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# The Impacts of Implementing ISO Certification 9000 Series on Productivity of Barez Industrial Group

❖ *Rouhollah-alreza Nematollahi / Ph.D. Student of Public Administration, Tehran University, Iran / E-mail. nematollahi@ut.ac.ir*

❖ *Abbas Abbasi / Ph.D. Faculty board of Shiraz University, Iran*

❖ *Mohammad Ali Forghani / Ph.D. Faculty board of Bahonar University of Kerman, Iran*

## Abstract

Quality management systems especially ISO 9000 has gained great importance in today business with the purpose of offering higher value to the stakeholders. This retrospective study analyzed productivity records of the Barez Industrial Group consisted of eleven companies in Iran, from 1994 to 2001 by the means of Statistical Package for Social Scientists (SPSS 15). One-Sample Kolmogorov-Smirnov Test was used for data normality. The non-parametric 2-related samples Wilcoxon Test was performed. The results show that the implication of ISO 9000 series did not have any significant impact on productivity. The findings of this study show that if quality management systems are considered as a tool for achieving excellence and not as a goal, they can give maximum efficiency and effectiveness; otherwise they would give low or even negative efficiency and effectiveness. This study is based on real achievements not respondents' perceptions. This study will be useful for all sectors of business.

## Key words

ISO 9000 Standard, Quality Management Systems, Productivity Improvements

## 1 INTRODUCTION

Various quality models have proposed which had made a framework for companies to achieve improvement in quality. The paper which is based on a case study, intends to discuss about one of these models which known as ISO 9000 to find relationship, if any, between implication of the standard and improving productivity. The main hypothesis of the study is that:

1. There is a positive significant relation between ISO 9000 implication and improving productivity of Barez Industrial Group.
  - 1.1. There is a positive significant relationship between implication of ISO 9000 series and production/person ratio of Barez Industrial Group.
  - 1.2. There is a positive significant relationship between implication of ISO 9000 series and production/total cost ratio of Barez Industrial Group.
  - 1.3. There is a positive significant relationship between implication of ISO 9000 series and production/ISO's investment ratio of Barez Industrial Group.
  - 1.4. There is a positive significant relationship between implication of ISO 9000 series and production/training ratio of Barez Industrial Group.

At the first section, important concepts such as quality management standards, ISO 9000 series standard and its potential benefits, and productivity are been described. After that, a review of literatures is presented. Then, research methodology is been explained. Lastly, discussion and conclusion are been presented.

### 1.1 Quality Management Standards:

Quality's evolution into its strategic role in today's businesses is generally accepted. Unresolved is how best to incorporate the quality imperative into business planning and operations. A number of quality philosophies and initiatives have appeared and virtually every manufacturing organization has pursued some type of quality system, for example, total quality management (TQM), just-in-time (JIT), Malcolm Baldrige Award, Deming Application Awards, European Quality Award, Shingo Prize, ISO 9000, Deming philosophy, etc. Prior to 1992, internal needs and motivations governed the choices of quality initiatives. However, the unification of

Europe and the directives associated with EC'92 brought a major external force into quality initiative decisions (Barbara withers, Maling Ebrahimpour; 2001).

Standards for quality developed from the need to document quality and parameters for others to use when manufacturing or servicing a product. Quality standards are defined as “documents that define contractual, functional, and technical requirements for all quality activities that will ensure that a product, process, service or system is fit for its intended purpose”. In Great Britain, users and producers together form standards which have to be approved and published by the British Standards Institute. In Canada, suppliers must comply with working standards called Z.299 or they are not allowed to bid for contracts. Dr Deming supports standardization as a way of improving production (Sabit Adanur, Brian Allen; 1995).

The International Organization of Standardization (ISO), a global federation of [more than] 130 national standard bodies, seeks to promote standardization and the development of related activities worldwide in order to facilitate the international exchange of goods and services, and cooperation in the spheres of intellectual, scientific, technological and economic activities (Clare Chow, Mark Goh, Tan Boon; 2003).

The first management systems standard (BS 5750) in the world was published by BSI in 1979, before being adopted by the ISO as the ISO 9000 in 1987 (Godfrey Yeung, Vincent Mok; 2005).

### **1.1.1 ISO 9000 series standard**

In 1946 the International Standards Organisation (ISO), founded ISO 9000 in Geneva, Switzerland (Frank Martin Aarts, Ed Vos; 2001). ISO 9000 is an independent cultural system (Barbara withers, Maling Ebrahimpour; 2001) consisted of common set of standards for manufacturing, trade and communications industries. It provides a documented process control program intended to enhance quality (Frank Martin Aarts, Ed Vos; 2001). These standards are to establish and foster voluntary adoption of global industrial and manufacturing standards (Divesh Sharma; 2005). In essence, this is a set of quality system standards that prescribes good quality practices, without mandating how a company should achieve them (Clare Chow, Mark Goh, Tan Boon; 2003).

The first version appeared in 1987 and outlined the requirements for quality management systems in manufacturing and service organizations (Ali Bayati, Allahviridi Taghavi; 2007). Gaining ISO 9000 certification does not guarantee quality of products and services, but rather it provides an assurance to customers that the organisation has conformed to an international standard (Mei feng, Mile Terziovski, Danny Samson; 2008).

The popularity of ISO 9000 can be illustrated by the huge increase in the number of certificates issued to organisations worldwide (Godfrey Yeung, Vincent Mok; 2005). According to the International Organization for Standardization (ISO), at the end of 2006 there were 897,866 certified companies in the world. With a growing annual rate of 20% for the period, 1995-2006, the number of ISO certified companies has been growing at a rate far higher than the economic growth (Martinez Costa et al.; 2009). According to this rate the number of certified firms at the world will exceed 1,550,000 at the end of 2009.

