

**ARE TQM PRINCIPLES IMPLEMENTED BY LARGE COMPANIES AND SMES  
SIMILAR IN TURKEY?**

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**ABSTRACT**

ISO 9001: 2000 Quality Management Systems (QMS): Requirement standards are based on Total Quality Management (TQM) approach. Moreover large companies can easily adopt to ISO 9001: 2000 certification due to their quality improvement efforts, Small and Middle Scale Enterprises (SMEs) can meet with some difficulties. Due to the fact that ISO 9001: 2000 QMS standard has been certificated since 2000, it is expected that the TQM principles which are customer focus, leadership, employee involvement, process approach, system approach, continuous improvement, decisions based on facts, relationships with supplier's mutual benefits, have been implemented both in large companies and SMEs.

The purpose of this paper is to find out the differences of TQM implementation levels between large companies, SMEs and to determine the principles in which SMEs need improvement on TQM in Turkey.

Each principles of TQM were investigated with several questions in this questionnaire with 5-Likert scale. The response rate is 11.5%. It is founded that four principles of TQM in Turkey are better managed by large companies than SMEs: leadership, employee involvement, continuous improvement, and decisions based on facts. Also, the results were compared with other countries.

In additionally, same questionnaire is applied in 2010 both SMEs and large companies in Turkey and results are compared with 2005.

**Keywords:** Total quality management, TQM principles, ISO 9001: 2000 quality management systems, Requirement standard, Questionnaire on SMEs.

**TKY PRENSİPLERİ TÜRKİYE'DE, BÜYÜK ÖLÇEKLİ FİRMALAR VE KOBİLER  
TARAFINDAN BENZER ŞEKİLDE Mİ UYGULANMAKTADIR?**

**ÖZ**

ISO 9001: 2000 Kalite Yönetim Sistemi (KYS): Şartlar standardı, Toplam Kalite Yönetimi (TKY) yaklaşımına dayanmaktadır. Büyük ölçekli firmaların ISO 9001: 2000 standardına uyumu daha önceki kalite geliştirme çabalarının var olması sebebiyle daha kolay gerçekleşirken, küçük ve orta ölçekli firmalar (KOBİ) bu süreçte bazı zorluklarla karşılaşmaktadırlar. ISO 9001: 2000 KYS standardı 2000 yılından itibaren yürürlükte olmasına rağmen, TKY prensipleri; müşteri odaklılık, liderlik, çalışanları katılımı, süreç yaklaşımı, sistem yaklaşımı, sürekli iyileşme, gerçeklere dayalı karar verme ve tedarikçilerle karşılıklı çıkara dayalı ilişki, hem büyük ölçekli hem de KOBİ'ler tarafından halen yerleştirilmeye çalışılmaktadır.

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Bu çalışmanın amacı, Türkiye genelinde TKY prensiplerinin büyük ölçekli firmalar ve KOBİ'ler tarafından yerleştirilme seviyeleri arasındaki farklılıklarını ortaya koymak, KOBİ'lerin geliştirilmesine ihtiyaç duydukları TKY prensiplerini belirlemektir.

Her bir TKY prensibi, yapılan ankette değişik sorular ile araştırılmış ve 5'li Likert ölçeği kullanılmıştır. Anket geri dönüşüm oranı %11,5. olmuştur. Araştırma sonucunda, dört prensibin Türkiye'deki büyük ölçekli firmalar tarafından KOBİ'lere göre daha iyi yönetildiği ortaya çıkmıştır. Bu prensipler ise, liderlik, çalışanları katılımı, sürekli iyileşme ve gerçeklere dayalı karar verme prensipleri olduğu tespit edilmiştir. Ayrıca, sonuçlar diğer ülke araştırma bulguları ile de karşılaştırılmıştır.

Ek olarak, aynı anket 2010 yılında Türkiye'deki hem KOBİ'lere hem de büyük ölçekli firmalara uygulanmış ve sonuçlar 2005 yılı ile karşılaştırılmıştır.

**Anahtar Kelimeler:** Toplam kalite yönetimi, TKY prensipleri, ISO 9001: 2000 Kalite yönetim sistemi, Şartlar standardı, KOBİ üzerine anket.

## 1. INTRODUCTION

The definition of total quality was endorsed in 1992 by the chairs and CEOs of corporations and Deans of universities such as: "Total quality is a people focused management system that aims at continual increase in customer satisfaction at a continually lower real cost. Total quality is a total system approach (not a separate area or program) and an integral part of high-level strategy" (Evans & Dean, 2003). Evans & Dean mentioned six three basic elements of total quality:

- Customer focus,
- Process orientation,
- Continuous improvement and learning,
- Empowerment and teamwork,
- Management by fact,
- Leadership and strategic planning.

Customer focus means understanding customer needs and expectations both current and future, and adopting them to the organization's strategic planning, product or service design, and all work that is related to the customer. It is important to take not only dissatisfaction information of the customer but also the customer's perceptions. Process orientation focuses on the sequence of activities that is intended to achieve the results. Continuous improvement is a part of the management in order to achieve the highest performance of organizations. The learning means that the activities come from continuous improvement studies reflected in daily work. Empowerment means giving people authority to make decisions take risks and learn from mistakes. Everyone must participate in quality improvement efforts as a teamwork philosophy. Collecting and analyzing data with real-time and taking decisions based on this data analysis is

called management by fact. Leadership is important for the implementation of quality. Leaders must direct to the organization with setting strategic planning by considering needs and expectations of customers and shareholders.

Two aspects are added to the previous total quality elements and these are the eight principles of Total Quality Management in ISO9000:2000 QMS: Fundamentals and Vocabulary (2001):

- System approach
- Relationship with supplier's mutual benefits

System approach is to set the methodology for doing tasks and documenting on them. Our product quality is connected with our supplier quality. So it is important to develop their quality levels. Mentioned elements are the basis of TQM. The implementation level of each element shows the organization's quality level. So, the eight principles of TQM were researched with a questionnaire to determine the levels of TQM in both SMEs and large companies in this study.

