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**The Use of Quality Practices in Emerging Economies: Determinants and
Impact on Performance in Latin America**

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Abstract

The progressive implementation of the ideas and techniques related to the concept of Quality Management is perhaps the most patent expression of the change and innovation which has taken place in organisations in recent years. The aim of this article is threefold. First, we describe the implementation level of quality management practices in southern Latin America. Second, we analyse the level of adoption of Quality Management (QM) practices in relation to a number of structural, internal and environmental factors. The data used are taken from a wide sample of Argentinean and Uruguayan industrial plants (301). Our results reveal that multinational and technological advancement of firms is positively related to acceptance and practice of QM techniques. The use of these practices allows firms to achieve better manufacturing performance.

Keywords: Quality Management Practices; Structural and Contextual Factors; Operational Performance; Uruguay; Argentina.

1. INTRODUCTION

Quality Management is a key factor for competitiveness of industrial firms worldwide since the last thirty years. The competitive environment have experienced a noticeable increase in the level of competition triggered by firms that try to respond quickly and with quality to a final consumers day after day more informed and exigent. (Huber, 1984; Doll y Vonderembre, 1991; Germain, 1996; Zhang et al., 2002; Huerta, 2003). In this context, both quality management practices and systems has been widely signalled as an important way to meet these requirements (Juran, 1992; Dean y Bowen, 1994; Flynn et al., 1994; Atkins et al., 2002; Guler et al., 2002; Merino, 2003; Sila, 2007). Therefore, quality management is one of the most critical factors for organizations to survive in the expanding and competitive global marketplace.

However, in this constantly changing and competitive world countries are in different stages of the quality movement. In the developed countries the quality movement has been under way for quite some time. There are lots of examples showing high levels of implementation of quality practices and certifications systems (Zhu et al., 1999; Martinez, 1996; Sila 2007; Yeung, 2009; Singh, 2009; Lee et al., 2009). On the other hand, in most of the developing countries, the quality movement is a more recent phenomenon. This fact supposes a great challenge for the immediate future of these countries since they have recently opened their economies to the international markets with the subsequent considerable exposure to international conditions and macroeconomics context. In the new context non-developed countries have to face up to the global competition, demanding to them to rethink and reconfigure their quality practices policy (Rao et al., 1997).

Our investigations respond to two called made from the specialized literature in production and operations management. On the one side, to the need to know the level of implementation of technological and organizational innovations such us quality management practices in the emergent economies, mainly in Latin America. On the other, to explain the observed implementation from a contingency perspective since the disparities in the results of its implementation shows that they are context-dependent (Souza and Voss, 2002, 2008; Sila 2007).

With regard to the first call, the implementation of quality management practices has been one of the most important issues in the last twenty years on management research in general and in the production and operations management literature in

particular. It can be proved for the large number of international relevant journals which mainly treat this specific topic from a wide range of views such as *International Journal of Quality and Reliability Management*, *Total Quality Management and Business Excellence*, *International Journal of Applied Quality Management*. In addition, a large number of papers related with quality management were published in prestigious journals such as *Administrative Science Quarterly*, *Academy of Management Journal* or *the Journal of Operations Management*. Most of the research which have been documented in these journals about the implementation of quality practices were carried out in developed countries as the United States of America (Richardson, 1993; Flynn et al., 1995; Idris, 2000), Japan (Miyagawa and Yoshida, 2005; Flynn and Flynn, 2005) or Spain (Merino, 2003; Martinez-Costa, 2009; Bayo-Moriones et al., 2010). Meanwhile, the big emergent countries as China, India, Mexico or South Korea have been also targets of different recently studies (Sohal et al., 1989; Sarkar, 1990; Green, 1990; Rao et al, 1997; Tseng et al., 1999; Craig and Lemmon, 2008). However, the incorporation of innovations in the framework of production and operations management and, specially the related with quality management, are practically nonexistence in South America. In this way, our paper try to shed some light about the diffusion grade of the quality management on this context, using for it, a wide sample of 301 industrial companies placed on Argentina and Uruguay, providing a new empirical evidence of one of the most influent regions of South America. Moreover, our paper shows an approximation of the impact of those practises on the evolution of the operating results experimented by the South American industrial factories on the last three years.