ISO 9000 certification is a static conformity format, which must undergo regular review for a system to stay in tune with the current dynamic global environment (Clare Chow, Mark Goh, Tan Boon; 2003).

### **1.1.2 ISO 9000:1994**

In its original version, the ISO 9000 series contains five documents: ISO 9000 to ISO 9004. ISO 9001/2/3 concern quality assurance, while ISO 9000/4 consists of guidelines for selecting an appropriate standard and its use (Godfrey Yeung, Vincent Mok; 2005). Documentation is at the centre of the ISO 9000 series (Sabit Adanur, Brian Allen; 1995). The old ISO 9000/1994 included twenty points that described categories ranging from management responsibility to statistical techniques. Contract reviews, design control, document and data control and purchasing were other categories (Martinez Costa et al.; 2009).

### **1.1.3 ISO 9000:2000**

In 2000, the International Organization for Standardization (ISO) revised the standard and replaced the three 1994 versions (i.e., ISO 9001/2/3:1994) with ISO 9001:2000. Organizations certified to ISO 9001/2/3:1994 had to comply with ISO 9001:2000 by 15 December 2003 to remain certified (Godfrey Yeung, Vincent Mok; 2005). The new standard is oriented towards the achievement of higher levels of customer satisfaction. ISO 9001:2000 is made up of at least 21 processes glued together by means of input-output relationships. ISO 9001:2000 series allows for greater flexibility (Dimitris Tzelepis et. al. 2006). By comparison, the new ISO 9001/2000 version has four major sections that replace twenty points from the 1994 version. The constructs represented in the framework are: (1) management responsibility, (2) resource management, (3) product and service realization, and (4) measurement, analysis and improvement. Overall, the framework shows a dynamic model of a systems perspective, the bedrock of TQM philosophy. Indeed, this approach marks a radical departure from the previous version where the twenty categories were listed separately with no apparent link between them (Martinez Costa et al.; 2009).

Casadesu's and Karapetrovic (2005b) have conducted an empirical investigation comparing the 2000 and

1994 versions of ISO 9000 in terms of the motivation for implementation and the associated challenges, as well as the costs and benefits of registration. They concluded that the evaluation, the motivation, the implementation process and the costs associated with both standards are quite similar. Therefore, the experience of the companies with the 1994 version of ISO 9000 can provide a reference to those interested in implementing the 2000 version of the ISO 9000 series (Woan Jang, Ching Lin; 2008).

## 1.2 Potential benefits of ISO 9000

There is general agreement in the literature on the association between quality and performance (Gavin Dick, Inaki Heras, Marti Casadesus; 2008). Figure 1 simply suggests plausible positive loops that could materialise and transform the effects of ISO 9000 registration into phenomena visible in the accounting statements (Tord HaEversjo; 2000).

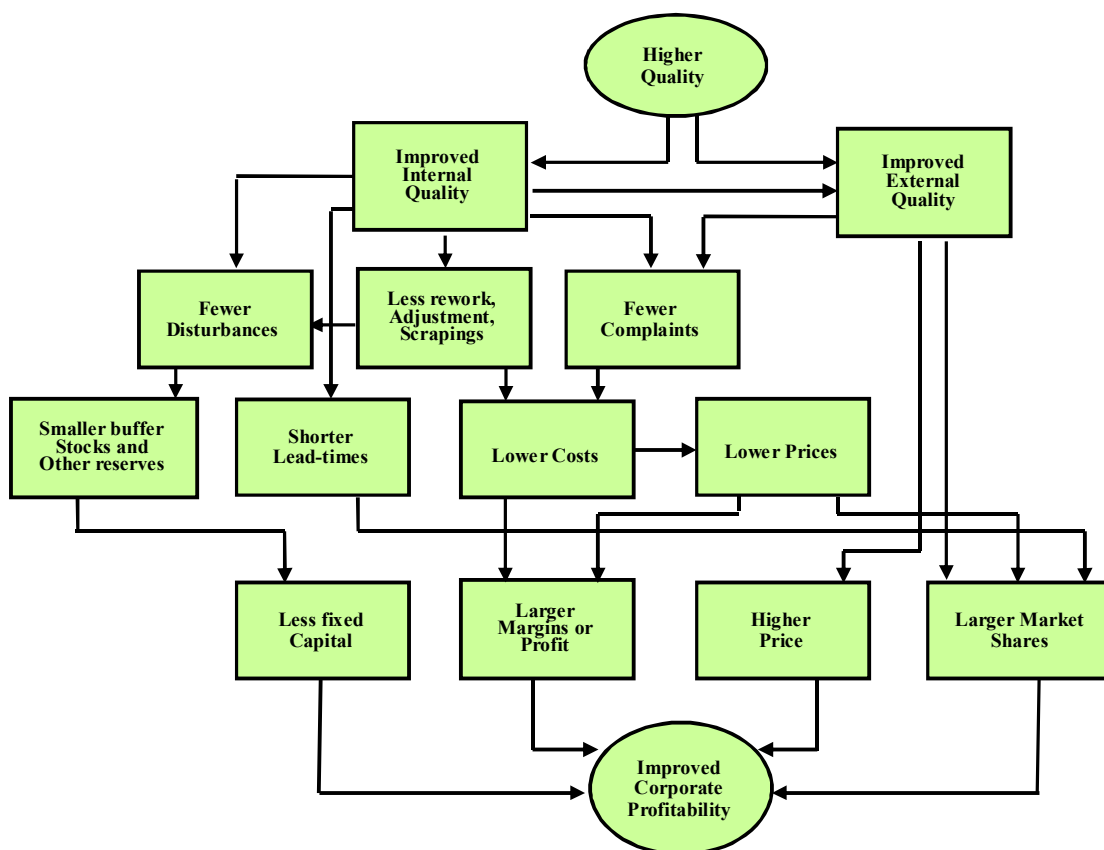


Figure 1 Model of the alleged relations between quality improvements and profitability (Tord HaEversjo; 2000).

