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TQM Practices in Manufacturing and Service Companies in Peru

by

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Abstract

The research study involved exploring how Peruvian companies use TQM practices and the differences in this use considering industrial sector and company size. Three hundred and sixty-three MBA students, middle managers of private companies operating in Arequipa, Cajamarca, Chiclayo, Cusco, Lima, Piura, or Trujillo, answered a questionnaire, developed by the author, about the use of TQM practices in their companies. The findings indicate significant differences between manufacturing and service companies in two practices, information and analysis and empowerment; and significant differences among small, medium, and large companies in two practices, information and analysis, and employee training.

Keywords: TQM; quality, industrial sector, company size, Peru

Introduction

Total quality management (TQM) is a management philosophy, diffused all over the world, with the objective of improving the operative and business performance of the organizations, by offering a systemic approach to continually improve the operative activities to continually fulfill customers' requirements (Agus, 2005; Powell, 1995). The philosophy is particularly attractive because of the focus on quality, which offers the promise of improvement of an organization's performance. However, until 1993, only one third of the 500 largest companies in the United States declared having perceived benefits of TQM implementation (Ahire, Waller, & Golhar, 1996). The poor results could be relate to a bad design or to not taking into account certain variables that could be relevant for the success of this implementation (Tata & Prasad, 1998).

To implement one or more of the TQM principles, companies use a series of management practices and TQM tools associated with the principles, given that the principles are the beliefs, and practices are the actions the companies take according to the principles (Boaden, 1997). The objective of the practices, as management commitment and training to workers, is to produce improvement in operative and business performance (Powell, 1995). Operative performance refers to customer satisfaction or product quality, while business performance relates to financial results. TQM practices became a means to improve business performance of the companies (Agus, 2005; Brah, Wong, & Rao, 2000; Chow-Chua, Goh, & Wan, 2003).

Research in Peru about quality management is scarce.

The literature review reflected no research related to the use of TQM practices in Peru. The results of the study may have closed this gap partially by illustrating information on how Peruvian companies are using TQM practices and whether any significant differences exist in this use considering industrial sector and company size. The research study represents a first approximation to the analysis of the use of TQM practices in Peru.

The objective of the study was to describe the use of TQM practices in Peruvian companies, considering companies from the manufacturing and service sector, and small, medium and large companies. The following research questions aided in fulfilling the objective of the study:

1. Do any significant differences exist in the use of TQM practices between companies in the manufacturing and service sector?
2. Do any significant differences exist in the use of TQM practices among small, medium, and large companies?

From these research questions, related to the orientation and structure of the company, the following hypotheses resulted:

*H*1. Significant differences exist in the use of TQM practices between manufacturing and service companies.
*H*2. Significant differences exist in the use of TQM practices among small, medium, and large companies.

Literature Review

TQM is a management philosophy oriented to increasing operating and business results of an organization through activities of continuous improvement (Agus, 2005; Antony, Leung, Knowles, & Gosh, 2002; Krumwiede & Lavelle, 2000; Noronha, 2002; Powell, 1995; Prajogo, 2005). As such, the philosophy is composed of principles, models and practices: practices are the observable actions that illustrate the underlying principles, while principles are the beliefs or dogmas (Boaden 1997; Powell, 1995). Models are conceptual frameworks developed from the TQM principles that have been adapted to changes in the atmosphere of business. Examples of the TQM models include ISO 9000:2000, Malcolm Baldrige, Six Sigma, and the European Foundation for Quality Management (EFQM) excellence model. The principles constitute the deepest and most constant part of the management philosophy; however, researchers have not yet reached a consensus on the TQM principles and whether the principles are universal (Powell, 1995; Samson & Terziovski, 1999; Zeitz, Johannesson, & Ritchie, 1997).

Despite being a widely used term, TQM does not have a unique definition (Morris, 2006; Zhang, Waszink, & Wingaard, 2000). A reason is that TQM is comprised of several management practices that group around certain principles established by the pioneers of this concept, such as Deming or Juran, at different points in time.