ISO 9000 series standards have been accepted from companies since the 1990's. Although ISO 9000 series standards (published 1994) consider Quality Assurance System, ISO9001: 2000 QMS takes care of TQM approach. For this reason, companies changed their quality systems from quality assurance to the total quality management philosophy. Some of the new topics like process approach, continuous improvement, management with leadership, taking customer needs and expectations, analyzing perceptions, using more statistical techniques come with ISO9001:2000 QMS to the companies especially to SMEs. These qual-

ity principles introduced in ISO 9000:2000 QMS: Fundamentals and Vocabulary (2001) are the basis of ISO9001:2000 QMS standard. Although some aspects like employee satisfaction, rewarding employees, team work and the suggestion system take in TQM philosophy, they are not required by ISO9001:2000 version. The questionnaire in this study covers both topics in ISO9001:2000 version and remaining of TQM philosophy.

It is expected that these TQM principles have been applied by both SMEs and large companies with certified ISO9001:2000 version standard since 2000. In this paper, this expectation was researched with a questionnaire.

There are two main purposes of this paper: First is to determine the implementation level of the eight principles of TQM in both SMEs and large companies. The second is to find out whether the differences of implementation levels of TQM principles between SMEs and large companies and if there is, to determine the TQM principles in which SMEs fail by surviving. For these reasons the questionnaire was designed with eight titles that are eight principles of TQM. The questionnaire was applied firstly in one city (Eskisehir) in Turkey with a total of 45 responses as a pilot study. Results of the aforementioned study were discussed in congress. (Erginel, 2005). After that, the application of this questionnaire was extended to several cities in Turkey. This questionnaire was sent to a total 950 companies in Turkey by mail, fax, telephone and web portal and 109 responses were received.

A brief literature review of TQM, methodology of this study, and survey results which includes a general evaluation on eight TQM principles is given in the following sections. The conclusions are given in the last section of this study.

Rao et al. were collected data about quality management system from five countries: USA, India, China, Mexico and Taiwan. They found that ISO 9000 registered companies exhibited higher levels of quality leadership, information and analysis, strategic quality planning, human resource development, quality assurance, supplier relationships, customer orientation and quality results (Rao, 1997). Rao et al. gave the structure to research the application levels of TQM. Quazi et al. uses the questionnaire developed by Rao et al. (Quazi, 2002; Rao, 1999). They revealed that the ISO certification does not affect quality management practice and quality

results of firms in Singapore to the contrary of Rao (Rao, 1997). Wilkens et al. found out that SMEs are, in general, aware of the existence of the European Foundation for Quality Management (EFQM) model but do not fully understand how they can derive benefits from self-assessment against its criteria (Wilkens, 1998). Quek et al. used 5-Likert scale to investigate the level of implementation of TQM in Malaysia by comparing the large companies and SMEs (Quek, 2003).

Sturkenboom et al. said that SMEs choose either an informal quality system or a formal quality system such as ISO9001:2000 system. If SMEs develop their informal quality system, they provide them with the self-assessment models in four issues: customer focus, participation, teamwork, and continuous improvement (Sturkenboom, 2001).

There are three past studies on Total Quality Management in Turkey. Beskese et al. investigated the current situation of the implementation of TQM and ISO9000 among Turkish companies (Beskese, 2001). The data was collected during 1997 and 1998. At this time, the 1994 version of ISO9000 standard was validated. Bayazit determined that the TQM implementation status for the large companies in Turkey is fairly mature (Bayazit, 2003), he examined only the large companies in Turkey. The implementation levels of TQM were investigated in the Turkish Cement Industry (Öztaş et al., 2004). They found that the importance of TQM has increased in the Turkish Cement Industry because of customers' demand.

The aim of this study is to state expressly the differences between SMEs and large companies in a different sector in Turkey for the understanding and implementation levels of TQM principles between. In this way, SMEs and large companies in Turkey can recognize their strong and weak sides by implementing total quality management approach. Also, companies that have some weaknesses on TQM principles can make a benchmarking to the other companies that have higher levels. At the same time this paper will provide a contribution to the literature on the present status of both SMEs and large companies on TQM principles in Turkey with a widely research.

Following the description of the methodology employed in the study, discussions that include some knowledge of respondents, hypotheses and the results from the survey are given. The conclusion presents the summary highlighting of the important inference from this study.

## 2. METHODOLOGY

The survey instrument was prepared by considering eight main titles that are the eight principles of TQM. At the same time, the study and questionnaire of Rao et al. helped design the questionnaire (Rao, 1999). The first four questions are related to the size of company, the time of the certification of ISO9001 (including 2000 version and old versions), sector information and customer profile that are in the same city, region, national and international. The rest of questionnaire (47 questions) are scaled to a five-point Likert with a score of 1 relating to "strongly disagree", 2: "disagree", 3: "no-comment", 4: "agree" and 5 meaning "strongly agree".

These questionnaires were sent to the companies that have certification ISO9001:2000 QMS. The questionnaire was mailed or faxed using web portal to these companies with the support of the Chamber of Cities Industry and Turkey Society of Quality. Some questionnaires were closely monitored, and telephone calls were made to the companies that did not respond. Some companies' management was informed about the questionnaire by e-mail. In this e-mail, they were directed to the web pages of the questionnaire. Companies' e-mail was found on the web pages of the Chamber of Cities Industry. The questionnaire was applied during 2005 in Turkey. 109 responses were received from both SMEs and large companies.

The first four questions were shown graphically. The rest of the questions were evaluated by the five-point Likert methodology. The analysis is made with MINITAB 14.0 statistical programs. There are some open-ended questions (15., 44., 45. questions). These questions are related to usage of some strategic planning tools, and some basic and advanced statistical techniques. The evaluations of these questions are shown graphically. The conclusions of this research are given in the last section.