The International Standards Organization, National Accreditation Registrars and the third-party accreditation bodies in Europe and the US all claim that ISO 9000 certification leads to business performance improvement (Ali Bayati, Allahviridi Taghavi; 2007) and the business benefits of quality management system certification (Gavin Dick, Inaki Heras, Marti Casadesus; 2008).

In the USA, ANAB (2005) claim 16 benefits from quality management system certification including increased operational efficiency, cost savings from less rework, customer satisfaction, competitive edge, perceived higher quality and increased market share. In Europe similar claims are made (Gavin Dick, Inaki Heras, Marti Casadesus; 2008). According to more moderate expectations, it as a factor reducing internal inefficiencies as well as a factor contributing towards the reduction of development times for new products, of start-up problems and of costs in general (Dimitris Tzelepis et. al. 2006).

The increase in productivity and access to overseas markets are two other benefits (Clare Chow, Mark Goh, Tan Boon; 2003). The causal model of improvements flowing from quality management system certification to improved business performance is shown in Figure 2 (Gavin Dick, Inaki Heras, Marti Casadesus; 2008).

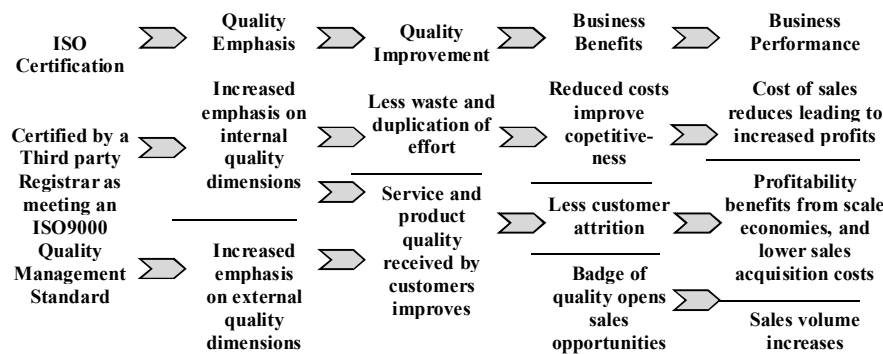


Figure 2. The expected links between management system certification to ISO 9000 standards and business performance (Gavin Dick, Inaki Heras, Marti Casadesus; 2008).

### 1.3 Productivity

Over the past two decades, the subject of productivity has been discussed, analyzed, criticized, and attacked (Joyce M. Hoffman, Satish Mehra; 1999). Productivity is generally defined as a measure of the amount of output generated per unit of input (Paula Linna et. al. 2010). Miller and Schmidt (1984) define productivity as a concept which is concerned with efficient utilization of resources (Daniel G. Hotard; 1988). Productivity is simply the effective enhancement of an organization's productive capability (Kiyoshi Suito; 1998). Productivity enhancement is considered as a process to achieve higher levels of output while consuming same or lesser amounts of input resources. Also, if the same output level is reached in a shorter time period, it indicates improved productivity (Joyce M. Hoffman; 1999).

Productivity is not merely an output/input ratio but that it involves, in a substantial way, the human element. Productivity is seen as a way of life, where the employee becomes a source of improvement rather than a mere resource. Overall, organizational productivity is emphasized in long-term gains and synergy. Japanese concept of total productivity, while recognizing that it is an output/input phenomenon, focuses on the elements within output and input, without consciously putting them together. For output, they embrace quality, quantity, delivery and price, and for input, manpower, facilities and materials. Rather than measure the output/input ratio, they concentrate on the indicators of the various elements. The Japan Productivity Center has indeed produced a model based on value added to aid in the distribution of productivity gains (Alan Stainer; 1995)

The battle cry of the 1980s and 1990s has been the need to increase the productivity of organizations. This cry appears to be certain to continue into at least the early part of the twenty-first century (Lawson K. Savery; 1998) Productivity, as a concept, has had a renaissance of late. For a time, it was relegated well behind quality as the exhorting force for organizations and individuals. All were urged to pay attention to customer needs and desires, to satisfy those needs and desires- indeed to go beyond mere satisfaction towards customer delight and joy. The culture that such a movement would engender would take care of the costs- less waste of materials, better customer retention, etc (David McKee; 2003). Productivity improvements result in a reduction in such unit production costs, thus providing a specific and simple metric for competitive advantage (Jacques A. Schnabel; 2010). Improving productivity performance is a primary driver of the UK economic performance and long-term sustainable competitiveness (Mohamed S. Abdel-Wahab et. al. 2008).

## 2 LITERATURE REVIEW

The phenomenon of growing use of ISO 9000 has had its consequences in the academic arena (Martinez Costa, Martinez Lorente; 2007). In the past ten years, research on quality management increased dramatically (Hongyi Sun; 2000). Most of these papers were intended to analyse the effect of this standard on company performance in some way (Martinez Costa, Martinez Lorente; 2007). ISO 9000 certification is not a risk-free undertaking. The cost of certification can be very high (ranging from \$10,000 to \$ 250,000 per company). Additionally, a high first-time failure rate pervades the experiences of US firms. These risks of ISO 9000 implementation are drawing increasing attention to the benefits of achieving certification (Barbara withers, Maling Ebrahimpour; 2001). Terziovski et al. (2003) stated that whether or not ISO 9000 is beneficial is likely to be the major determinant of the degree to which managers will embrace or reject ISO 9000 certification in the twenty-first century (Woan Jang, Ching Lin; 2008).