Dow, Samson, and Ford (1999) indicated that most of the studies about TQM included concepts developed by quality pioneers to define quality practices. However, such use could limit the number of practices and did not allow for adequate coverage of the whole concept. TQM practices, and not principles, are observables in a company (Boaden, 1997). However, consensus does not exist on which practices researchers consider part of TQM (Dow et al., 1999).

TQM Practices

Several authors made different propositions about what constitutes TQM practices. Figure 1 indicates some of the more recent studies and the quality practices the authors considered part of TQM. Each quality management model contains a group of practices organizations should implement. Auditing of the practices can corroborate whether or not the company is following the model. Different approaches exist to indicate what practices should form part of TQM. TQM includes a group of management practices with the purpose of improving an organization's performance. On the other hand, a company does not need to implement a quality management model to use the management practices associated with the concept.

The literature review of TQM practices (Figure 1), illustrated that management practices associated with TQM can be grouped in: those that deal with company's processes, those that involve personnel management, and those that include tools and techniques. TQM practices that deal with company's processes includes leadership, or management commitment, because the manager is responsible for the processes and resource allocation; suppliers' management, which involves the processes' inputs; and customer focus, which includes processes' results. Practices that involve personnel management, includes empowerment, which is the level of power granted to employees for decision making; employee involvement, that has to do with human resource management in the company; and employee training, to provide the necessary level of competence for employees to carry out their work. Finally, the tools and techniques relates to the use and analysis of information and to the product and service design.

Therefore, the quality practices analyzed in this study included the following: (a) management commitment, which measures the level of importance allocated to the activities of quality and the assignment of resources on the part of managers; (b) customer focus, which is the extent to which the company knows its clients and offers assistance to customer requirements; (c) suppliers' quality management, which involves evaluation, selection, and coordination with suppliers; (d) employee training, which measures the training in quality techniques and tools; (e) empowerment, which is the level of power and autonomy personnel

have in decision making; (f) employee involvement, which is the employees' commitment to quality activities in the company; (g) information and analysis, which is the extent to which the company uses statistical techniques for decision making and problem resolution; and (h) product or service design, which is the care the company takes when designing and introducing new products to the market.

The Industrial Sector

The analysis of the industrial sector was relevant, and although the pioneers of TQM manifested that they could apply the principles of this philosophy equally in all organizations, the truth is that they developed these principles based on their knowledge of manufacturing companies (Woon, 2000). The implementation of TQM in service companies might need a different approach, given the peculiar characteristics of the sector. Woon defined manufacturing companies as companies that produce mainly tangible goods, and devote a significant part of their operations to the production of such goods. The products of service companies, on the other hand, are mainly intangible.

The more relevant difference between manufacturing and service companies is that the intangibility of the final product makes it more difficult to measure customers' satisfaction in the service companies. For example, a narrow relationship with suppliers could affect the performance of a manufacturing company, but not so much a service company (Powell, 1995). Woon (2000) mentioned several researchers who identified four characteristics in which service companies differ from manufacturing companies: (a) intangibility, (b) inseparability, (c) heterogeneity, and (d) perishability. Services are intangible by nature; inseparability refers to the fact that the service takes place and is consumed at the same time; heterogeneity refers to the adaptation of the service to the customers; and perishability indicates that the company cannot inventory the service.

Company Size

The variable researchers use to define a small or a large company is usually the number of employees. The literature review illustrated that the usual number to make the distinction varied from 250 to 500 employees (Ghobadian & Gallear, 1996; Madu, Kuei, & Lin, 1995; Powell, 1995; Yusof & Aspinwall, 2000). In Peru, a small company employs up to 50 employees (Ley de Formalización de la Micro y Pequeña Empresa, 2003). Considering the growth in gross domestic product (GDP) that Peru has experience since 2003 (Banco Central de Reserva del Perú (BCR), 2005), that has increased the number of large companies, and to make the study more comparable with other research, the following definitions applied: a small company employed fewer than 50 employees, a medium company employed between 50 and 500 employees, and a large company employed more than 500 employees.