## 3. ANALYSIS

The first table is related to the size of the companies and the number of responses. In this study small and medium size companies were introduced to SMEs. The size is connected to the number of employees. Classification of the companies, number of respondent and percents are given in Table 1. For these responses the proportion of SMEs is 56.8%; large companies is 43.2%.

Reliability was measured of the questionnaire for credibility by Cronbach's Alpha. The reliability results are given in Table 2. As can be seen, the reliabilities of the questionnaire for each title are rather high values. Only the reliability of system approach is less than the others. The reason for this could be that the system approach contains only two questions. The overall reliability result of the questionnaire is the high values with 0.9672.

The distribution of having ISO9001 certifications are shown in Figure 1. The biggest proportion of companies had this certificate for between 5-10 years. It is denoted that most companies have experience in implementing TQM principles.

The first hypotheses are set to research whether the experience that describes having ISO9001:2000 certification for 5 and more than 5 years, is affected in the implementation level of TQM.

### (i) Hypotheses

$$H_0: \mu_{\text{ISO9001} (< 5 \text{ years})} = \mu_{\text{ISO9001} (\geq 5 \text{ years})}$$

$$H_a: \mu_{\text{ISO9001} (< 5 \text{ years})} \neq \mu_{\text{ISO9001} (\geq 5 \text{ years})}$$

It can be said that experience with ISO9001 are not affected by the implementation of TQM principles with Table 3. The significance level of all hypotheses was selected as 0.05 ( $\alpha=0.05$ ). Similarly this conclusion, Quazi et al. said that there is no statistical significant relationship between ISO9000 registration status and quality management practices for experience (Quazi, 2002). In contrast, Rao et al who found that ISO certification did affect quality management practices (Rao, 1997). However companies that haven't ISO certification were not considered.

The distribution of the companies by sector is given in Figure 2. Although the metal industry has the biggest portion, there are many companies in several sectors. Figure 3 shows the customer profile of the respondents. Approximately 60% of the respondent have national customers and 40% of the respondents have international customers.

Table 4 shows that the summary of the mean score of each item in the questionnaire and the overall mean of each of the 8 principles of TQM are both large companies and SMEs. As can be seen, the mean score ranges for each item in the questionnaire from 3.35 to 4.50. These values are considerably bigger than the no-comment value which is 3.00. However, the overall mean score for each of the 8 principles of TQM ranges from 3.78 to 4.30. The analysis of each TQM principles are given in the following subsections.

Table 1. Breakdown of the respondents to their size of industry

Size of company	No. of respondent	Percent (%)
Small (< 50 employees)	26	23.8
Medium (50-200 employees)	36	33.0
Large (> 200 employees)	47	43.2
Total	109	100

Table 2. Reliability results

	No. of cases	Alpha
Customer focus	9	0.8702
Leadership	7	0.8493
Employee involvement	8	0.8830
Process approach	5	0.9233
System approach	2	0.6809
Continuous improvement	7	0.9215
Decisions based on facts	4	0.7996
Relationship with supplier's mutual benefits	6	0.8529
Overall	109	0.9672

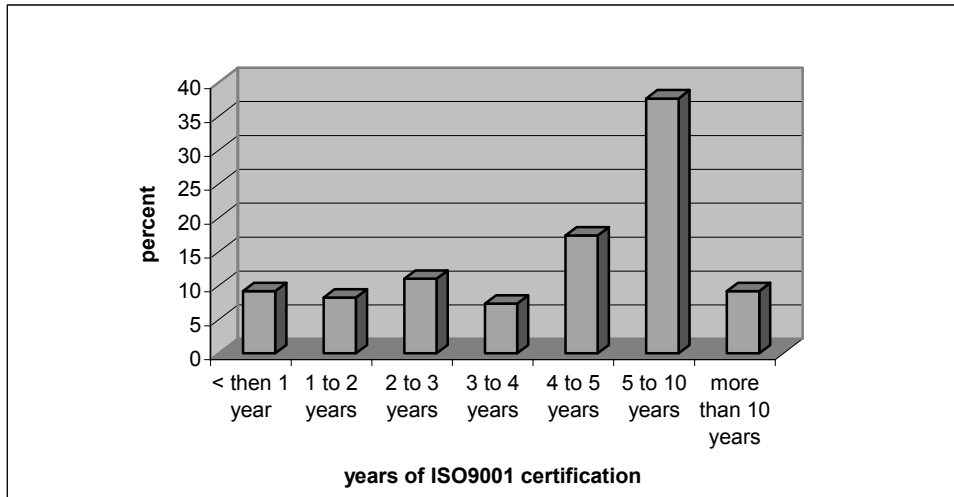


Figure 1. No. of years of ISO9001 certification

Table 3. Two-sample t test results of company's experience

$\mu$ ISO9001 (< 5 years)	$\mu$ ISO9001 ( $\geq$ 5 years)	$t_{cal}$	p-value	Result ( $\alpha=0,05$ )
3.934 (n=59)	4.141 (n=50)	-1.80	0.075	Not Sig.