With regard to the second call, the study of the factors conditioning the implementation of the practises of quality management, widely known as “universals”, as hold Deming, Crosby and Juran, is mandatory since the mixed results about the success and failure of its implementation (Souza and Voss, 2008). So that quality management requires an approximation to the study of the contextual and organizational factors which be conditioning the implementation of different quality management practises. In this way, the contingent theory holds that the organizations chose the system that fit better to their structural characteristics and to their competitive environment (Duncan, 1972; Miller, 1992; Souza and Voss, 2008). Therefore, we believe that it is a properly approximation to explain the levels of in this countries, until now ignored by the literature.

Summing up, the aims of this paper are threefold. First, offer new evidence about the diffusion of quality management practises in the Latino American context. Secondly, to test some hypothesis about the incidence of some contextual and organizational factors over the implantation level of those quality management practises. Last but not least, analyze if the implantation of this practises could have improved the competitive of the enterprises, measured through the evolution experimented on the operational results.

The paper is organized as follows. Next we offer a revision of the literature related with quality management practises implementation, from a contingent perspective in order to establish a theorist argument. Some hypothesis about the relationship between the analyzed factors and the implementation level of the quality management are proposed. The third section, presents the dataset, the descriptive statistic of the sample and the patterns used for contrast the hypothesis. Finally, the discussion of the results and the conclusions close the paper.

2. HYPOTHESES STATEMENT.

The quality Management practices considered in this study turn around four categories of practices: Customer Focus, Process Management, Human Resource Management and supplier Management. All of these dimensions are directly related with the improvement of the quality of products and processes, and has been largely documented in the specialized literature (Deming, 1986; Saraph et al., 1989; Hackman y Wageman, 1995; Flynn et al, 1994 y 1995; Powell, 1995; Black y Porter, 1996; Ahire et al., 1996, Parast et al., 2000; Sanchez-Rodriguez et al., 2004, Zakuana et al., 2010).

2.1 Determinants of the Implementation of Quality Management Practices

Company Size

The company size has been largely documented as a predictor of the implementation of innovative practices in manufacturing firms. Large companies have more resources to invest in innovations and also the “staff” to guide and support the implementation process (Ghobadian and Gallear, 1997; Van der Wiele and Brown, 2002; Merino, 2003). Large companies also are more formalized, specialized, and

decentralized (Germain and Spears, 1999) and have strong negotiation power through the vertical chain allowing them to pressure in order to implement these practices (Newman, 1988; Finch, 1986). However, small-medium sized companies also have some characteristics in favour of the implementations of quality practices. They have flatter management structures and higher flexibility than large companies (McAdam and McKeown, 1999), more customer orientation, less complexity and better communication due to informal relationships with suppliers and clients (Cagliano et al., 2001) and largely implement innovative work practices (Osterman, 1994; Walley, 2000). Therefore, the expected relationship between size and quality practices implementation are not all conclusive.

This inconclusiveness is reinforced by the empirical evidence about this issue. For example, Sjoblom (1995) using a source of 347 industrial plants in the Electronic sector reject a relationship between the size and the implementation of quality practices. Powell (1995) found a little negative relation between with the size using a sample of 54 American firms. In this way, Ahire y Golhar (1996) using a sample of 499 north American motor companies find evidence that support a soft positive relationships analysing the vertical relationships with clients and the use of process statistical control. In other context, Martinez (1996), Merino (2003) and Bayo et al. (2010) using information of Spanish companies find a positive correlation between the implementation of quality assurance practices and the size. In sum, there are a lot of differences documented about the implementations of quality practices between small and large firms due to the structural characteristics, procedures, people, factors promoting the implementation and also in the benefits obtained depending on the size of the firm (Ghodadian and Galleary, 1997; Hendricks and Singhal, 2001, Sila, 2007). However, a priori its not possible to determine the direction of the relationship. Thus we make the following proposition:

H1.- The implementation of quality assurance practices in developing countries will differs according with the size of the firm.

Multinational

Another contextual factor that has been documented a lots is the ownership of the companies. Specifically, the implementation of quality practices in multinational companies. Multinational companies are generally more exposed to international competitive pressures (Osterman, 1994). These companies also face up to new ideas and practices experienced in other plants located in different contexts. Thus multinational firms are in a better position to learn from the experiences of similar plants and adopt new management techniques more rapidly (Sila, 2007). In addition, these companies implement in a greater extend human resource practices more innovative such us work groups, training, selection and recruitment and promotion needed for an appropriate implementation of quality practices (Rosezweig y Nohria, 1994; Hiltrop, 2002; Bayo and Merino, 2004). Finally, the fact that from the head of the corporative groups take a more global view, facilitates knowledge of successful experiences of the implementation of these practices (inside or outside the group) and the transmission thereof to all plants in the group. It can therefore be expected that those plants belonging to a multinational group, presenting a more open attitude to change and innovative organizational practices.