The differences between large and small companies are structural and may influence on the relevance, planning, and implementation of the TQM concept. Differences exist in structure, in procedures to implement policies, and in the use of resources, which means that a small company cannot function under the concepts of the larger companies (Ghobadian & Gallear, 1996).

Methodology

The population was a group of companies from the private sector that operate in any of these Peruvian main cities: Arequipa, Cajamarca, Chiclayo, Cusco, Lima, Piura, or Trujillo. Two different analyses were made: (a) considering companies that belonged to the manufacturing or service sectors, and (b) considering size, small companies employing fewer than 50 employees; medium companies employing between 50 and 500 employees; and large companies employing more than 500 employees.

Participants

For this research, the requirements to participate included that private companies had at least one of their employees studying an MBA at CENTRUM Católica. CENTRUM is the Pontificia Universidad Católica del Peru's graduate business school located in Lima. CENTRUM offers different MBA programs in Lima, in other cities inside the country, and abroad, on a part-time and full-time basis, on campus and online, in Spanish and also in English and Spanish. Although CENTRUM's first MBA program began in March 2001, by the end of 2007, CENTRUM was the Peruvian business school with the largest number of students registered in MBA programs.

In 2007, approximately 700 MBA students were studying at CENTRUM Católica. Thus, CENTRUM was a good place for executives of a large number of companies of the country to converge. With the purpose of homogenizing the sample, the study included selecting two programs, one taught in Lima and the other outside the capital in different cities inside the country, with similar curricula and class hours. This selection reduced the variation in the respondents' profiles.

The sample consisted of 363 MBA students, 236 in Lima and 127 students in cities inside the country. Each participant was a middle manager who belonged to a different private company with operations in Arequipa, Cajamarca, Chiclayo, Cusco, Lima, Piura or Trujillo. Of the 363 completed questionnaires, 24 reflected one or more answers not filled or more than one answer marked in one or more questions, resulting in elimination of these questionnaires. Of the participants 22 persons declared that the company they worked for belonged to the public and not the private sector, and 59 indicated that they were not middle managers resulting in elimination of these 81 cases. The depuration of the responses produced 258 valid questionnaires

for processing. Of these 180 were from Lima and 78 from other cities inside the country, with 167 from the service sector and 91 from the manufacturing sector.

Instrumentation

For this research, the author developed a questionnaire that included the following TQM practices: (a) management commitment, (b) customer focus, (c) suppliers' quality management, (d) employee training, (e) empowerment, (f) employee involvement, (g) information and analysis, and (h) product or service design. The instrument included eight scales to measure the use of the TQM practices. Also, the instrument included four questions to classify the sector, size, and type (state or private ownership) of the company, and the position of the participant in their companies.

The development of the questionnaire resulted from a literature review which reflected a group of management practices accepted as part of TQM (Figure 1). Each of the chosen practices was operationalized using published instruments as a basis. The author, who earned a diploma in quality management, from the Pontificia Universidad Católica del Perú and qualified as a certified quality engineer through the American Society for Quality, translated the instruments from English to Spanish.

After the identification of the variables under study, and construction of a preliminary questionnaire the students in operations management helped to determine the appropriate understanding of the questions. This initial depuration of the questionnaire form part of the first pilot test with 70 MBA students.

The first pilot test consisted of two versions, with the questions in a different order in each version to detect whether fatigue effect occurred. A one-factor ANOVA test was applied to detect differences between the mean values of answers in each one of the constructs of the two versions. For one construct, the difference was significant with $p = .03$. The rest of the constructs did not present significant differences ($p > .13$), resulting in the decision to reduce the number of questions in the final questionnaire, from 62 to 41. Elimination of questions occurred because they were not relevant to the purpose of this study. Students of a different MBA class participated in a second pilot test, providing 28 answers. The second pilot test allowed for a new depuration of the questionnaire, resulting in the final version.