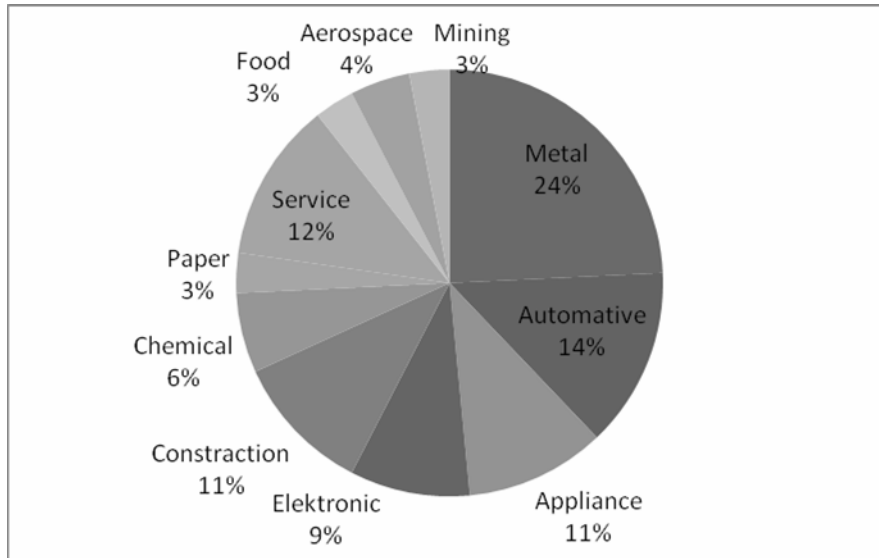


Figure 2. Distribution of the respondents by sector

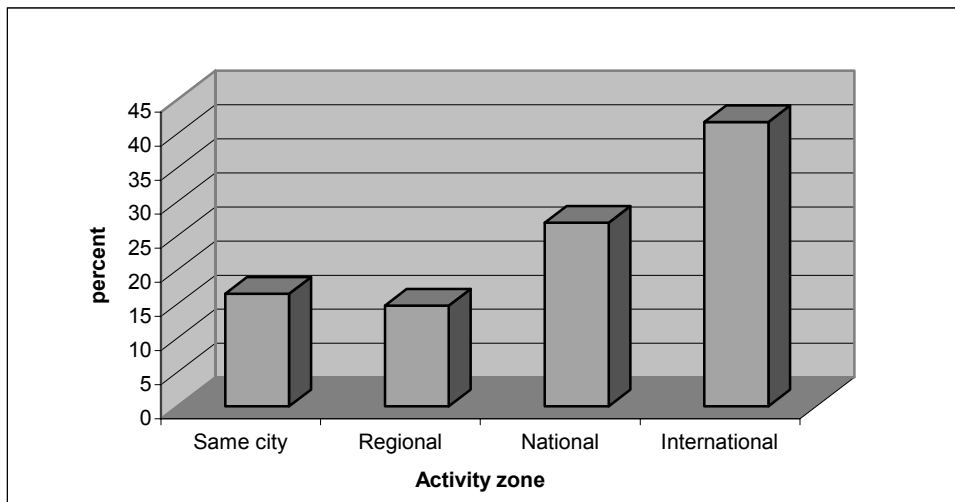


Figure 3. Distribution of the respondents by activity zone

### 3.1 Customer Focus

Customer focus gave the highest overall mean rating of 4.30. Customer focus's overall mean is a surprising result because of the new topic on ISO9001:2000 version standard. It could be concluded that the companies could understand the importance of customer focus and they could easily adopt the requirements of them. Mandal et. al. have indicated that companies were aware of the importance of customer focus since the 1980's (Mandal, 1999). The "have a specified approach in place for collecting and dealing with customer complaints" and "extend to which specifications for product/service requirements from the customer for

delivery and post-delivery activity are met" questions (Q9-Q8) have the highest scale in customer focus title. It concludes that the customer complaints and specific expectations are met by companies. "Extend to which the specified approach is in place for perception of customer satisfaction is effectively applied" question (Q12) have the lowest scale in customer focus title. It shows that the meaning of *perception* is less understood than the *complaints* by companies.

Table 4. The mean of eight principles of TQM practice both SMEs and large companies

Eight principles of TQM practice	Item no.	Mean	Overall mean
Customer focus	Q5	4.43	4.30
	Q6	4.21	
	Q7	4.30	
	Q8	4.47	
	Q9	4.49	
	Q10	4.31	
	Q11	4.25	
	Q12	3.97	
	Q13	4.19	
Leadership	Q14	4.50	4.15
	Q15	3.57	
	Q16	4.11	
	Q17	4.02	
	Q18	4.39	
	Q19	4.31	
	Q20	4.15	
Employee involvement	Q21	4.11	3.81
	Q22	4.18	
	Q23	3.52	
	Q24	4.16	
	Q25	3.83	
	Q26	3.67	
	Q27	3.45	
	Q28	3.52	
	Process approach	Q29	
Q30		4.06	
Q31		4.06	
Q32		3.84	
Q33		3.98	
System approach	Q34	3.89	4.10
	Q35	4.30	
Continuous improvement	Q36	3.91	3.86
	Q37	3.99	
	Q38	3.64	
	Q39	3.81	
	Q40	3.78	
	Q41	4.01	
	Q42	3.86	
Decisions based on facts	Q43	4.08	3.78
	Q44	3.70	
	Q45	3.35	
	Q46	3.99	
Relationship with supplier's mutual benefits	Q47	4.22	4.04
	Q48	3.96	
	Q49	3.76	
	Q50	4.27	
	Q51	3.98	
	Q52	4.05	

### 3.2 Leadership

Generally, “quality policy, goals and targets have been clearly defined by the top management” question (Q14) have the highest range in leadership title both SMEs and large companies. It is said that ISO9001:2000 QMS looks for quality policy, goals and targets from companies. Because of applying this questionnaire only to certified companies, all companies have quality policy, goals and targets. It is seen that the extension of them are provided to their employee with the question “*importance of policy, goals and targets is clearly reflected from top management through to employee level*” (Q 16). Some strategic planning tools like *Balance scorecard, SWOT analysis, etc.*, were used with the lowest range in leadership title with question (Q 15)

### 3.3 Employee Involvement

Employee involvement has one of the lowest overall means in all TQM principles with 3.81. “*Availability of resources for the carrying out of on-the-job employee training*” question (Q22) has the highest ratio in employee involvement. But “*extend to which training in basic statistical techniques (such as using histograms, Pareto diagrams, cause and effect analysis, etc) is provided to employees by the company*” question (Q23) has the one of the lowest ratios. It concludes that the meaning of on-the-job training is only related to using machines, tools etc. not analyzing the data. The lowest ratio of employee involvement title is about the question “*extend to which the scheme for rewarding employees is effectively applied to the company*” (Q26). In others the lowest ratio is related to question (Q28) “*level of increase of job satisfaction according to the number of years since implementation*”. It is shown that studying of an employee involvement is not so satisfactory in Turkish companies.