Empirical evidence about the relationship between multinational groups and quality practices implementation is very scarce and focused in U.S and Spain. Sila (2007) using a sample of 286 American companies does not find statistical support to differences in TQM practices across domestic and international operating companies. Contrary to this, Merino and Bayo (2004) and Bayo-Moriones et al, (2010) found a positive relationship between multinational firms and quality practices in Spain. In spite of no evidence from no-developed countries linked to this issue were found, the cultural proximity and the strong presence of Spanish companies in Latin America allow us to propose the following hypothesis.

H2.- Firms integrating multinational groups in developing countries are more likely to implement quality practices in a greater extend.

Technology

It can be said that manufacturing firms with a higher level of automation use more sophisticated technologies. In this context, firms require more experienced teams in order to deal with the technology sophistication, and also more innovative culture helping to implement innovative practices. These higher sophistication and complexity demands more efforts to guarantee the quality since in this context errors will have a great impact in the optimization of the production process. In addition, it could be expected that those plants immersed in this technological environments shows a greater implementation of quality practices.

Empirical evidence on this issue is very scarce. Dean y Snell (1996) found that firms implementing AMTs more intensively fit better with quality-oriented manufacturing strategies. Schroeder y Sohal (1999) also found that organisational and infrastructure variables such as quality practices influence the adoption of AMTs. Merino, 2003 found strong evidence supporting a positive effect of technological change in quality practices adoption. Bayo-Moriones et al. (2010) analysing 5S adoption found a positive and statistically significant correlation different advanced manufacturing technologies. Despite no empirical evidence from emerging countries were found, we believe that this principles could be extended to this countries. Therefore, propose the following hypothesis.

H3.- Firms more advanced in technology use are more likely to implement quality practices in a greater extend.

Competition

In the last years, companies have experienced a noticeable increase in the competition due to the markets globalization. In this context, one might expect a more pressure for firms in order to adopt quality practices in order to improve the effectiveness and efficiency of their production process and its relationships with customers and suppliers. Quality practices and certification systems also are key factor of competitiveness of firms since they can generate trust between the customer and the suppliers (Souza and Voss, 2002). In this way, regardless of the country concerned, a strong correlation between a nation's application of total quality management and its

national competitiveness is observed (Martin and Weill, 2000). However, investments in technological and organizational innovations such as quality management practices could be postponed when the competition increases as a consequence of the more uncertainty and the long term of return on investment of these changes (Huerta, 2003).

Empirical evidence on this issue is scarce and non-conclusive. Benson et al. (1991) and Powell (1995) did not find statistical relationships between the level of competition and the use of quality practices in the framework of TQM. Martinez (1996) got that a higher level of perceived competence does not lead to a higher level of quality practices implementation using a sample of Spanish firms. A similar result has been obtained in Spain by Merino (2003) and Bayo-Moriones et al. (2010). However, Lawler et al. (1995) found that the variable that measures the intensity of competition is clearly related to the implementation of TQM practices that are adopted are more likely when an organization needs to address increased competitive pressure.

H4.- More competitive contexts requires firms more involved in quality management practices.

Exports

The international competitiveness of a firm could be approximated by the percentage of sales exported. It is reasonable to think that companies competing in the international markets have to face up with a higher degree of competition and therefore they should be more worried with the quality improvement of their products and process.

Despite empirical evidence on this issue scarce, all the paper points out in the same direction; firms that have larger export markets have better quality management practices (Lawler et al., 1995; Ismail et al., 1998; Sampaio et al., 2009). Therefore, we propose the following hypothesis,

H5.- Firms more directed to exports implement quality management practices in a greater extent.

Operational Performance

The implementation of quality management practices can lead to improves in the operational performance. This improves are not easily traceable in directly to quality practices as there are many factors that could be affecting the plant performance. However, different outcomes has been directly attributed to the quality policy in the specialized literature, such as compliance with the product specifications (Filippini et al., 1998), reduction of defective products (Samson and Terziovski, 2003), or percentage of returned products (Merino-Díaz, 2003). Others authors has quantified quality costs (Adam et al., 1997; Kaynac, 2003; Prajogo and Sohal, 2006; Prajogo and Hong, 2008) and also the external (perceived) quality (Rao et al. 1997; Flynn et al., 1995). In all these papers have found that the implementation of quality management practices lead to improvements in the quality performance.