The final version of the questionnaire required validity and reliability testing. The first analysis made was the detection of outliers to find inconsistencies in the completion of the survey. An outlier does not necessarily mean elimination of an answer but rather invites analysis of the questionnaire to find inconsistencies in the completion (Hair, Anderson, Tatham, & Black, 1995). The analysis reflected that in two cases the respondents had marked *totally in agreement* for almost all the answers. Elimina-

Figure 1. *TQM practices and author*

TQM Practices / Authors	Management Commitment	Costumer Focus	Suppliers' Quality Management	Employee Training	Empowerment	Employee Involvement	Information and Analysis	Product/Service Design
Saraph, Benson, & Schoeder (1989)	X		X	X	X	X	X	X
Powell (1995)	X	X	X	X	X		X	
Ahire, Golhar, & Waller (1996)	X	X	X	X	X	X	X	X
Samson & Terziovski (1999)	X	X		X	X	X	X	X
Dow et al. (1999)		X	X	X		X		
Ghobadian & Gallear (1996)		X			X	X	X	
Zeitz et al. (1997)	X	X	X		X	X	X	
Yusof & Aspinwall (2000)	X		X	X		X	X	
Escrig et al. (2001)		X				X		
Walsh, Hughes, & Maddox (2002)		X						
Huarng & Chen (2002)	X		X	X	X	X	X	
Li, Anderson, & Harrison (2003)	X	X	X	X				X
Lagrosen (2002)	X	X				X	X	
Hasan & Kerr (2003)	X	X	X	X		X		X
Agus (2005)	X	X	X	X	X	X	X	

tion of both cases occurred because the information could have affected the analysis.

The next step was to evaluate normality of the data. Calculation of the P-P plot, the frequency distribution, and its relationship to the normal curve occurred for each construct. In all cases they were considered acceptable.

TQM practices have shown correlation in different research reports (Behara & Gundersen, 2001; Morrow, 1997; Samson & Terziovski, 1999). Thus, the data initially obtained required evaluation to identify those items that could be representing a construct improperly. The process involved the unidimensionality of the data. Evaluation of the empirical unidimensionality included applying the confirmatory factor analysis. The criterion is that a goodness-of-fit index (GFI) greater than .9 indicates no evidence to reject the unidimensionality (Ahire, Golhar, & Waller, 1996). For this analysis the software AMOS 7 was used. Table 1 indicates the number of items in each final construct and the index GFI adjusted by the number of variables.

After adjustment of the questionnaire, the Kaiser-Meyer-Olkin (KMO) sample adequation measurement was applied, to provide evidence that supports the unidimensionality of each construct, according to Behara and Gundersen (2001). The indicative KMO for the total of the items of the questionnaire was .948, where the meritorious result is .885. The test of esfericity of Barlett was a chi-square of 6014.26 with 180 degrees of freedom and $p < .001$.

The analysis of the validity and reliability of the instrument followed the analysis of the extreme values, normality, and unidimensionality of the data. Determination of reliability involved the Cronbach alpha coefficient for each final construct. A Cronbach alpha of .7 or more indicated an appropriate reliability level for a construct (Dow et al., 1999; Powell, 1995).The value of Cronbach alpha for the constructs was between .728 and .842 (Table 2).

Because the analysis was confirmatory, the content, convergence and discriminant validity were verified (Ahire, Golhar, et al., 1996). Content validity is a function of how well the dimensions and elements of a concept have been delineated and represent what they are intended to measure. All the constructs and the items that constituted them appeared in the literature review. Ahire, Golhar et al. (1996) indicated that content validity is assured in this way, a criterion shared by Prajogo (2005), Sila and Ebrahimpour (2005), and Yusof and Aspinwall (2000).

Convergence validity refers to the extent to which a variation in the measurement of data does not affect the results. When constructs present correlation, an accepted analysis is to use the coefficient Bentler-Bonett (Ahire, Golhar, et al., 1996; Sila & Ebrahimpour, 2005). The coefficient Bentler-Bonett, also known as normed fit index (NFI) or Delta 1, assumes that each construct item is a different way of measuring the same concept. When its value is higher than .9 the construct has convergent validity. The coefficient NFI for each one of the constructs was more than .92 (Table 2).