### 3.4 Process Approach

“Extent to which the processes of company are defined and responsible management is determined” question (Q29) has the highest scale “extend to which top management renew performance indicators if and when necessary” question (Q32) has the lowest scale in process approach title. It concludes that the process and performance indicators were defined by companies but the improvement of process is not so sufficient in Turkey.

### 3.5 System Approach

There are two questions in the system approach title that are “extend to which interactions between processes are determined and its appropriateness to the whole management process (Q34)” and “extent to which the ISO 9001:2000 documentation system are effectively applied (Q35)”. They are provided based on the requirements of ISO9001: 2000 QMS with the high ratio on TQM principles.

### 3.6 Continuous Improvement

Continuous improvement is the second lowest rating with 3.86 in Table IV. Continuous improvement includes “team working” and “suggestion system” for improvement. ISO9001:2000 version doesn’t require “team working” and “suggestion system”. This could indicate that although companies could apply ISO9001: 2000 version standard requirements, but they could be still struggling to find the methods for continuous improvement.

“Extent to which top management review quality targets periodically” question (Q41) is the highest ratio in the continuous improvement title. It is seen that reviewing quality targets periodically is well managed by companies. “Extend to which employee suggestions are applied” question (Q38) is the lowest ratio, but it is not that low.

### 3.7 Decisions Based on Facts

The lowest overall mean is the decision based on facts principle with 3.78. It could be said that the importance of the statistical tools will be understood by observing the benefits of them. It can be said that the introduction/ training program for statistical tools is required. “Extent to which the quality data (such as test/ measurement results, scarp levels, rework levels, etc.) are collected” question (Q43) has the highest scale. “Extent to which several advanced statistical techniques (such as control charts, regression analysis, design and analysis of experiment, FMEA, QFD, etc.) are used while analyzing quality data” has the lowest question (Q45) in decisions based on facts. It is said that data is collected but there are some problems in the analyzing of this data.



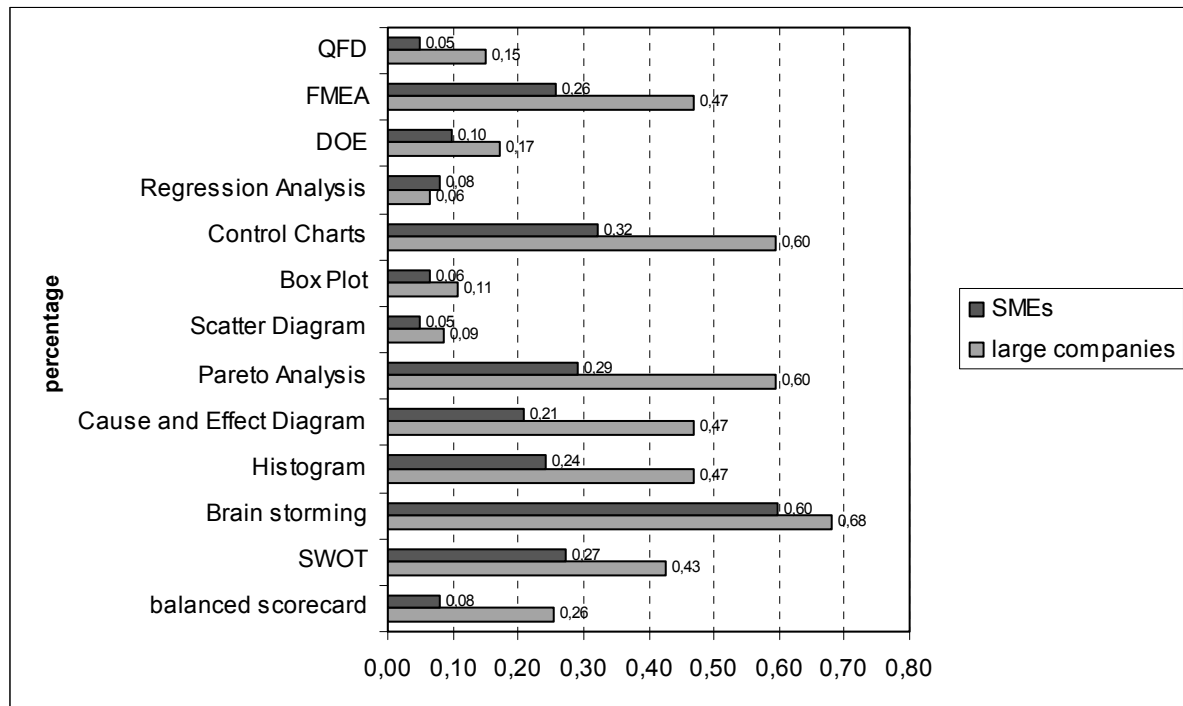


Figure 4. The ratio of using statistical tools by SMEs and large companies

Figure 4 shows that the ratio of the using statistical tools by large companies and SMEs. It is seen that the strategic planning tools like Balanced Scorecard and SWOT Analysis are used more by large companies than SMEs. SWOT Analysis was adopted by 43% of the large companies for determining their strength, weakness, opportunities and threats, these are in the high ratio.

The basic problem solving tools that are Brain Storming, Histogram, Cause and Effect Diagram, Pareto Analysis, Scatter Diagram, Box Plot and Control Charts are used more by large companies than SMEs. Brain Storming, Pareto Analysis and Control Charts are the most used tools by both large companies and SMEs.