Other studies have also found positive relationships between quality practices and other outcomes, such as operational productivity and efficiency (Flynn et al., 1995; Grandzol and Gershon, 1998; Merino-Díaz, 2003; Kaynac, 2003 , Sila 2007), customer satisfaction (Anderson et al., 1995, Forza and Filippini, 1998; Choi and Eboch, 1998; Adam et al., 1997; Das et al., 2000; Yusuf et al., 2007), the vertical relationships with suppliers (Ahire et al., 1996), product innovation and process (Prajogo and Sohal, 2006; Prajogo and Hong, 2008), the advantages related to flexibility of production and supply cycle (Flynn et al., 1995). No evidence from emerging economies was found.

In the light of these evidences, we are allowed to propose the following hypothesis.

H5.- Firms implementing quality practices achieve improves in their operational performances.

3. METHODOLOGY

3.1 Sample and data collection

The data used in the empirical section of the paper were obtained from a survey conducted in 2008 through personal interviews with managers of 301 manufacturing plants with at least 20 workers, from Uruguay and Argentina. Manufacturing industry is precisely defined in the National Classification of Economic Activity (NACE).

The survey was restricted to establishments with at least twenty workers, because small plants often show a less formal and more variable production organization and work practices (Cappelli y Neumark, 2001). The plant was chosen as unit of analysis instead of the firm because the practices studied are used and implemented at the plant level. Moreover, the collection of data in the plant provides with more precise information. This happens because, unlike headquarters, it is in the plant where there is a greater knowledge of the management practices applied in the shop floor. Once the plants fulfilling the above mentioned requirements were identified, the sample was designed in such way as to guarantee representativeness in size and activity sector.

In order to reach the objectives of the research, a questionnaire was made up according to the methodological recommendations offered by Nunnally (1978). The questionnaire includes several questions related to plant and worker characteristics, work organization, human resources management, technology, production organization and operational performance. In order to define the different questions of the survey tool, a deep review of the relevant theoretical and empirical literature was previously carried out. The scales considered for the questionnaire have previously been validated in other empirical studies published in reputable international journals. An initial version of the questionnaire was subject to a pre-test in several plants. Based on the results of such pre-test, some modifications were introduced, which configured the final version of the questionnaire.

The data collection process started with the submission of an introductory letter to the plant general managers explaining the goals of the research and asking for their collaboration. Moreover, they were informed that the firm in charge of the fieldwork would contact them to arrange a personal interview in the plant in order to fill

in the questionnaire. The average length of the interviews was sixty minutes. The interviewee was a manager of the plant, who was in most cases either the general manager or the operations manager.

3.2. Measures

Indexes of QM Practices

We have established a conceptual composed by four dimensions of practices, associated with the transformation process, relations with the suppliers, relations with the customers, and human resource management. They are considered to be primary dimensions in the sense that they are directly related to improvement in the quality of the product. The same dimensions appear, more or less explicitly, in almost all of the studies on quality management, (Deming 1986; Saraph et al., 1989; Hackman and Wageman, 1995; Flynn et al, 1994, 1995; Powell, 1995; Black and Porter, 1996; Ahire and Golhar, 1996, Merino, 2003 etc.).

The framework we have established reflects the idea expressed by Ahire and Golhar (1996). They are of the opinion that commitment on the part of management must be seen by implementing a set of strategies which take into account three important stakeholders in the operations of the organisation: customers, suppliers and employees. Customer attention is very important for an efficient QM initiative. The quality of the material supplied by suppliers who are competent, reliable and flexible is a prerequisite for the quality of the finished product. The strategies which allow the company to produce high quality products starting from supplies of quality comprise of the following; the introduction of quality in the design of the products, quality assurance in the processes through the use of different instruments and the judicious use of external and internal information. Nevertheless, the key to success lies in human resource management through the empowerment of employees and the creation of a structure which promotes their participation and training. We have built four indexes, each associated with one of the four dimensions established in the conceptual framework (see figure 1) in order to put the concept of QM into operation.

The following indexes were used, associated with the production process (QPROC), relations with the suppliers (QSUP), relations with the customers (QCUST)

and human resource management (QHUMRES). Each index incorporates a series of items, which choice was based on existing literature as well as on the experience of professionals, experts in the implementation of Quality Management programmes.