Despite the quantity of these studies there is still no clear conclusion about the impact of ISO 9000 (Martinez Costa, Martinez Lorente; 2007). Are the claims for attribution of improved performance to quality management system certification valid? Are the mechanisms other than certification to the ISO 9001 standard could be the cause? (Gavin Dick, Inaki Heras, Marti Casadesus; 2008).

The results of Sabit Adanur and Brian Allen study in US textile industry at 1995 show that ISO 9000 quality systems prove to be very helpful in the manufacturing and service industries (Sabit Adanur, Brian Allen; 1995). Hongyi Sun (2000) in a sample of 316 companies in Norway stated that companies with ISO 9000 certification perform better productivity (Hongyi Sun; 2000). Ebrahimpour et. al. in a study on ISO 9000 registered companies in US stated that the firms cited broadly-based benefits from their ISO 9000 registration efforts. Product quality was the key beneficiary (Barbara withers, Maling Ebrahimpour; 2001). Rao et. al. (1997) surveyed companies in China, India, Mexico and the United States. They concluded that ISO 9000 certification was significantly related to productivity. Elmuti and Kathawala's (1997) study of two manufacturing plants in a large U.S. organization showed that ISO 9000 certification increased employee productivity. Chittenden et. al. (1998) found that U.K. firms attaining ISO 9000 certification reported similar benefits. Consistent effects have been observed by McAdam and McKeown (1999) in Northern Ireland and Simmons and White (1999) in North America. Heras, Casadesus, and Dick (2002) provided evidence of certified Spanish firms outperforming non-certified firms (Divesh Sharma; 2005). Negative effects due to the diversion of scarce resources and institutional resistance to change during the period of transitional implementation are offset by the overall enhancement of the firm's productivity in the long run (Godfrey Yeung, Vincent Mok; 2005). Reincheld and Sasser (1990), argue that the adoption of an ISO quality assurance scheme reduces the costs of scrap, rework or jammed machinery (Dimitris Tzelepis et. al. 2006). The conclusions of Romano (2000) longitudinal analysis on 100 Italian companies are that registered companies improve their internal quality and the reliability of the production process (Martinez Costa, Martinez Lorente; 2007). The investigation of Tufan Koc (2007) on 106 SMEs showed that ISO 9000 implementation makes a significant difference on firm performance between certified and non-certified firms. Similar results are also found in the analysis on manufacturing parameters and competitive priorities indicating that firms gain significant benefits (Tufan Koc; 2007). The findings of Gavin Dick, Inaki Heras and Marti Casadesus (2008) on 29 study showed that there were many studies reporting expectations of increased market share and improved product quality from ISO 9001 implementation. The studies fall into two categories snapshot (cross-sectional) and longitudinal studies. Analyses of first group indicate that the strongest findings are for the internal benefits of less waste and lower cost. The second group of studies which are longitudinal covers four research articles that used research designs that could provide evidence of causality. The first was Haversjo's (2000) longitudinal analysis of Danish companies between 1989 and 1995. The results fined no consistent statistically significant pattern of post-registration performance gains could be detected. The second article Wayhan et al.'s (2002) analysis of the performance of 96 organizations in the USA between 1990 and 1998. The results show as with Haversjo no significant post-registration performance gains can be detected. The third was Corbett et al. (2005) which examined the performance of 544 US firms between 1987 and 1997. Their findings indicate that differences in abnormal performance in ROA tend to be highest. The fourth is Naveh and Marcus's (2005) examination of 313 US firms between 1990 and 2000. They found only non-significant yearly ROA gains for all of the five years following registration (Gavin Dick, Inaki Heras, Marti Casadesus; 2008). The implementation of ISO 9000 directly and positively influences operational performance and indirectly affects market performance, in turn positively impacting business performance (Woan Jang, Ching Lin; 2008). Highlands (1995) and Elmuti (1996) claimed that productivity improved due to ISO 9000 certification. The results of study by Mei feng, Mile Terziovski, Danny Samson (2008) on 613 Australia and New Zealand-based manufacturing and service company, show a positive and significant relationship between certification practices with operational performance (Mei feng, Mile Terziovski, Danny Samson; 2008).

On the other hand there is some research that finds no positive correlation between firm performance and ISO 9000 adoption (Tufan Koc; 2007). Haversjo (2000) reported that ISO 9000 certified companies have better earnings (rates of return) than similar non-certified companies (Clare Chow, Mark Goh, Tan Boon; 2003) which is not due to improved internal capacity utilization but rather to an increase in sales (Tord Haversjo; 2000). ISO 9000 certification does not have significant impact on the strategic management of quality and human resources development. These two criteria are significantly correlated to performance improvement (Hongyi Sun; 2000).

Beattie and Sohal's (1999) survey of 50 Australian companies showed that 25% of the companies could not identify any strategic benefits and a mere 4% reported improving their profitability following certification. Similarly, Shams-ur (2001) noted insignificant differences in self-rated organizational performance between small- and medium-sized enterprises (SMEs) with and without ISO 9000 certification in Australia. Hua et al.'s (2000) survey of 100 companies in Shanghai found no significant differences in quality related performance measures between companies with ISO 9000 certification and those without. Quazi et al.'s (2002) study revealed that ISO 9000 certification did not affect quality management practices and quality related measures of companies in Singapore. Low et al. (1999) stated the lack of observed positive association between ISO 9000 and firm performance (Divesh Sharma; 2005). Casadesus and Karapetrovic (2005) employ a longitudinal impact study and argue that ISO 9000 standards are limited in providing a set of concrete benefits over time (Dimitris Tzelepis et. al. 2006).