The advanced tools that are Regression Analysis, Design of Experiments (DOE), Failure Mode and Effect Analysis (FMEA) and Quality Function Deployment (QFD) were used more by large companies than SMEs, like other tools. FMEA is the most preferred tool (large companies 43%, SMEs 25%) for advanced evaluation of data. As a result, basic problem solving tools are the most preferred tools by both large companies and SMEs and the statistical tools are approximately used twice as much as in large companies than SMEs. It is seen that, 29 out of 59 (49%) of companies have used the problem solving techniques in Malaysia in 2000 (Quek, 2003).

### 3.8 Relationship with Supplier's Mutual Benefits

In general, relationships with supplier's mutual benefits principles are well managed by companies in Turkey. While "extent to which long term relationships are conducted with suppliers" is the highest ratio, "extent to which suppliers are selected based on quality rather than price" is the lowest ratio in relationship with supplier's for mutual benefits. It could be said that the price is one of the critical factors for choosing the supplier.

Further to this, two main statistical tests are used to justify the understanding and implementation level of TQM eight principles among SMEs. One-sample t-test was carried out to investigate if the overall mean of the eight principles of TQM on SMEs is bigger than the no-comment value (=3.0).

- (ii) Hypotheses  
 $H_0: \mu_{SMEs} = 3.00$   
 $H_a: \mu_{SMEs} > 3.00$

Table 5. One-Sample t-test results of eight principles of TQM on SMEs

	$\mu_{SME}$	$t_{cal}$	p-value	Result ( $\alpha=0.05$ )
<b>Grand mean</b>	3.906	25.03	0.000	Sig.
Eight principles of TQM				
Customer focus	4.231	18.61	0.000	Sig.
	4.012		0.000	
Leadership	3.649	11.96	0.000	Sig.
Employee involvement	4.013	6.34	0.000	Sig.
	4.113		0.000	
Process approach	3.714	9.68	0.001	Sig.
System approach	3.528	10.35	0.001	Sig.
	3.992		0.000	
Continuous improvement		6.54		Sig.
Decisions based on facts		4.34		Sig.
Relationship with supplier's mutual benefits		11.98		Sig.

The results of the test are given in Table 5 with a 5% significant level. Grand mean and all the overall means of the eight principles of TQM are significantly bigger than 3.00. It shows that all TQM principles are implemented by SMEs. According to Table 5, customer focus gave the highest overall mean rating of 4.23; and the decision based on facts gave the lowest rating 3.53 for only SMEs. It should be investigated as to whether there are any significant differences between the eight principles' overall means for SMEs. This is the third hypotheses. One-way ANOVA was carried out for this purpose.

(iii) Hypotheses

$$H_0: \mu_{\text{costum}} = \mu_{\text{leader}} = \mu_{\text{employ}} = \mu_{\text{process}} = \mu_{\text{system}} = \mu_{\text{cont}} = \mu_{\text{dec.fact}} = \mu_{\text{relat.suppt}}$$

$$H_a: \text{At least two of the means are not equal.}$$

The results of the test are given in Table 6 and evaluated with a 5% significance level.  $H_0$  is rejected, so it indicates that there is at least one mean difference from the others. Since  $H_0$  is rejected, multiple comparison tests should be applied. ANOVA analysis indicates that customer focus and system approach are significantly better managed than continuous improvement, employee involvement and decisions based on facts for SMEs. In addition, overall means of process approach, overall means of leaderships and overall means of relationship with supplier's mutual benefits are significantly bigger than the

overall means of decisions based on facts for SMEs. It could be said that SMEs need more study, especially in continuous improvement, employee involvement and decisions based on facts aspects.

Yusof et al. (Yusof et al., 2000) said that companies lack of practice in areas including continuous improvement system, supplier quality assurance and improvement tools and techniques in the UK automotive SMEs. The same results have been obtained for continuous improvement system and improvement tools and techniques with this study for SMEs, both in the UK automotive industry and in Turkey for several sectors.

This analysis was made for the large companies. One-way ANOVA was set to investigate whether there are any significant differences between the overall means of the 8 principles of TQM on large companies.

(iv) Hypotheses

$$H_0: \mu_{\text{costum}} = \mu_{\text{leader}} = \mu_{\text{employ}} = \mu_{\text{process}} = \mu_{\text{system}} = \mu_{\text{cont}} = \mu_{\text{dec.fact}} = \mu_{\text{relat.suppt}}$$

$$H_a: \text{At least two of the means are not equal.}$$

p-value in Table 7 is bigger than the significant level (p-value=0.179 >  $\alpha=0.05$ ,  $H_0$  is not rejected). It concludes that there is not any statistically significant difference between means of eight principles of TQM in large companies in contrast with SMEs. It could be said that large companies are well managed in all TQM principles.

Table 6. One-Sample t-test results of eight principles of TQM on SMEs

<b>ANOVA</b>					
Analysis of Variance for means					
Source	DF	SS	MS	F	P
principl	7	25.997	3.714	6.12	0.000
Error	488	296.070	0.607		
Total	495	322.067			

Level	N	Mean	StDev	Individual 95% CIs For Mean Based on Pooled StDev		
cust.foc	62	4.2312	0.5209	-----+-----+-----+----- (-----*-----)		
leadersh	62	4.0115	0.6662	(-----*-----)		
emplo.in	62	3.6492	0.8069	(-----*-----)		
process	62	4.0129	0.8241	(-----*-----)		
system a	62	4.1129	0.8465	(-----*-----)		
cont. im	62	3.7143	0.8603	(-----*-----)		
decis.fa	62	3.5282	0.9593	(-----*-----)		
supplier	62	3.9919	0.6518	(-----*-----)		
Pooled StDev = 0.7789				3.60	3.90	4.20

Table 7. One Way ANOVA results of large companies between eight principles of TQM

<b>ANOVA</b>					
Analysis of Variance for principles					
Source	DF	SS	MS	F	P
grup	7	5.892	0.842	1.46	0.179
Error	368	211.723	0.575		
Total	375	217.614			

Level	N	Mean	StDev	Individual 95% CIs For Mean Based on Pooled StDev		
cust.foc	47	4.3806	0.5317	(-----*-----)		
leadersh	47	4.3313	0.6641	(-----*-----)		
employ.i	47	4.0133	0.6677	(-----*-----)		
process	47	4.1319	0.9702	(-----*-----)		
system a	47	4.0745	0.8906	(-----*-----)		
cont.imp	47	4.0456	0.8394	(-----*-----)		
decis.fa	47	4.1117	0.8056	(-----*-----)		
supplier	47	4.1028	0.5873	(-----*-----)		
Pooled StDev = 0.7585				4.00	4.25	4.50

Two-sample t-test were made to investigate whether there are any significant difference in the mean of general and eight principles of TQM between SMEs and large companies in the fifth hypotheses.