Table I. Description of the items composing QM indexes

		Mean	SD	VIF	
Processes* (QPROC)	Statistical Process Control. (SPC)	3,76	3,92	1,297	
	Six Sigma	1,84	3,40	1,346	
	Experimental Design (“Taguchi”)	1,50	3,01	1,319	
	“5S” Order and cleanliness in the plant	2,16	3,35	1,319	
	Problem Solve Methodology (“8-d” and others..)	2,25	3,48	1,306	
Suppliers** (QSUP)	We put quality before any other criterion of selection	3,92	0,97	1,112	
	Audits are regularly carried out to evaluate suppliers	2,46	1,41	1,171	
	We collaborate in technical aspects related to production	3,05	1,29	1,366	
	We have established systems for the elimination of the inspection of supplied parts	2,90	1,38	1,255	
Customers** (QCUST)	Questionnaires are carried out to determine the level of satisfaction of our products	2,74	1,41	0,834	
	Audits are regularly carried out to evaluate our company	2,15	1,21	0,731	
	We collaborate in technical aspects related to production	3,04	1,31	0,813	
	We have established systems for the elimination of the inspection of supplied parts	2,76	1,38	0,815	
Human resources (QHUMREC)	Number of training hours per worker, per year	7,55	18,90	1,089	
	% of employees working in autonomous teams	12,47	25,25	1,127	
	Involvement***	There is a suggestion system in the plant	0,94	0,80	1,018
		There are improvement groups in the plant			
	Information sharing***	Surveys to employees	0,91	0,92	1,197
		Informative meetings held with employees			
Open days					

*Items included are in a scale 0-10 ** Items are in a scale 1-5 ***Items are 0-1

The different items which make up the four key indexes are measured on different scales. The variables were standardised and converted into z scores before combining them additively to form the indexes and in this way unify the unit of measurement. In order to simplify the interpretation, a linear transformation was applied to the z scores, the totals of which were obtained for each of the five indexes. With the result that a 0 value for the indexes is given to the plant which has the lowest score of the sample, and a value of 100 is given to the plant with the highest score (Mac Duffie, 1995).

The resulting indexes are treated as formative or causal indicators (Diamantopoulos and Winklhofer 2001; Martinez-Costa et al., 2009). In this case, the indicators are causing rather than being caused by the latent variable measured¹ (MacCallum and Browne 1993). “A breadth of definition is extremely important to causal indicators” (Nunally and Bernstein, 1994): thus, a census of indicators is required for a formative specification. Traditional reliability measures like coefficient Alpha assume that indicators are redundant, each measuring the same thing from a different vantage point. Causal indicators assume they are multiple, objectively different manifestations of an underlying phenomenon which need not correlate. Bollen and Lennox (1991) argued that “we have no recommendations for the magnitude of correlations for causal indicators, because these correlations are explained by factors outside of the model. Second, the absence of multicollinearity between items has been tested so as to validate the construct (Podsakoff et al., 2006).

The table also shows the values of the Variance Inflation Factor (VIF) for all the items in the four indexes. As recommended, all the values are lower than five, indicating the absence of multicollinearity, which is required for the validity of the indexes.

Finally, a global indicator of quality practices using the former four indexes has also been created. It is a formative indicator, since it includes the four different dimensions of quality mentioned above: QPROC, QSUP, QCUST and QHUMREC. It is defined as the mean of their values. The absence of multicollinearity has been proved to validate this indicator, as VIF was lower than five (see table II)

¹ Bollen (1989) gives some examples for causal indicators. Time spent with family and time spent with friends are causal indicators of the latent variable of time in social interaction and race and sex are causal indicators of exposure to discrimination. In the first example, time spent with family and friends need not correlate (hence a low coefficient alpha), but they add up to form the construct of “social interaction”. Similarly, race and sex need not correlate with one another. In contrast to effect indicators, in causal indicators the latent variable is the effect of the observed variables rather than vice versa.

