

A JOURNEY TOWARD TOTAL QUALITY MANAGEMENT THROUGH SIX SIGMA BENCHMARKING- A CASE STUDY ON SME'S IN TURKEY

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Abstract: This paper aims to explore the best strategy for the Turkish SME's in order to become a world-class manufacturing company. Factor analysis was used to reduce the 42 quality management practices into a smaller set of dimensions. The resulting dimensions (factors) were used as independent variables for multiple regression analysis. Multiple regression analysis measures whether there is a relationship between the factors and exporting, being ISO 9000 certified, and ISO 9000 guaranteeing the quality of the product/service supplied. Finally, according to all the results and literature review the best strategy for the Turkish Electric-Electronic SME's was chosen to be six-sigma benchmarking.

Keywords: world-class manufacturing, quality, ISO 9000, six-sigma, benchmarking.

1. INTRODUCTION

In order to compete with the highly competitive world market all of the companies are searching for the best way to become the world's number one manufacturing company. Usually it is seen that the most effective TQM practices are found in larger and/or medium sized organizations. Nowadays for a company to receive ISO 9000 approval is not only a fashion or trend, but also a general requirement toward what is needed to run a good business [1]. It is true that ISO 9000 has provided significant benefits for SME's [2]. An encouraging outcome is that a number of SME's see ISO 9000 series certification as a useful first step in the quality journey with a view to moving forward in the direction of a broader quality management [3]. On the other hand, a survey conducted by Laszlo [4] in Canada stated that although ISO 9001 had been an effective guide for a good quality system in order to serve the interests better a broader definition of quality would be needed. Chyn Jeng [1] stated that managers do not overwhelmingly believe that ISO 9000 approval is an effective strategy for improving performance. Jeng [1] also added that in Taiwan at least, 30% of managers do not regard the procedure of ISO 9000 as the best way or the necessary approach for improving organisational performance. Rather than using a short-term approach like ISO 9000 approval, they may prefer using a long-term strategy like TQM principles to improve quality and total organisational performance [1]. Many smaller enterprises face strong pressure to gain certification due to either customer requirements or to maintain their competitive position in the industry when other companies are also moving in this direction [3]. The implementation and certification of a quality management system according to one of the standards of the ISO 9000 series has come under strong criticism from some sections due to its cost

and in many cases limited benefits, particularly for smaller enterprises [3].

On the other hand, when Turkey is analysed it is figured out that the Small and Medium Sized Enterprises (SME's) form the majority of the Turkish industry. Quality has become the main concern for the SME's operating in Turkey. Each and every company is trying to gain the ISO 9000 certificate in the last 10 years. This paper reports the results of a pilot study conducted among a sample of local SME's. The sample group was chosen to be the electric electronic companies operating in Turkey. The paper aims to answer the following questions:

Which quality management practices determine the company's quality strategy?

What is the relationship between implementation of quality management practices and exporting?

What is the relationship between implementation of quality management practices and ISO 9000 certification?

What is the relationship between implementation of quality management practices and believing in that the ISO 9000 certification guarantees the quality of the product/service supplied?

What can be the best strategy for the local SME's in order to become a world manufacturing company?

2. ANALYSIS METHOD

The sample was chosen to be the electric-electronic industry located in Turkey. The questionnaires were collected by using primary data techniques and face-to face interviews in the electric-electronic industry. The questionnaire was

adopted from the article written by Quazi and Padibjo [2], which was concerned with "a journey toward TQM through ISO 9000 certification-a study on SME's in Singapore". The questionnaire has the type of a "5 Lickert Scale" form. The questionnaires are formed in three parts, the general position of business, the 42 variables of quality management practices, which were also divided into eight subheadings, and the information concerning the respondent.

Reliability analysis and factor analysis was used in analysing the 42 variables of quality management practices. In addition, regression analysis was also used to figure out the direction

and effect of the relationship between the ISO 9000 and the factors resulted from the factor analyses, which are to be quality management practices.