(v) Hypotheses

$$H_0: \mu_{SMEs} = \mu_{large\ companies}$$

$$H_a: \mu_{SMEs} \neq \mu_{large\ companies}$$

for each eight principles of TQM.

This analysis indicates that the grand mean of 8 principles of TQM of large companies is significantly higher than the grand mean of SMEs in Table 8 ( $\alpha=0.05$ ). Table 8 shows that

the means of leadership, employee involvement, continuous improvement and decision based on facts principles of TQM in large companies are better than the means of SMEs ( $\alpha=0.05$ ). For continuous improvement, this result concurs with Quek et al. (2003) findings on Malaysian SMEs, the SMEs may face problems in competing with large companies in employing continuous improvement as a tool towards achieving total quality. One reason could be that SMEs do not use statistical tools as much as the large companies. The evidence of this can be seen in Figure 4.

Table 8. Two-sample t-test of general and 8 principles of TQM between SMEs and large companies

	$\mu$ SME	$\mu$ large	$t_{cal}$	p-value	Result ( $\alpha=0.05$ )
<b>Grand mean</b>	3.9065	4.149	4.55	0.000	Sig.
Eight principles of TQM					
Customer focus	4.2312 4.0115	4.3806 4.3313	-1.47	0.146	Not sig.
Leadership	3.6492	4.0133	-2.49	0.015	Sig.
Employee involvement	4.0129 4.1129	4.1319 4.0745	-2.58	0.011	Sig.
Process approach	3.7143	4.0456	-0.68	0.501	Not sig.
System approach	3.5282 3.9919	4.1117 4.1028	0.23	0.820	Not sig.
Continuous improvement			-2.02	0.046	Sig.
Decisions based on facts			-3.45	0.001	Sig.
Relationship with supplier's mutual benefits			-0.93	0.354	Not sig.

Table 8 shows that there is not any statistically significant difference for customer focus, process approach, system approach and the relationship with supplier's mutual benefits between large companies and SMEs. It can be concluded that these principles set on the companies by helping ISO9001:2000 QMS certification. And, it could be said that the top management conform to their management system in the process approach.

The management with targets examined in leaderships. Leadership is significantly better managed in large companies than in SMEs according to Table 8. It may be said that the top management of SMEs are just struggling to change their management system to the management with target.

There are some questions (26, 27, 28, 36, 37, 38) that are only related with TQM. These questions aren't a requirement of ISO9001:2000 version. Some of these are related to the reward of an employee, degree of satisfaction of employee, team working and suggestion system. Two-sample t-test carried out to investigate whether there is significant difference between SMEs and large companies for only the mean of these questions in sixth hypotheses.

(vi) Hypotheses

$$H_0: \mu_{SMEs} = \mu_{large\ companies}$$

$$H_a: \mu_{SMEs} \neq \mu_{large\ companies}$$

for only TQM aspects.

According to Table 9, rewarding of employee, working for the satisfaction of employee, team working and suggestion system are similar managed by large companies and SMEs. It could be said that companies both SMEs and large companies, did not consider so many topics out of ISO9001: 2000 version standard. But these topics are important to survive the implementation of TQM.

If we examined the having suggestion system in companies, it is found that 69 out of the 109 respondents (thus 63.3%) of both large companies and SMEs had a suggestion system in Turkey in 2005. Beskese (2001) also note that 49 out of 87 respondents (thus 56%) had a suggestion system in Turkey in 1997-1998. It is denoted that the usage of a suggestion system has increased since 1998 up to 2005 in Turkey. But this increase is not so satisfactory.

In additionally, same questionnaire is applied totally 36 large companies and SMEs in Turkey in 2010. Related hypothesis is given as follows. Table 10 shows that the differences of SMEs on the 8 principles of TQM between in 2005 and in 2010. Table 11 shows that the differences of large companies on the 8 principles of TQM between in 2005 and in 2010.

Table 9. Two-sample t-test result for only TQM aspects.

$\mu$ SMEs	$\mu$ Large companies	$t_{cal}$	p-value	Result ( $\alpha=0.05$ )
3.581 (n=62)	3.851 (n=47)	-1.60	0.112	Not Sig.

Table 10. Two-sample t-test of SMEs general and 8 principles of TQM between in 2005 and 2010.

	$\mu$ SMEs_2005	$\mu$ SMEs_2010	$t_{cal}$	p-value	Result ( $\alpha=0.05$ )
<b>Grand mean</b>	3.9065	4.052	-2.51	0.013	Sig.
Eight principles of TQM					
Customer focus	4.2312 4.0115	4.114 4.151	0.9	0.374	Not sig.
Leadership	3.6492 4.0129	3.741 4.111	-0.92	0.364	Not sig.
Employee involvement	4.1129 4.1129	4.381 4.381	-0.54	0.593	Not sig.
Process approach	3.7143 3.5282	4.063 4.480	-0.58	0.562	Not sig.
System approach	3.9919 3.9919	3.802 3.802	-1.804	0.077	Not sig.
Continuous improvement			-2.29	0.025	Sig.
Decisions based on facts			-3.29	0.002	Sig.
Relationship with supplier's mutual benefits			1.20	0.240	Not sig.