Discriminant validity refers to the extent to which the items of the scale estimate only one construct. A way to

Table 1

Number of Elements of Each Construct and GFI Adjusted for Number of Variables

Construct	Nº of items	GFI adjusted
Management commitment (MgmCom)	5	.970
Customer focus (CusFoc)	4	.963
Suppliers' quality management (SupQMa)	6	.938
Employee training (EmpTr)	5	.954
Empowerment (Empow)	5	.933
Employee involvement (EmpInv)	6	.955
Information and Analysis (InfAn)	3	1.000
Product or service design (ProdDis)	7	.923

Table 2

Cronbach Alpha and Coefficient Normed Fit Index (NFI) for Each Construct

Construct	Cronbach Alpha	NFI Coefficient
Management commitment	.809	.985
Customer focus	.728	.981
Suppliers' quality management	.842	.965
Employee training	.802	.972
Empowerment	.747	.951
Employee involvement	.822	.966
Information and analysis	.813	1.000
Product or service design	.810	.928

analyze discriminant validity is to place the constructs two by two in a model in which they are correlated and to calculate the chi-square value for the model. Next, analysis of a new model occurs where the correlation between the two constructs becomes 1, and if the chi-square value is higher than 10.83, the two models are significantly different, and the variables are said to measure different constructs (Ahire, Golhar, et al., 1996). The value 10.83 measures the significant difference among chi-squares with one degree of freedom and $p < .001$. Table 3 shows the differences in the chi-square values for each pair of constructs.

Additionally, calculation of the load of each element in the construct to which it belongs occurred. For the sample size used, a load higher than .35 is significant (Hair et al., 1995). All the elements had a load higher than .6 (Table 4).

The final instrument consisted of 41 items on a Likert-type scale anchored by the following descriptors: 1= *totally in disagreement*, 2= *in disagreement*, 3= *neutral*, 4= *in agreement*, and 5= *totally in agreement*. Furthermore, four items of questions discriminated the sector, size, and type (state or private ownership) of the company and the position of the participant in the company.

Procedure

The participants answered the questionnaire in their classrooms, on one day intended for studies, using part of the normal class time under the supervision of one professor. On average, participants completed the surveys in 10 minutes.

CENTRUM professors received instructions on how to direct the fieldwork and conducted the survey. The emphasis was on asking the students to participate voluntarily in the survey, transmitting the objective of the study, and providing the questionnaire to the selected participants. In addition, the students manifested their informed consent when completing the questionnaire. Selection of the companies occurs through a CENTRUM database from which a list of participants emerged. Each selected student was called individually to participate, but no identification appeared on the printed questionnaires.

Analysis of the collected data occurred through the statistical software, SPSS 15. Analysis involved descriptive statistics, including calculation of the mean values and standard deviations, considering companies sector and size. Finally, it was estimated the ANOVA for the difference between means considering industrial sector and company size.

Results

Regarding the difference between manufacturing and service companies, the research involved measuring the level of use of the practices for each industrial sector. Table 5 shows the mean values and standard deviation obtained for each construct. The ANOVA analysis of variance was applied to determine the significance of the difference among means of the considered groups (Table 6).

In both service and manufacturing companies, the highest mean value among the TQM practices was product or service design. The second highest mean value in

Table 3
Differences Among Chi-Square Values for Null Model and of Correlation Equals One for each pair of Constructs

Construct	MgmCom	CusFoc	SupQMa	EmpTr	Empow	EmpInv	InfAn
CusFoc	50.5						
SupQMa	34.2	38.6					
EmpTr	78.3	45.0	70.4				
Empow	91.0	76.0	73.8	93.6			
EmpInv	33.8	32.6	37.1	68.0	80.1		
InfAn	37.5	50.5	27.1	24.1	59.6	23.4	
ProdDis	25.9	29.5	48.6	58.8	76.1	34.8	20.5

