area. A majority of firms from India and China, regardless of their certification status, reported significant improvements in Customer Satisfaction which perhaps could account for the non-significance of this factor for these two countries. As to be expected, for all countries except Russia, with effective quality improvement systems in

place to eliminate waste and improve customer satisfaction, certified companies did significantly better in the area of profitability.

There was considerable heterogeneity in the data due to variability in the demographic characteristics especially for Russia and China. This could be a limiting factor for this study and partly the reason for our mixed results. Survey data showed that a good majority of companies who do not have certification also practiced TQM based strategies such as continuous improvement and improving customer satisfaction. These factors appear to have contributed to comparisons being more similar resulting in differences being not significant in statistical tests. There may be other country-specific factors also at play here that would have an impact on quality such as good work ethics and individual pride in work. Also the cost of obtaining and maintaining certification is much higher in the US compared to India and China. For both India and China, increase in market share was found to be a significant factor while this factor was not significant for US and the rest of the countries. Part of the reason for this could be the fact that both India and China are emerging economies that depend on exports for their economic growth and international recognition through ISO9001 quality standard certification could be a valuable asset for improving business. A comparison of individual firms before and after receiving certification would have been ideal to control variability but it is difficult if not impossible to obtain that kind of data in practice.

Currently over a million companies worldwide have certifications and it is reasonable to expect that the number will grow in the next several years as more companies require that their suppliers be certified as well. Also with increased global competition, more companies view certification to ISO9001 standard as a critical marketing tool. In addition, the decreasing cost of certification will also enhance the number of organizations that will join the rank to increase substantially in the foreseeable future.

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