

**Simultaneous Consideration of TQM and ISO 9000 on Performance and
Motivation: An Empirical Study of Spanish Companies**

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ABSTRACT

After more than two decades since quality became part of managers' everyday lexicon, total quality management (TQM) and ISO 9000 have taken the centre stage. However, there has been much debate about how they might be related to each other. This research is a new contribution to the knowledge on the relationships between TQM and ISO 9000, and it addresses their implications on performance and motivations for implementation. While past studies have considered them separately, we study them together in one study. As might be expected, both TQM and ISO 9000 lead to improvement in performance. However, it appears internal motivation to implement ISO 9000 is associated with high performance, whereas external motivation is not. Further, companies with high internal motivation for ISO 9000 naturally show a high level of TQM practices. We use institutional theory and resource based view to consider the internal versus external motivations for implementing ISO 9000. The data for this research has been obtained from a large sample of Spanish industrial companies. Longitudinal objective data have also been used.

KEYWORDS: Total Quality Management, ISO 9000, Performance, Motivation, Institutional Theory, Resource based view, Longitudinal data, Postal survey.

1. Introduction

Even though some authors consider the “quality management movement” to be a fad, after more than two decades, it is still an important area of research in management as demonstrated by many papers still published on this topic. The two most important areas in this field are known as total quality management (TQM) and ISO 9000, and they are important for both practitioners and academics. This research tries to analyse the dynamics involved in TQM and ISO 9000 implementations, extend our understanding of them, and clarify the relationships between them.

Studies analyzing the impact of quality management on company performance have been conducted by many scholars, and largely they have considered TQM and ISO 9000 separately. Most of the studies regarding the TQM’s effect on performance have indicated a positive correlation with performance and/or customer satisfaction (Shetty, 1993; Choi and Eboch, 1998; Easton and Jarrell, 1998; Adams, McQueen and Sewright., 1999; Terziovski and Samson, 1999 and 2000; Hendricks and Singhal, 1996, 2001a and 2001b). Regarding ISO 9000, researchers such as Corbett, Montes-Sancho, and Kirsch (2005) recently found a positive financial impact of ISO 9000. However, for a long time, there was no general agreement regarding the effects of ISO 9000 on the company performance. There were some optimistic views (Docking and Downen, 1999; Gupta, 2000; Romano, 2000; Withers and Ebrahimpour, 2001), and there were also pessimistic findings (Terziovski, Samson and Dow, 1997; Simmons, 1999; Lima, Resende and

Hasenclever, 2000; Hua, Chin, Sun and Xu, 2000; Aarts and Vos, 2001; Singels, Rüel and Van der Water., 2001; Wayhan, Kirche and Khumawala, 2002).

A few papers indicated the salience of the source of the implementation motivation on outcome variables; whether the source is the internal drive for improvement or the reaction to external requirement matters on how much the company benefits from implementing TQM or ISO 9000. For instance, in their study of TQM implementation at parts supplier plants, Choi and Eboch (1998) pointed out that when the motivation for implementing TQM comes from external sources (i.e., industrial customers), the impact on customers satisfaction is much stronger and direct compared to the impact on internal plant performance results. The literature regarding ISO 9000 also pointed out the importance of implementation motivation. Companies applying ISO 9000 by external motivation such as customer pressure or as a promotional tool saw fewer benefits from it than those companies that were convinced of ISO 9000's possibilities to improve management practices and, consequently, performance (Huang, 1998; Van der Wiele, Dale and Williams., 2000; Withers and Ebrahimpour, 2001; Singels et al., 2001). In this regard, the source of motivation, whether internal or external, refers to where the firm wants the implementation of TQM or ISO 9000 to have an effect—we call it external motivation if the firms want the implementation to have an effect on external perception of the firm, and we call it internal motivation if the firms want the implementation to have an effect on internal business processes.

In this study, we bring forth four managerial issues of TQM and ISO 9000 implementation. First, we investigate the relationship between TQM implementation and company performance, focusing on the causal link between them. Second, we do the

same for ISO 9000 implementation and company performance. Third, we explore the impact of the source of motivation for implementing ISO 9000 on company performance—whether the motivation is internal or external might impact the outcome differently. Lastly, we address the relationship between the source of motivation of implementing ISO 9000 and TQM practices.