Table 4
Load Value of Each Item in its Construct

Construct	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7
MgmCom	.702	.602	.807	.821	.835		
CusFoc	.684	.724	.780	.778			
SupQMa	.782	.711	.821	.772	.696	.720	
EmpTr	.700	.836	.748	.763	.683		
Empow	.561	.785	.784	.747	.663		
EmpInv	.697	.737	.757	.662	.742	.772	
InfAn	.791	.890	.877				
ProdDis	.800	.772	.540	.746	.610	.727	.573

service companies was customer focus and in manufacturing companies was suppliers' quality management. The lowest mean value for service companies was information and analysis, while the lowest mean value in manufacturing companies was employee involvement.

The difference in empowerment was significant with $p < .05$. The difference in information and analysis was significant with $p < .01$. This result supports hypothesis $H1$ in that significant differences exist in the use of TQM practices between manufacturing and services companies.

Regarding the level of use of quality practices in small, medium, and large companies, Table 7 indicates the mean values and standard deviations for each construct. The ANOVA variance analysis was applied to determine the difference among the means of small, medium, and large companies (Table 8).

The highest mean value for small, medium, and large companies was product or service design. The second highest value in both small and medium companies was suppliers' quality management, and for large companies, the second highest value was customer focus. The lowest mean value for small and medium companies was information and analysis and for large companies was empowerment.

The differences of mean values for information and anal-

Table 5
Level of Use of TQM Practices for Service and Manufacturing Companies

	Service: $n = 166$		Manufacturing: $n = 90$	
Construct	*M*	*SD*	*M*	*SD*
MgmCom	3.359	.754	3.529	.690
CusFoc	3.480	.679	3.464	.727
SupQMa	3.457	.715	3.537	.714
EmpTr	3.296	.723	3.431	.732
Empow	3.269	.648	3.460	.625
EmpInv	3.346	.699	3.420	.754
InfAn	3.048	.935	3.474	.929
ProdDis	3.600	.639	3.592	.627

Table 6
ANOVA for the Difference Among Means Considering Industrial Sector

Construct	SS	*df*	*MS*	*F*	*p*
MgmCom					
Intergroups	1.6841	1	.684	3.141	.078
Intragroups	136.146	254	0.536		
Total	137.830	255			
CusFoc					
Intergroups	0.016	1	0.016	0.033	.856
Intragroups	123.069	254	0.485		
Total	123.085	255			
SupQMa					
Intergroups	0.375	1	0.375	0.735	.392
Intragroups	129.817	254	0.511		
Total	130.193	255			
EmpTr					
Intergroups	1.059	1	1.059	2.006	.158
Intragroups	134.131	254	0.528		
Total	135.190	255			
Empow					
Intergroups	2.136	1	2.136	5.209*	.023
Intragroups	104.173	254	0.410		
Total	106.309	255			
EmpInv					
Intergroups	0.319	1	0.319	0.618	.432
Intragroups	131.234	254	0.517		
Total	131.554	255			

Table 6 (continued)
ANOVA for the Difference Among Means Considering Industrial Sector

Construct	SS	*df*	*MS*	*F*	*p*
InfAn					
Intergroups	10.585	1	10.585	12.156**	.001
Intragroups	221.165	254	0.871		
Total	231.750	255			
ProdDis					
Intergroups	0.004	1	0.004	0.009	.926
Intragroups	102.399	254	0.403		
Total	102.403	255			

* p < .05. ** p < .01

Table 7
Level of Use of TQM Practices in Small, Medium, and Large Companies

Construct	Small: *n* = 42		Medium: *n* = 103		Large: *n* = 111	
	M	*SD*	*M*	*SD*	*M*	*SD*
MgmCom	3.305	.727	3.423	.722	3.458	.752
CusFoc	3.357	.515	3.442	.755	3.550	.692
SupQMa	3.441	.662	3.458	.737	3.527	716
EmpTr	3.062	.609	3.287	.726	3.503	.737
Empow	3.371	.561	3.332	.662	3.326	.664
EmpInv	3.310	.611	3.291	.756	3.472	.713
InfAn	2.802	.952	3.129	.937	3.411	.919
ProdDis	3.541	.580	3.587	.633	3.628	.657

ysis, and for employee training were significant with $p < .01$. This result supports hypothesis *H*2 in that significant differences exist among small, medium, and large companies.