Batchelor (1992) found that the benefits of certification were mainly procedural efficiency and error rate, but not related to increase in market share, staff motivation, or cost. Allan (1993) and Brown (1994) found that managers went back to “fire fighting” after ISO 9000 certification. Terziovski et al. (1997) found that ISO 9000 certification does not have a significantly positive relationship with organisational performance in either the presence or absence of a TQM environment. Mei feng, Mile Terziovski, Danny Samson (2008) concluded that ISO 9000 certification by itself does not lead to improvement in business performance (Mei feng, Mile Terziovski, Danny Samson; 2008). The results of Amiran's study (2000) showed that achieving ISO 9000 certification did not improve the performance of that organization (Ali Bayati, Allahviridi Taghavi; 2007). The substantial difference between certified and non-certified firms' sales and profitability that we reported in earlier research (Heras et al., 2002a) cannot be attributed to quality certification (Gavin Dick, Inaki Heras, Marti Casadesus; 2008). Lai and Cheng also suggested that certification alone does not appear to have a direct effect on performance success. The study of Tufan Koc (2007) was not found significantly different between defective part production of the certified and non-certified firms (Tufan Koc; 2007). Martinez Costa et. al. (2009) concluded from a study on 713 Spanish companies that ISO 9001/2000 certified companies do not perform noticeably better than ISO 9000/1994 or non-certified companies (Martinez Costa et. al. 2009).

### 3 RESEARCH AND METHODOLOGY

Most of the research in this field is composed of comparative analysis between companies that obtained the certification and companies that did not. Very probably, this is due to the difficulty in collecting longitudinal data in this arena (Martinez Costa, Martinez Lorente; 2007). By the way, this study tried to analyze the recorded achievements of the group in a longitudinal methodology. Longitudinal against snapshot studies show more reliable results gained from implementing ISO 9000 along time. This type of study results to more precise and defendable conclusions about the study's subject.

In addition, despite the increasing amount of research on ISO 9000 QMS, most of it is not empirical and mostly case studies, which are merely descriptive or prescriptive. This situation is pointing the importance and need for further research of the subject on behalf of practitioners and academic circles (Tufan Koc; 2007). Therefore, in-depth case studies are needed which detail the impact of ISO elements and improvement initiatives over time (Mei feng, Mile Terziovski, Danny Samson; 2008). To reach a clear conclusion about impacts of implementing ISO 9000, the productivity of the group during a period of eight years (1994 to 2001), is compared with itself. This was needed as the study wants to know how productivity had changed during the period in the group.

Companies that decide to implement the ISO 9000 necessarily need a period of time to adapt their operations to the requirements of the standard (Martinez Costa, Martinez Lorente; 2007). According to this, the study chose a period of eight years to being certain about adaption of group with ISO 9000 requirements.

The advantages claimed, are just perceived benefits that are neither measurable nor empirically verifiable (Goh Eng Ann, Suhaiza Zailani and Nabsiah Abd Wahid; 2006). Indeed, most of studies in this subject just could show the respondents' perception of implementing ISO 9000 series impacts and not real achieved impacts due to it. Probably, a response for these vast conflicts among the studies is the perceptual differences among respondents. This study is based on achieved records in eight years to find the relationships, if any, between implementing ISO 9000 and productivity of the group.

This study is based on Mei feng, Mile Terziovski, Danny Samson's (2008) study on 613 Australia and New Zealand-based manufacturing and Service Company. According to the study performance is fall into two categories, operational and business performance. Operational performance is consisted of Cost reduction, increased productivity, Quality improvement, increased customer satisfaction, improved internal procedures, and improved employee morale. Business performance is consisted of increased market share, improved corporate image, improved competitive advantage, increased access to global markets, increased organizations' profits. Productivity is selected as dependent variable because of its great importance for the group and key role of it in industry.

The population of this study is Barez Industrial Group consisted of 11 companies in Iran, which established at 1984. The group has started at 1993 with initial 25,000 tons yearly production and 90,000,000 US dollars. The group with more than 2000 employee and 17 years experience at the end of 2009 has become a leader in tire industry of Iran. The center activity of this group is producing various light and heavy automobile tires. The group has established companies in order to being competitive in the supply chain management. The group started the plan of implementing of ISO 9000 series from 1994, and started implementing it at 1995, and finally achieved the certification at 1997. This practical study is to find relationship, if any, between implication of ISO 9000 and productivity of Barez Industrial Group. This study is based on real not perceptual data of eight years productivity of the group. At the period of study neither other management systems nor any other systems, with different base with ISO 9000 were implemented. As stated former, the production of the group has started at 1993. To obtain more precise and reliable results, the first year is neglected, as this

year was the first year of operation and the group has had trial production. So, the years remain before achieving ISO 9000 certification were four years. Therefore, the group productivity at the period of four years before and after achieving ISO 9000 certification is analyzed.

According to Paula Linna et. al. 2010, productivity defined as a measure of the amount of output generated per unit of input. In the study, yearly production is given as output, and yearly person, total cost, ISO's investment and training are given as inputs. The data gathered from the documents of the group, which is shown in table 1.