3. FINDINGS AND EVALUATION

3.1 General Profile of the Firms Included in the Research

The general profile of the firms included in the research is as shown in Table 1.

Table 1. General Profile of the Firms Included in the Research

<i>Variables</i>	<i>n</i>	<i>%</i>	<i>Variables</i>	<i>n</i>	<i>%</i>
Certification Date			Certification Time		
1990-1992	11	6,4	Less Than 1 Year	97	56,4
1993-1994	28	16,3	1-2 Year	43	25,0
1995-1996	22	12,8	2-3 Year	5	2,9
1997-1998	26	15,1	More Than 3 Years	5	2,9
1999-2000	33	19,2	Missing Answer	22	12,8
2001-2002	23	13,4	Total	100	100
No certification	22	12,8			
Missing Answer	7	4,0			
Total	172	100			
Quality Certificate			Firms Exporting		
ISO 9001	84	48,8	Yes	138	80,2
ISO 9002	51	29,7	No	34	19,8
ISO 14000	4	2,3	Total	172	100
ISO 9000-2000	11	6,4			
no certificate owned	22	12,8			
Total	172	100			
Firms having ISO 9000-2000 certificate			ISO 9000 Guarantees quality		
Not Yet	11	6,4	Yes	145	84,3
Total	161	93,6	No	12	7,0
	172	100	Missing Answer	15	8,7
			Total	172	100

According to the frequency analysis, 80% of the companies are exporting while only 20% are not. 48.8% are ISO 9001 certified, 29.7% are ISO 9002 certified, 2.3% are ISO 14000 certified and only 12.8% are not certified to any of the standards. Among all the 172 companies only 6.4% have upgraded their certificate to ISO9000-2000. 32.6% of the companies were certified between years 1999-2002 and becoming certified

lasted less than 1 year for 56.4% of the companies. Finally 84.3% believe in that ISO 9000 standard guarantees the quality of a product or service supplied.

3.2 Results Of the Factor Analysis Related with the Quality Management Practices

The quality management practice criteria had a general reliability (cronbach ∞) which explains the variation as 96,67%. The 42 variables related with quality management practices were reduced into a new set of salient variables by factor analysis.

Factors with eigenvalue greater than 1.0 are retained. Inspection of scree plot and eigenvalues enabled the analysis to reduce the 42 quality management variables into 8 factors. Table 2

reports the factors and corresponding quality management practices. Table 3 presents rotated

component factor matrix.

Table 2. Quality Management Practices and Corresponding Factors

FACTOR	QUALITY MANAGEMENT PRACTICES
FACTOR 1	B1, B2, B6, B7, B8
FACTOR 2	B4, B28, B29, B31, B36, B37
FACTOR 3	B9, B10, B11, B12, B17, B19
FACTOR 4	B32, B33, B34
FACTOR 5	B3, B5, B24
FACTOR 6	B22, B23
FACTOR 7	B40, B41, B42
FACTOR 8	B13, B14, B20

According to the rotated component matrix the factors were formalised as follows;

Factor 1: Information Analysis:

According to the component the first factor is named as "Information Analysis". The highest loading was given to B6, which is about carefully collecting data on all facets of the business. The second highest loading was given to B1, which is related with personally conducting regular reviews of quality performance on the product/service. These two loadings show that the electric electronic companies are giving importance to information and data collection.

Factor 2: Quality Results: The highest loading is given to documenting the financial performance of their business compared to other businesses in the same industry. The second highest loading is given to documenting the technical quality of their product/service as compared to other companies. These two components state that the electric electronic firms have the ability to compare their technical quality and financial performance to other businesses in the same industry. They are also using these comparisons as quality results, in order to continuously improve.

Factor 3: Strategic Planning: The third factor is related with strategic planning. The highest loadings were also given to the components related to this topic. The highest loading was given to doing regular strategic planning, and the second highest loading is given to linking the strategic plan to quality values. It is pleasing to see that one of the highest loading is given to a component, which is both related to strategic planning and quality.