Discussion

The purpose of this study was to describe the use of and differences in the TQM practices in Peruvian companies considering industrial sector and size. The results show that the largest difference in quality practices between service and manufacturing companies is in information and analysis, being that manufacturing companies employ the practice more. Information and analysis represent the extent to which companies use graphics and statistical techniques to measure quality performance. Measurement of quality in the service sector is more subjective, which would explain this result. Manufacturing companies also show a higher use of empowerment than do service companies, a result contrary to what had been expected.

Another result expected was that manufacturing companies would reflect a higher use of quality practices than service companies, because theorists developed the concept of TQM for manufacturing companies. Concerning the two quality practices with significant differences, manufacturing companies show a higher level of use of TQM practices than did service companies. This fact could help to explain why manufacturing companies showed higher empowerment use than service companies.

The results align with the work of Woon (2000) who studied a group of companies in a quality program in Singapore. Woon found that service companies used some quality practices to a lesser degree than manufacturing companies, such as information and analysis, process management, and quality performance. However, Woon did not find significant differences for the soft aspects of quality, such as leadership, employee involvement, or customer focus. Huq and Stolen (1998), in contrast, indicated that the more relevant differences would be in the implementation of the techniques and tools of quality.

Significant differences existed considering company size. The significant difference obtained in employee training, being that large companies use employee training more, reinforces the findings of Powell (1995), who indicated that large companies had begun implementation of TQM before small companies. The finding relates to the training employees received and the fact that large companies have more resources than small companies do to invest in human resources.

The significant difference obtained for information and analysis, being that large companies use information and analysis more, is logical because large companies reflected more structure than do medium and small companies.

Table 8
ANOVA for the Difference Among Means in Small, Medium, and Large Companies

Construct	SS	*df*	*MS*	*F*	*p*
MgmCom					
Intergroups	0.716	2	0.358	0.660	.517
Intragroups	137.114	253	0.542		
Total	137.830	255			
CusFoc					
Intergroups	1.314	2	0.657	1.365	.257
Intragroups	121.771	253	0.481		
Total	123.085	255			
SupQMa					
Intergroups	0.355	2	0.177	0.346	.708
Intragroups	129.838	253	0.513		
Total	130.193	255			
EmpTr					
Intergroups	6.468	2	3.234	6.357**	.002
Intragroups	128.722	253	0.509		
Total	135.190	255			
Empow					
Intergroups	0.065	2	0.033	0.078	.925
Intragroups	106.244	253	0.420		
Total	106.309	255			
EmpInv					
Intergroups	1.934	2	0.967	1.887	.154
Intragroups	129.620	253	0.512		
Total	131.554	255			
InfAn					
Intergroups	12.139	2	6.070	6.993**	.001
Intragroups	219.611	53	0.868		
Total	231.750	255			
ProdDis					
Intergroups	0.251	2	0.125		0.310
.733					
Intragroups	102.152	253	0.404		
Total	102.403	255			

** $p < .01$

In general, large companies also use more quality tools and techniques. The results support Yavas and Rezayat (2003) who reported in their study in the United States, Japan, Taiwan, and Hong Kong that a larger organization size is associated with a larger alignment with industry standards, which relates to information and analysis.

Finally, an expectation was that because large companies adopted TQM systems before medium and small companies, they would show a higher use of these practices in general. Analyzing the level of use of TQM practices that reflected significant differences between the groups fulfilled the expectation. In general, the results show that, except in the case of employee training and information and analysis, the level of use of TQM practices is not related to company size.

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Footnotes

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