2. Literature Review and Hypotheses Formulation

2.1 TQM and Performance

TQM is typically defined as a system of practices with overarching or systematic impact on company practices and performance. For instance, Flynn, Schroeder, and Sakakibara (1994) defined it as “an integrated approach to achieving and sustaining high quality output. It focuses on the maintenance and continuous improvement of processes and defect prevention at all levels and in all functions of the organization, in order to meet or exceed customer expectations” (p. 342). Its principles are also outlined in Evans and Lindsey (2002) as “focus on customers and stakeholders, participation and teamwork by everyone in the organization and a process focus supported by continuous improvement and learning.”

Many researchers have analysed the impact of TQM implementation on business performance inquiring into the mechanisms that could make improvements possible (Elmuti and AlDiab, 1995; Mohrman, Tenkasi, Lawler and Ledford, . 1995; Powell, 1995; Hendricks and Singhal, 1996; Forker, Mendez and Hershauer, 1997; Choi and Eboch, 1998; Easton and Jarrell, 1998; Adams *et al.*, 1999; Dow, Samson and Ford,

1999; Terziovski and Samson, 1999 and 2000; Hua *et al.*, 2000; Zhang, 2000; Hendricks and Singhal, 2001a and 2001b). Simply put, they all consistently found a positive relationship between the implementation of TQM practices and company performance.

However, most of these studies have relied on cross-sectional data. Consequently, the causal link between the TQM implementation and company performance has typically been made based on theoretical arguments rather than empirical. Exception is the work by Hendricks and Singhal (2001a). They empirically argued the causal link between TQM and performance by demonstrating the significant performance difference between the companies that implemented TQM and the companies in the control group. Nonetheless, their results were not conclusive when focusing on the timing of TQM implementation—they could not show significant performance difference between the early implementers and late implementers. Therefore, we propose to examine this causal link using the timing of TQM implementation more explicitly.

Hypothesis 1: Companies with high TQM implementation will show high level of performance outcomes.

Hypothesis 2: Companies that implemented TQM will show significant performance improvement from before implementation to after implementation.

2.2 ISO 9000 and Performance

Since 1987, when the ISO 9000 series of standards appeared, a plethora of papers about registration, costs and benefits of certification, and its effects upon company performance have been published (Rayner and Porter, 1991; Askey and Dale, 1994;

Brecka, 1994; Vloeberghs and Bellens, 1996; Ebrahimpour, Withers and Hikmet, 1997; Meegan and Taylor, 1997; Brown, Van der Wiele and Loughton, 1998, Anderson, Daly and Johnson, 1999; Huarng, Horng and Chen, 1999; Hughes, Williams and Ryall, 2000; Sun, 2000; Withers and Ebrahimpour, 2000; Gotzamani and Tsiotras, 2002). However, most of these papers tended to be descriptive and were lacking in explicit empirical testing of hypotheses.

In general, studies investigating the effects of ISO 9000 on performance have shown mixed results. Some studies showed a positive effect (Docking and Downen, 1999; Gupta, 2000; Romano, 2000; Withers and Ebrahimpour, 2001), while others did not (Terziovski *et al.*, 1997; Simmons, 1999; Lima *et al.*, 2000; Hua *et al.*, 2000; Aarts and Vos, 2001; Singels *et al.*, 2001; Wayhan *et al.* 2002). However, we note that a few key recent studies (Corbett *et al.*, 2005; Sharma, 2005) have found the companies that implemented ISO 9000 outperforming financially the companies that did not implement ISO 9000. Our view is that there may be companies that implement ISO 9000 just to satisfy the external requirements and, therefore, may do little internally to improve the internal performance. Even then, these companies by implementing ISO 9000 would ensure the continued flow of contracts and the good will of external constituents (Choi and Eboch, 1998; Zucker, 1987). Therefore, we posit that ISO 9000 certified companies would do better on overall performance than non-ISO 9000 certified companies.

As in the case of TQM literature, most of ISO 9000 studies have also been based on cross-sectional data and, consequently, have the problem of causality. Heras, Dick, and Casadesus (2002) argued that certified companies had better results not only after the certification but previously to the certification date, which would indicate that companies

only undertake the certification process when they have enough resources and are not overwhelmed by negative results. However, recent longitudinal studies (Romano, 2000; Corbett et al., 2005; Sharma, 2005) found strong evidence that ISO 9000 does lead to improvements in performance.

Hypothesis 3: ISO 9000 certified companies will show higher performance compared to non-ISO 9000 certified companies.

Hypothesis 4: Companies that are ISO 9000 certified will show significant performance improvement from before certification to after certification.