Factor 4: Customer Satisfaction: The highest loading is given to systematically asking customers what they expect in the product/service. This shows that the electric-electronic industry in Turkey started to become customer oriented. Although it is seen to at factor 4, being above the next four factors is also believed to be pleasing.

Factor 5: Leadership: The highest loading is given to being trained in total quality management and the second highest loading is to monitor all production processes and introduce continuous improvement whenever possible. The loading shows that the leaders are all educated for TQM and that they are always trying to continuously improve in every situation.

Factor 6: Management of Process Quality:

The two components show that the employees in the electric-electric industry are motivated to take innovative action.

Factor 7: Business Outcome Comparative:

All three of the components are loaded above 0,7, which is very high. It is also interesting to have all the components related with business outcome comparative. According to the components the analysed businesses had compared themselves with their past and recognised that quality has helped them to improve.

Factor 8: Human Resource Utilisation: It is clear that there is good communication between the staff and the managers. The companies are giving importance to training their staff. The highest loading is given to being aware of long-term business goals, while the second highest loading is also like a supplement of this component, which is working as a team with clear goals. This shows that the electric-electronic companies are always working to have clear cut goals and also are trying to work in team and be well educated in order to be successful in the global market no matter what they are producing/servicing.

3.3 Multiple Regression Analysis

Multiple Regression Analysis involves a single dependent variable and two or more independent variables. Multiple Regression analysis was used to determine which of the independent variables (the 8 factors computed after the factor analysis) explain a significant variation in the dependent exporting, being ISO certified, ISO certification guaranteeing quality), which was to explain whether a relationship exists. It was also useful in determining how much of the variation in the dependent variable can be explained by the independent variables, which was explaining the strength of the relationship.

The hypothesized tested in this paper are listed as follow:

Hypothesis 1:

H_0 : There is not a relationship between implementation of quality management practices and doing export.

H_1 : There is a relationship between implementation of quality management practices and doing export.

Hypothesis 2:

H_0 : There is not a relationship between implementation of quality management practices and being ISO 9000 certified.

H_1 : There is a relationship between implementation of quality management practices and being ISO 9000 certified.

Hypothesis 3:

H_0 : There is not a relationship between implementation of quality management practices and the belief of ISO 9000 guarantee for the quality of product/service supplied.

H_1 : There is a relationship between implementation of quality management practices and the belief of ISO 9000 guarantee for the quality of product/service supplied.

3.3.1 The Findings of the Multiple Regression Analysis

From this analysis it is seen that the companies doing export are paying attention to the quality results. When referred to the factor analysis in section 3.2, it is seen that the companies are documenting the financial performance of their business compared to other businesses in the same industry. The companies are also giving importance to documenting the technical quality of their product/service as compared to other companies.

The second result figured out from the multiple regression analysis is that the application of the quality management practices has no relationship with being ISO 9000 certified or not in general. But when the coefficients were analysed it was seen that only F3 had a relation with ISO 9000, which is the factor related with strategic planning. This shows that the strategic planning plays an important role in ISO 9000 certification for electric-electronic companies.

The third and last result of the multiple regression analysis is that F2 and F5 play an important role in the belief of ISO 9000 guaranteeing the quality of the product/service supplied. These two factors are explaining the quality result and leadership. It is interesting to see that the quality result factor is placed in another result section (see section 3.3.1) of the analysis. This also proves that the electric-electronic companies are paying attention to quality results in every situation.

Another pleasing result is that leadership is going together with quality results. As it is known that quality implications start from the top, these

electric-electronic companies seem to be promising for total quality management in the future.

Best Business Strategy for Electric-Electronic Industry in Turkey: "Six-Sigma Benchmarking"

Becoming a world class manufacturer is the newest trend in nowadays. Especially the SME's in developing countries are struggling for this purpose. Their most important goal is to be able to compete in the global market. Most of these SME's are searching for ways to make this dream come true. According to the literature review, it is seen that the only way to survive is to continuously improve. The question arises now: "how to continuously improve and how to become world-class manufacturer?"