Table 1 – Output, and inputs data

Year	Production (kg)	Person (man)	Total cost (Iran Rls)	ISO's investment (Iran Rls)	Training (man-hour)
1994	12,478,317	862	118,800,136,000	20,561,600	151,703
1995	23,167,411	942	142,834,628,000	44,636,000	80,750
1996	28,267,191	982	173,190,231,000	53,233,336	48,607
1997	27,812,913	1,005	211,663,300,000	78,432,500	45,701
1998	27,904,797	1,066	251,967,267,000	102,436,800	32,103
1999	27,828,203	1,117	289,458,000,000	159,850,000	51,776
2000	31,361,512	1,210	390,449,000,000	206,024,000	55,546
2001	32,868,371	1,258	426,192,000,000	254,328,500	52,987

Two variables have financial nature, total cost and ISO's investment. To obtain more reliable results, time value of money must be considered. The yearly inflation rate is taking from website of Central Bank of Iran which are given at table 2.

Table 2 – Inflation rate \*

year	1994	1995	1996	1997	1998	1999	2000	2001
Inflation Rate	0.352	0.494	0.232	0.173	0.181	0.201	0.126	0.114

\* [www.cbi.ir](http://www.cbi.ir)

The future value of yearly total cost and ISO's investment are calculated by the formula  $PV = X(1+i)$  at the base year i.e. 2001. The data are shows in table 3.

Table 3 – Future value

FV at 2001	Total cost (Iran Rls)	ISO's investment (Iran Rls)
1994	610,884,541,055	123,656,788
1995	491,614,980,034	153,630,296
1996	483,842,800,761	148,718,356
1997	504,113,633,284	186,800,889
1998	508,132,657,317	206,580,339
1999	486,043,939,055	268,412,425
2000	582,258,583,069	307,234,088
2001	570,521,068,416	340,456,338

According to the given productivity definition, the output/input ratios are calculated. To the simplicity of the currencies exchanging, it is assumed that 1 US \$ is equal to 10000 Iran rls. The ratios are given in table 4.

Table 4 - Production percapita

Year	Production per person (kg/man-yr)	Production per total cost (kg/US \$)	Production per ISO's investments (kg/US \$)	Production per training (kg/man-hr)
1994	14476.01	0.20	1009.11	82.25
1995	24593.85	0.47	1508.00	286.90
1996	28785.33	0.58	1900.72	581.55
1997	27674.54	0.55	1488.91	608.58
1998	26177.11	0.55	1350.80	869.23
1999	24913.34	0.57	1036.77	537.47
2000	25918.60	0.54	1020.77	564.60
2001	26127.48	0.58	965.42	620.31

First the normality of data distribution must be tested. It is needed to show that parametric or non-parametric tests must be used. Two tests are using for normality of data distribution, Chi-Square and Kolmogorov-Smirnov Test. To attain more precise results, Chi-Square Test is using for high number of data and Kolmogorov-Smirnov Test is using for low number of data (Momeni Mansour, 2009). Since the number of data was low, Kolmogorov-Smirnov Test is applied. The results of Test are as follows:

Table 5 - One-Sample Kolmogorov-Smirnov Test

	Production per person	Production per total cost	Production per ISO's investments	Production per training
Asymp. Sig. (1-tailed)	.136	.129	.300	.276

The result of Kolmogorov-Smirnov Test shows that the normality distribution of ratios are not significant at the level of 95% so non parametric tests must be applied for hypothesizes test. The study is to find out that is there any significant differences between productivity before and after achievement of ISO 9000 certification. For this purpose, the study analyzed ratios, 4 years before and 4 years after achievement of ISO 9000 certification. Nonparametric Tests can be fall into three categories on the basis of how the data are organized: one sample tests which analyze one variable in a sample, related samples tests which analyze two or more variables in same related sample, and independent sample tests which analyze one variable which is categorized by other variables (Momeni Mansour, 2009). Therefore, as the data belong to two related society (before and after achievement of certification) the non-parametric 2-related samples tests must be applied. The tests in this section compare the distributions of two related variables. The appropriate test to use depends on the type of data. If the data are continuous, the sign test or the Wilcoxon signed-rank test must be used. The sign test computes the differences between the two variables for all cases and classifies the differences as positive, negative, or tied. If the two variables are similarly distributed, the number of positive and negative differences will not differ significantly. The Wilcoxon signed-rank test considers information about both the sign of the differences and the magnitude of the differences between pairs. Because the Wilcoxon signed-rank test incorporates more information about the data, it is more powerful than the sign test. If the data are binary, the McNemar test must be used. If the data are categorical, the marginal homogeneity test must be used (SPSS Base 15.0 User's Guide). As the data are continuous and more preciseness is needed, Wilcoxon Test must be applied. The results of Wilcoxon Test are as follows:

Table 6 - Test Statistics

Pre - post	Production per person	Production per total cost	Production per ISO's investments	Production per training
Asymp. Sig. (1-tailed)	.500	.137	.072	.137

As the results of Wilcoxon Test show, there is no significant difference between ratios, at the periods of 4 years before and 4 years after achievement of ISO 9000 certification at 1997.

#### 4 DISCUSSION

As the tests' results show, there is no significant difference at the level of % 95 between pre and post ISO 9000 series achievements in all four variables. The first variable, which should be discussed, is the ratio of production per person. The test result about the variable is 0.50, which is not in the significant level. It is higher than 0.05, which means that the hypothesis one is been rejected. On the other hand, implementation of ISO 9000 did not have any direct impacts on the production percapita. The diagram of the ratio during 1994 to 2001 is been shown at figure 3 As the diagram shows, production percapita is at the lowest level in 1994 which is the first production year of the group. The production percapita at this year is below 15000 kg/man-year. A great increase about % 135 is occurred during next year i.e. 1995. This increase is the highest increase during the study period and two years before achieving ISO 9000 certification. This procedure is been followed by an increase about % 17 at 1996 which is one year before certification achievement. The ratio is the highest level during the study period, which is 28785.33 kg/man-year. The increasing rate is declined from % 70 at 1995 to % 17 at 1996. At the year of certification achievement, i.e. 1997 the production percapita is start to decrease by the rate of about % 4. This decreasing is been continued during two years after i.e. 1998 and 1999. These two years are exactly the first two years after certification achievement. Production percapita at 1999 is near to the ratio at 1994, both below 25000 kg/man-year. A slight increase of % 4 can be seeing at 2000 which is three years after certification achievement. This increasing is been continued by less than % 1 at the year after i.e. 2001. The increasing rate is declined from % 4 at 2000 to less than % 1 at 2001. It is clear that during four years after certification achievement, there are no direct impacts on the production percapita.