Table II Description of QM indexes

		Mean	SD	VIF
Global Quality (QUALITY)	QPROC	22,95	23,15	1,139
	QSUP	52,12	21,70	1,418
	QCUST	41,76	22,98	1,466
	QHUMREC	17,23	15,73	1,236

Explanatory variables

The size of the plant has been measured by the logarithm of the number of workers. The *export* variable has been measured by the percentage of exports to total sales. *Competition* is a perceptual variable measured in a scale one (lowest level of competence) to five (highest level). The variable *Multinational* has the value 1 if the factory is part of a foreign multinational group. The presence of *AMT* in the plant is captured by an index that reflects the degree of utilization of a series of technologies identified by the literature (Boyer and Pagell, 2000; Jonsson, 2000; Beaumont et al., 2002). The interviewee had to assess the level of implementation of these technologies in the plant on a zero to ten scale. Therefore, the index used to measure AMT is a formative indicator. It is computed as the average of the degree of use of the technologies considered.

Performance measures

It is important to explain the two characteristics of the measurements of performance we have used in this study. First of all, they measure the improvement registered in the results of the plant in relation to the situation three years earlier. The different manufacturing performance dimensions, which are measured in absolute terms, depend largely on the technology being used and type of process being undertaken at the plant. Therefore, it becomes difficult to establish comparisons when the data is obtained from a group of heterogeneous plants, even when the sector is introduced as a control variable. The other noteworthy characteristic is the subjectivity of the information used. Results of a subjective nature are often used in research on organisations. Some studies have demonstrated a strong relationship between objective

and subjective measures of financial performance. This may serve as a justification for the use of this kind of performance (Powell, 1995; Venkatraman and Ramanujan, 1987).

The indicator for efficiency (cost performance) used here is *PRODUCTIV*; this refers to the percentage of productive hours in relation to the total number of hours of direct presence of the workforce. It reflects waste and inefficiency in the productive system and identifies unproductive time resulting from organisational problems (lack of material, breakdowns, problems with quality, etc.).

We have two indicators of improvement in quality performance. First, *DEFECT*, correspond to a definition of product quality as conformance with specifications and they are defined as the percentage of defective products. Second, *RETURN*, refers to the product return by the customers. We also use two indicators for time performance. *DELIV* indicates the improvement in the percentage of delivery dates fulfilled, which is a typical measurement of punctuality, and considered a basic aspect of customer service. *LEAD* indicates improvement in the reduction of the time taken from the moment the material is received to the moment the product is delivered to the customer. This serves as an indicator of process speed (lead time).

The five performance variables are discrete variables. They take values from 1-when firms have experienced a deterioration in its operations performance – to 5 when plants whose results have improved greatly take value 5.

3.3 Estimation methods

To test the hypotheses established in the theoretical section of the paper we use two different models depending the character of the dependent variables. First, to test the hypotheses 1 to, a tobit model (Maddala, 1983) is employed to estimate the influence of the explanatory variables on our dependent variables. This model is suitable when the dependent variable is censored, as in our case. The statistical significance of the regression coefficients allows the acceptance or rejection of the hypotheses. Five regression models have been estimated. The first one has the global *QUALITY* index as dependent variable. The other four models have the four dimensions identified individually as dependent variables: *QPROC*, *QSUP*, *QCUST* and

QHUMRES. Industry dummies have also been included in order to take into account differences in items purchased between plants.²

The question of whether quality management practices leads to differences in operational results will be tested by estimating ordered logit models (Maddala, 1983), given the nature of our dependent variables. For each dependent variable five different models are constructed in order to contrast the influence of the global index QUALITY and the former four partial indexes. In this case, industries are also included as control variables. The assignation of the plant to an industrial sector is determined by means of fourteen dummy variables that do not appear in the result tables.

4. RESULTS AND DISCUSSION

The results show that both structural and contextual factors affect the degree of implementation of quality management practices.

Table III: Results of Tobit Regression Analysis. Dependent variables are Quality (Sum of Quality Practices) and QProces, Qsup, Qcust, QHumrec.

	QUALITY	QPROCES	QSUP	QCUST	QHUMREC
Constant	17.241*	-7.445***	51.816***	36.057**	-1.372
LnSize	-0.369	1.225	-1.896	1.267	1.192
Multinational	11.450***	20.057***	10.531**	6.799*	8.100**
Export	0.028	-0.006	-0.0275	0.102***	0.047
AMT	2.753***	5.389***	2.765***	3.280***	1.386***
Competition	1.236	-0.038	2.764**	2.842*	2.028*
<i>Pseudo-R2</i>	0.046	0.033	0.020	0.020	0.023
<i>Log likelihood</i>	818.534*	1045.742	1190.235	1152.409	907.037

Industry dummies are controlled for.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

² The industries considered are: food, beverages and tobacco; textile industry, wearing apparel, leather and footwear; wood and cork; paper, editing and graphic design; chemical industry; rubber and plastic products; non-metallic mineral products; metallurgy and fabricated mechanical products; machinery and mechanical Equipment; electrical, electronic and optical products and equipment; transport equipment and furniture; pharmaceutical industry; aeronautical industry, and other manufacturing industries.