The best answer for this question is to do benchmarking with other world's best companies, no matter which industry they are operating in. Many world manufacturers have adapted "six-sigma" as a benchmark standard. Six-sigma benchmarking is the best strategy for the Turkish SME's, as the main problems of these companies is to reduce defects and increase customer expectations and finally to continuously improve, in order to compete in the global market.

Six-sigma is used for reducing variation. This term is under the quality umbrella of continuous improvement. Six-sigma quality is a statistical measure that equates to nearly perfect quality. Six-sigma has become a recognised quality program based on the goal of virtually perfect quality [5]. Six-sigma is seen as the basis for a "best-in-class" philosophy and a long-term business strategy that measures quality improvement. Six-sigma is to focus on improvement and variance reduction in every process and transaction within a company. The companies adapting six-sigma believe in that with the help of six-sigma, waste and cost are driven out as quality improves, and customer satisfaction and loyalty, and thus profits, are increased through the continuous improvement of quality.

The results of the factor analysis support the benefit of six-sigma for the Turkish electric-electronic industry. As the first four factors explained are, information analysis, quality results, strategic planning and customer satisfaction, the electric-electronic companies are very much suitable for adapting six-sigma. These companies are giving importance to the key points, which is helpful for adapting six-sigma quality.

4. CONCLUSION AND IMPLICATION FOR FURTHER RESEARCH

This paper aimed to answer five questions. The first question was answered via factor analysis. Factor analysis reduced the 42 quality management practices into 8 important factors, which was than useful in setting the best strategy for the Turkish Electric-electronic SME's in Turkey to become world-class-manufacturers. These factors were information analysis, quality results, strategic planning, customer satisfaction, leadership, management process quality, business outcome comparative and human resource utilisation.

The second, third and the fourth questions were answered by the multiple regression analysis. Three hypotheses were used to figure out each relationship asked in each question.

The first finding from the multiple regression analysis was that there is a relationship between exporting and paying attention to quality results plus documenting the technical quality of their product/service as compared to other companies.

The second result was that the application of the quality management practices has no relationship with being ISO 9000 certified. This result was found when the explanation of the total variation was analysed. When it was analysed in more detail, the only factor having a relation with ISO 9000 certification was to have strategic planning.

The third finding was proving the relationship between the belief of ISO 9000 guaranteeing the quality result and leadership.

According to the results that was mentioned above the best strategy for the local SME's in order to become a world-class-manufacturer was figured out. This helped to answer the last question of this paper. The best strategy was found to be "six-sigma benchmarking". Six-sigma will help the local SME's to become world-class-manufacturers as they will be benchmarking the other world-class manufacturers. As the above findings are also supporting this strategy it is believed that six-sigma together with benchmarking will be helpful and useful for the Turkish electric-electronic SME's.

In addition to the findings stated above, this paper was restricted with only SME's, while it should be looked at large scale firms for a comparative purpose.

REFERENCE LIST:

- [1] Jeng, Yann-Chyn, Performance Evaluation of ISO 9000 Registered Companies in Taiwan, The TQM Magazine, Vol. 10, Issue 2, 1998.
- [2] Quazi, H.A. & Padibjo, S.R., A journey toward total quality management through ISO 9000 certification- a study on small-and medium-sized enterprises in Singapore, International Journal of Quality & Reliability Management, Vol. 15, Issue 5, 1998.
- [3] Brown, A., Wiele van der, T. and Loughton, K., Smaller Enterprises' Experiences With ISO 9000, International Journal of Quality & Reliability Management, Vol.15, Issue3, 1998.
- [4] Laszlo, G., ISO 9000 or TQM: which approach to adopt- a Canadian case study, The TQM Magazine, Vol 10, Issue 5,1998.
- [5] Russell, R. S. & Taylor, B. W.,. Operations Management, Fourth Edition, 2003, Prentice Hall.