Table 11. Two-sample t-test of large companies general and 8 principles of TQM between in 2005 and 2010.

	$\mu$ large_2005	$\mu$ large_2010	$t_{cal}$	p-value	Result ( $\alpha=0.05$ )
<b>Grand mean</b>	4.149	4.173	-0.32	0.752	Not sig.
Eight principles of TQM					
Customer focus	4.3806 4.3313	4.320 4.422	0.46	0.650	Not sig.
Leadership	4.0133 4.1319	4.038 4.144	-0.54	0.592	Not sig.
Employee involvement	4.0745 4.0745	4.567 4.567	-0.10	0.925	Not sig.
Process approach	4.0456 4.1117	4.078 4.067	-0.06	0.955	Not sig.
System approach	4.1028 4.1028	3.778 3.778	-2.32	0.027	Sig.
Continuous improvement			-0.14	0.891	Not sig.
Decisions based on facts			0.21	0.832	Not sig.
Relationship with supplier's mutual benefits			1.84	0.078	Not sig.

Table 10 indicates that SMEs shows improvement for “continuous improvement” and “decisions based on facts” TQM principles from 2005 to 2010. Other TQM principles are the same between mentioned years. Also, the grand mean of SMEs improves from 2005 to 2010. “System approach” principle shows the improvement for large companies from 2005 to 2010 as seen in Table 11. Eighth hypothesis is given as follows. Other principles and the grand mean don’t show any significant improvement from 2005 to 2010 for large companies in Turkey.

(vii) Hypotheses

$$H_0: \mu_{\text{SMEs (2005)}} = \mu_{\text{SMEs (2010)}}$$

$$H_a: \mu_{\text{SMEs (2005)}} \neq \mu_{\text{SMEs (2010)}}$$

for each eight principles of TQM.

(viii) Hypotheses

$$H_0: \mu_{\text{large companies (2005)}} = \mu_{\text{large companies (2010)}}$$

$$H_a: \mu_{\text{large companies (2005)}} \neq \mu_{\text{large companies (2010)}}$$

According to Table 12, there is no any significant difference between SMEs and large companies in 2010 for any principles of TQM. The hypothesis related to Table 12 is given in the following. Also, the grand mean doesn’t shows any differences SMEs and large companies in 2010. They are indicate that SMEs show improvement on the principles of TQM and catch the level of large companies.

(ix) Hypotheses

$$H_0: \mu_{\text{SMEs (2010)}} = \mu_{\text{large companies (2010)}}$$

$$H_a: \mu_{\text{SMEs (2010)}} \neq \mu_{\text{large companies (2010)}}$$

#### 4. RESULTS AND DISCUSSION

- It is found that there aren’t any statistically significant differences between the companies that have ISO9001 standard since 5 and more than 5 years, and less than 5 years. It could conclude that the experience has not affected the implementing of TQM practice in Turkey.
- Grand mean and all the overall mean of the eight principles of TQM are significantly bigger than 3.00 of SMEs. It shows that all TQM principles are implemented by SMEs in Turkey.
- Customer focus and system approach are significantly better managed than continuous improvement, employee involvement and decisions based on facts by SMEs.

- All principles of TQM are well managed by large companies in Turkey. There is not any difference of TQM eight principles of large companies. Eight principles of TQM on large companies are, on grand mean, better than SMEs in Turkey.
- The means of leadership, employee involvement, continuous improvement and decision based on facts principles of TQM of large companies are better than the means of SMEs. It is denoted that SMEs need more effort for implementation especially for these principles of TQM in Turkey.
- Management with targets is examined in leaderships title. Leadership is better managed in large companies than in SMEs in Turkey.
- Rewarding of employee, working for satisfying of employee, team working and suggestion system are managed in the same implementation levels by large companies and SMEs in Turkey.
- The levels of principles of each TQM principles are the same SMEs and large companies according to the results of Table 10-12 in 2010. It indicates that SMEs strive on the lack of TQM principles that are leadership, employee involvement, continuous improvement and decision based on facts, and succeed to catch the levels of mentioned principles of large companies in 2010 in Turkey.

Finally, it can be said that the eight principles of TQM are applied by both SMEs and large companies. Bayazit (2003) found that the implementation levels of TQM principles are fairly mature for large companies similarly the results of this study. SMEs have some lack of by understanding and implementing the principles of TQM especially leadership, employee involvement, continuous improvement and decision based on facts principles in 2005. But it is observed that SMEs have efforts for improving them in Turkey in 2010 and they are improved the level of these TQM principles as the same of large companies. After that, it is said that both SMEs and large companies in Turkey should struggle to improve the level of employee involvement and relationship with supplier’s mutual benefits in the future.

Table 12. Two-sample t-test of general and 8 principles of TQM between SMEs and large companies in 2010

	$\mu$ SMEs	$\mu$ large companies	$t_{cal}$	p-value	Result ( $\alpha=0.05$ )
<b>Grand mean</b>	4.052	4.173	-1.56	0.121	Sig.
Eight principles of TQM					
Customer focus	4.114	4.320	-1.33	0.193	Not sig.
Leadership	4.151	4.442	-1.46	0.155	Not sig.
Employee involvement	3.741	4.038	-1.46	0.155	Not sig.
Process approach	4.111	4.144	-1.07	0.295	Not sig.
System approach	4.381	4.567	-1.07	0.295	Not sig.
Continuous improvement	4.063	4.078	-0.15	0.878	Not sig.
Decisions based on facts	4.048	4.067	-0.94	0.356	Not sig.
Relationship with supplier's mutual benefits	3.802	3.778	-0.94	0.356	Not sig.
			-0.09	0.950	Not sig.
			-0.09	0.926	Not sig.
			0.12	0.908	Not sig.

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