Table III summarizes the results obtained from estimating the tobit models for our five dependent variables (QUALITY, QPROC, QSUP, QCUST and QHUMRES). The results show a clear confirmation of the hypotheses 2 and 3 concerning the multinational character of the firm and the level of AMT implementation. All the coefficients are positive and with statistical significance.

Moreover, we can see how the coefficient of *Competition* is positive and significant in the case of *QSUP*, *QCUST* and *QHUMRES*. Nevertheless the rest of variables (*Size and Expor*) do not seem to have any effect on the quality management practices implementation.

With regard to the impact of quality management practices implementation on the operational performance, results are summarised in table IV. A hypothesis 5 is clearly confirmed.

Table IV. Results of Ordered Logit Regression Analysis. Dependent Variables: (1-5 lickert scale)

	PRODUCT	DELIV	RETURN	DEFFECT	LEAD
Constant $\mu_1 = 1$	6.066				-3.431
$\mu_1 = 2$	8.430	3.703	-1.154	3.747	-1.441
$\mu_1 = 3$	11.653	7.620	2.590	8.495	2.077
$\mu_1 = 4$	13.872	9.327	4.494	10.590	3.785
QUALITY	0.035***	0.032***	0.040***	0.049***	0.028***
Constant $\mu_1 = 1$	2.556	0.170	-5.852	-3.103	-4.246
$\mu_1 = 2$	4.897	1.604	-3.316	-1.467	-1.727
$\mu_1 = 3$	7.774	4.866	0.186	2.573	1.663
$\mu_1 = 4$	9.632	6.598	1.779	4.431	3.340
QPROCES	0.007	0.004	0.010**	0.017**	0.008*
Constant $\mu_1 = 1$	4.397	1.917	-4.934	-0.157	-1.926
$\mu_1 = 2$	6.614	3.216	-2.398	1.244	0.507
$\mu_1 = 3$	9.541	6.539	1.028	5.511	3.962
$\mu_1 = 4$	11.507	8.307	2.678	7.434	5.665
QSUP	0.011**	0.012**	0.012**	0.022***	0.015**
Constant $\mu_1 = 1$	4.929	2.208	-4.234	-1.424	-2.217
$\mu_1 = 2$	7.223	4.224	-1.687	0.207	0.222
$\mu_1 = 3$	10.126	7.577	1.778	4.201	3.694
$\mu_1 = 4$	12.007	9.270	3.461	6.054	5.310
QCUST	0.011**	0.012**	0.010*	0.011**	0.010**
Constant $\mu_1 = 1$	1.721				-6.290
$\mu_1 = 2$	4.170	2.297	-6.189	-1.612	-4.174
$\mu_1 = 3$	7.340	6.091	-2.348	3.244	-0.665
$\mu_1 = 4$	9.584	7.932	-0.475	5.368	1.153
QHUMREC	0.033***	0.046**	0.039***	0.049***	0.034***

Industry dummies are controlled for in each model.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A statistically significant relationship therefore exists between the set of QM practices and its different dimensions and improvement in all the types of manufacturing performance considered. Only we appreciate one exception, QPROC with . In other words, plants with a higher level of implementation of QM practices are more likely to improve their manufacturing performance.

On the one hand, we have seen how the general index of quality management practices and also each of the four dimensions of quality management practices considered are related with two structural characteristics of firms: belonging to a multinational group and the level of technology. These relationships have been statistically significant and the direction expected. These results would be showing, in line with those found by Merino (2003) and Bayo-Moriones et al. (2010), that multinational companies take further innovative organizational practices which likely contributes to improve the competitiveness. Therefore, the presence of multinational firms in these countries is a positive factor for the economy of the region. On the other hand, plants that use more advanced technologies further implement quality management practices. The results would be indicating that the greater the technological complexity of firms the greater effort to implement quality practices designed to prevent the occurrence of errors and to manage vertical relationships with suppliers and clients.

With regard to the contextual factors, the results show that the more intensity in the competition the more pressure for firms to adopt quality practices. In this context, firms must not only to improve the effectiveness and efficiency of their production process using different quality tools and training workers but also, they should boost more collaborative and relational relationships with customers and suppliers. In this way, firms that successfully compete in the international markets develop strong links with the clients.