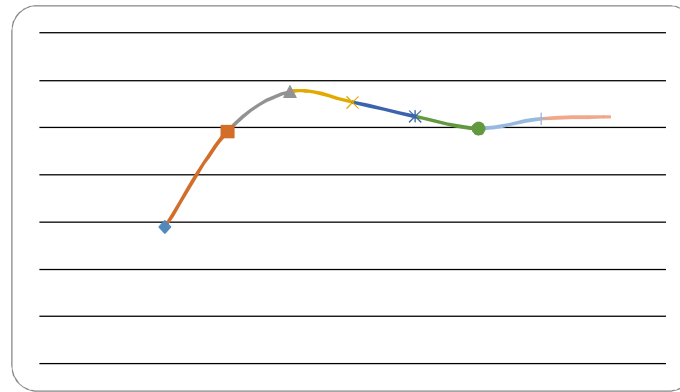


Figure 3 - Production/person

The second variable, which should be discussed, is the ratio of production per total cost. The test result about the variable is 0.137, which is not in the significant level. It is higher than 0.05, which means that the hypothesis two is been rejected. On the other hand, same to hypothesis one, implementation of ISO 9000 did not have any direct impacts on the ratio of production per total cost. The diagram of the ratio during 1994 to 2001 is been shown at figure 4 as the diagram shows, the ratio of production per total cost is at the lowest level in 1994 which is the first production year of the group. The ratio of production per total cost at this year is 0.20 kg/US \$. A great increase about % 135 is occurred during next year i.e. 1995. This increase is the highest increase during the study period and two years before achieving ISO 9000 certification. This procedure is been followed by an increase about % 23 at 1996 which is one year before certification achievement. The ratio is the highest level during the study period which is 0.58 kg/US \$. The increasing rate is declined from % 135 at 1995 to % 23 at 1996. At the year of certification achievement, i.e. 1997 the ratio of production per total cost is start to decrease by the rate of about % 6. This decreasing is been continued during the year after i.e. 1998. This year is the first year after certification achievement. A slight increase of about % 4 can be seeing at 1999 which is two years after certification achievement. This increasing is not been followed at the year after i.e. 2000. A decrease of about % 6 is been occurred at 2000 which is the third year after certification achievement. At the year after i.e. 2001, which is the fourth year after certification achievement, again an increase of about % 8 can bee seen. The ratio of production per total cost at this year is equal to the ratio at 1996. It is clear that during four years after certification achievement, same to previous, there are no direct impacts on the ratio of production per total cost.

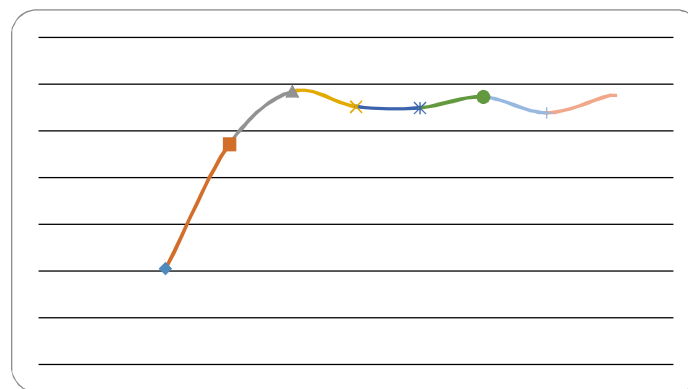
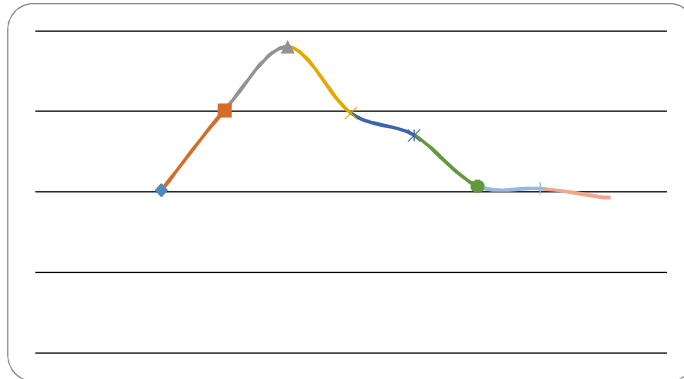