Summing up, the decisions about the implementation of quality management practices in the south Latin American countries' firms are the consequence of the internal demands involved in the quality policy drawn up by multinationals and the specific technological conditions, and also by the competitive pressure of the markets.

Analyzing the impact of the quality management practices on the operational performance, the results of the ordered regression models confirm the hypothesis H6. In the six model proposed the relationship between the quality management practices index and the different dimensions of operational performance has been positive and statistically significant. Industrial plants with a high level of implementation of quality

management practices have achieved improves in the percentage of productive hours, while reducing the percentage of returned product over sales, defective finished products and defective products in process. It also increases the probability of achieving a higher percentage of delivery dates complied with and a reduction in the process lead-time. This results, therefore, indicates that firms that makes a greater effort in the introduction of quality management practices enhances the likelihood of achieving an increase in their operational results. In sum, the findings obtained here are unequivocal in indicating this as the area on which firms need to focus in the short run if they are to succeed in improving operational performance.

Despite is quite difficult to make direct comparisons with these studies because not all of them use the same measurement for both quality practices and operational performance, we are able to confirm that our results are aligned with the most observed in other studies carried out in other countries, mainly developed such us Flynn et al. (1995), Powell (1995), Lawler et al. (1995), Madu (1997), Forza (1995), Samson and Terziovski (1999), Martínez-Lorente et al. (2000), Merino (2003), Prajogo and Sohal, (2006), Sila (2007), o Bayo et al.(2010) between others.

At this point, and after having confirmed that the industrial companies of these countries also achieve improvements in operational performance throughout the use of quality management practices, it is necessary a reflexion on how to promote its greater implementation. Uruguayan and Argentinean companies makes strong efforts to maintain close relationships with suppliers and customers, however, the degree of diffusion of quality tools (like 5S, 6 Sigma, SPC,,) as well as human resource practices such as training or the promotion of employees involvement, are at very low levels. Therefore, these results allow us to advise managers that they should insist on the implementation of quality programmes, mainly they should encourage human resource practices such as empowerment, involvement, training and information sharing, since these appear to be some of the keys to success in these programmes implementing and in order to avoid problems later on at the production stage. In addition, there have been documented lots of benefits of the use of these quality tools. For example, 5S is largely known by its simplicity and operability, allow firms to reduce waste and optimize productivity and quality maintaining an orderly workplace achieving improvements in quality and productivity and, as a consequence, in competitiveness (Bayo-Motiones, et al., 2010).

Otherwise, Gupta (2000) and Merino (2003) found that the levels of implementation of quality management practices increase significantly in companies that are certified by standards quality systems. However, our data indicates that the levels of diffusion of quality management systems like ISO 9000 standard or others are really short in these countries; the 60 % of the companies were not certified by any quality standards. Therefore, a reasonably optimal way to advance in the quality improvement is the promotion of quality standards certification like ISO 9000. In fact, as stated in Appendix 1, we found these same differences for all the quality practices. So that, given the wide dissemination and knowledge of the standards, the presence of agencies in charge of granting such certificates, as well as the availability of specialized technical assistance in this area may facilitate the successful implementation and thereby improving the competitiveness of these companies.

This investigation makes several contributions to the quality management research field. First, it offers new evidence about the implementation of quality management practices in Latin American countries. Secondly, it shed new lights about the contextual and structural factors affecting its implementation. Thirdly, it performs a more thorough exploration of relationships of quality practices with the different dimensions of operational performance.

The main limitations of the research are those derived from the cross-sectional character of the data, which prevents to make definitive statements on the causality relationships among the variables. The work does not avoid the disadvantages derived from research based on surveys either, especially when the answers are of subjective nature.

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Appendix 1.

ANOVA. Quality management practices of ISO vs non-ISO companies.

Quality Standard System	QUALITY		QPROCES		QSUP		QCUST		QHUMREC	
	Mean	StD	Mean	St.D.	Mean	St.D.	Mean	St.D	Mean	St.D
NO	30,06	(14,34)	17,01	(20,31)	49,44	(21,28)	36,99	(23,52)	16,97	(14,78)
YES	39,97**	(13,87)	31,89**	(24,26)	55,83**	(21,97)	49,16**	(20,52)	17,88	(17,35)

Standard Deviation between brackets.