Figure 4 - production/total cost

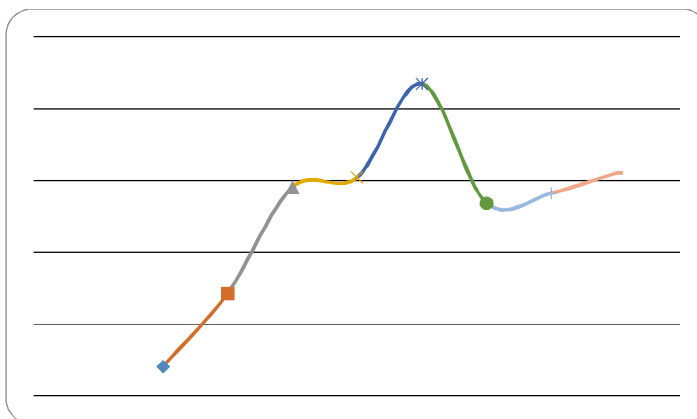
The third variable, which should be discussed, is the ratio of production per ISO's investment. The test result about the variable is 0.072, which is not in the significant level. It is higher than 0.05, which means that the hypothesis three is been rejected. On the other hand, same to hypothesis one and two, implementation of ISO 9000 did not have any direct impacts on the ratio of production per ISO's investment. The diagram of the ratio during 1994 to 2001 is been shown at figure 5 as it can be seeing, at the first year i.e. 1994 the production per ISO's investment is 1009.11 kg/US \$ which not at the lowest at the study period, against the two ratios before. At 1995 a % 50 increase is occurred which is followed by a % 26 increase at the year after i.e. 1996. The ratio is the highest level at the study period, which is 1900.72 kg/US \$. This year is one year before achieving the certification. At the five years after, the ratio is continuously decreased insofar as reach

the lowest level at the last year of the study period i.e. 2001, which is four years after certification achievement. At this year the production per ISO's investment is below 1000 kg/US \$, even less than the first production year of the group. It is clear that during four years after certification achievement, same to previous, there are no direct impacts on the ratio of production per ISO's investment.



**Figure 5 - Production/ISO's investment**

The fourth variable, which should be discussed, is the ratio of production per training. The test result about the variable is 0.137, which is not in the significant level. It is higher than 0.05, which means that the hypothesis four is been rejected. On the other hand, same to the other three hypotheses, implementation of ISO 9000 did not have any direct impacts on the ratio of production per training. The diagram of the ratio during 1994 to 2001 is been shown at figure 6 As the diagram shows, the ratio of production per training is at the lowest level in 1994 which is the first production year of the group which is below 100 kg/man-hr. A continuous increase is occurred during the four years after which at 1998 is the highest level of production per training which is near to 900 kg/man-hr. The ratio is increases by the considerable great rate of about % 249 at the second production year of the group i.e. 1995. This great increase followed by another great rate of about % 103 at the year after i.e. 1996. The rate of increasing ratio is decreased intensively to about % 5 at 1997, but at the year after i.e. 1998 continue its increases by the rate about % 43 which is the highest level of ratio during the study period. This year is one year after certification achievement. The only year which the ratio is decreased is 1999 i.e. two years after certification achievement. The ratio is decreases at 1999 by the rate of about % 62 which is lower than the ratio at 1996 i.e. one year before certification achievement. A continuous increase is be seen at the two years after i.e. 2000 and 2001 by the rate of about % 5 and % 10 respectively. At the third year after certification achievement, still the ratio is lower than the ratio of one year before achieving the certification i.e. 1996. It is clear that during four years after certification achievement, same to previous, there are no direct impacts on the ratio of production per ISO's investment.



**Figure 6 - production/training**

## 5 CONCLUSION

As it is clear from discussion above, all four variables had increased at the first two years of the study i.e. 1994-1995 and 1995-1996, which are respectively two years and one year before certification achievement. Three variables; production per person, production per total cost, and production per ISO's investment, are

decreased at the year of certification achievement i.e. 1997. Just production per training had a slight increase of 5 % at 1997. At the year after certification achievement i.e. 1998 these three variables had not increased, just one variable; production per training, had a great increase. Two years after certification achievement i.e. 1999 three variables; production per person, production per ISO's investment, and production per training had decreased, just production per total cost had increased 4 %. Three years after certification achievement i.e. 2000 two variables; production per person, and production per training, had increased and two other variables; production per total cost, and production per ISO's investment had decreased. At the last year of the study i.e. 2001, three variables; production per person, production per total cost, and production per training had increased and the other variable i.e. production per ISO's investment had decreased.

As the results and procedure analyses show, implementation of ISO 9000 had not any direct impacts on the four variables. The study is fall in the category that did not find any direct impacts on the performance. In the study, productivity is chose as the performance criteria to study the impacts of implementing ISO's 9000. The study, same to the studies of Batchelor (1992); Allan (1993); Brown (1994); Terziovski et al. (1997); Beattie and Sohal's (1999); Low et al. (1999); Hua et al. (2000); Quazi et al. (2000); Haversjo (2000); Hongyi Sun (2000); Shams-ur (2001); Clare Chow, Mark Goh, Tan Boon (2003); Casadesus and Karapetrovic (2005); Tufan Koc (2007); Mei feng, Mile Terziovski, Danny Samson (2008); Amiran (2000); Gavin Dick, Inaki Heras, Marti Casadesus (2008); Martinez Costa et. al. (2009) reaches a similar result, which not found any direct impacts of implementing ISO 9000 on the productivity of Barez Industrial Group.

The study concluded that the standard of ISO 9000 series was working as a base to regulate the Group's affairs and not to improve its productivity directly as this large business by itself set the minimum levels of quality management standards. The study suggests that the standard to be efficient and effective, is more helpful for small businesses rather than large ones and other standards with higher levels of quality management requirements may be appropriate for large businesses specially Barez Industrial Group.

The study also suggests for another research to survey the impacts of implementation of EFQM on the productivity of Barez Industrial Group.

## **6 LIMITATIONS AND IMPLICATIONS**

As long time passed from the time period of study, the possibility of in detail analyzes is not available. From these results must not be concluded that implication of ISO 9000 series do not have impact on other variables that are not considered in this study. This study did not consider other possible intermediary factors. It is suggested to planning a vast study with considering all intermediary factors and their impacts on performance of Barez Industrial Group.

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