2.3 Source of Motivation and ISO 9000 Implementation

Motivation for certification has been analyzed and many researchers have indicated that most companies apply it for external reasons; that is, they try to get it because of the pressure from the customers or as a marketing tool (Rayner and Porter, 1991; Askey and Dale, 1994; Vloeberghs, 1996; Ebrahimpour *et al.*, 1997; Brown *et al.*, 1998; Anderson *et al.*, 1999; Hughes *et al.*, 2000; Withers and Ebrahimpour, 2000). However, several papers showed that the positive results from certification hinges on the type of company's motivation for implementing it (Brecka, 1994; Meegan and Taylor, 1997; Huarng *et al.*, 1999; Hughes *et al.*, 2000; Sun, 2000; Gotzamani and Tsiotras, 2002, Terziovski, Power and Sohal, 2003). The general agreement is that companies that obtain ISO 9000 certification motivated by internal reasons get better results than those pressured by external reasons.

This type of dynamics is captured remarkably well by the institutional theory (e.g., DiMaggio and Powell, 1983; Meyer and Rowan, 1977; Zucker, 1987). Clearly,

with ISO 9000 being implemented all over the world (see www.iso.org), it has become institutionalized. As DiMaggio and Powell (1983) might attest, the field has become “isomorphic.” If so, the institutional theory would predict a decoupling between the administrative-level reactions that conform to external pressures and the internal operations at the technical core (Meyer and Rowan, 1977). The externally motivated activities engaged by companies would focus on assuaging the demands of external constituents, while the internal activities continue to focus on productivity and efficiency improvements (Choi and Eboch, 1998).

Hypothesis 5: ISO 9000 certified companies that score high on internal motivation will show higher levels of performance than ISO 9000 certified companies with lower scores for internal motivation.

However, we are still left with the question of the causal relationship between ISO 9000 implementation and performance when the motivation is internal versus when external. The consideration of resource based view (e.g., Barney, 1991; Grant, 1991) might be useful for this purpose. This theoretical perspective grounds company success in the resources and capabilities that are controlled by the organization and may become a source of competitive advantage. Then, by implication, it takes time to acquire these resources, especially if they are socially complex. And, if they are socially complex, once they are acquired, they are difficult to be imitated by others (Barney, 1991).

On the one hand, if the motivation for implementing ISO 9000 is more internal, a company stands a better chance of creating such valuable resources because the activities they create would be part of the technical core (Meyer and Rowan, 1977). If so, the

changes would become intangible and tacit resources, and these resources are not easily copied by others (Barney, 1991; Grant, 1991). Therefore, in the larger sense, these companies would show performance improvement from before certification to after certification. On the other hand, if getting ISO 9000 is driven by the external pressures and just to satisfy external requirements, the company would end up conforming only at the administrative or surface level (Choi and Eboch, 1998; Meyer and Rowan, 1977). If a company goes through a formality of implementing a computer system to collect statistical process control data in hopes of meeting the ISO 9000 requirements, what this company has done is easily copied by other companies and the change made would not become intangible and tacit resources (Meyer and Rowan, 1977). Further, if a company adopts ISO 9000 just to satisfy the requirements of present customers, this company's performance after the adoption would be no better or worse off than it had been—by adopting ISO 9000 the company merely alleviated potentially losing this customer.

Hypothesis 6: ISO 9000 certified companies that are internally motivated will show significant performance improvement from before certification to after certification.

Hypothesis 7: ISO 9000 certified companies that are externally motivated will fail to show significant performance improvement from before certification to after certification.

2.4 Motivation for ISO 9000 and TQM Implementation

During the early stages, in the 1987 and 1994 versions, ISO 9000 was largely a quality assurance system. It entailed a proof that companies have implemented generic, documented guidelines regarding quality management. In other words, ISO 9000 was conceived as a means to prove to third parties that the company has implemented a set of

guidelines, whereas TQM was mainly viewed as a management system that companies would apply in order to improve quality. As far as ISO 9000 was concerned, there were clear requirements that led to a hard outcome. In this regard, from a practical point of view, ISO 9000 represented a compulsory program for participating companies.

Even though it is originally driven by an external entity, many authors consider ISO 9000 as a possible first step toward a TQM system (Bradley, 1994; Hoyle, 1994; Tummala and Tang, 1996; Stephens, 1997; Kanji, 1998; Curkovic and Pagell, 1999; Skrabec, 1999; Sun, 2000; Yusof and Aspinwall, 2000; Escanciano, Fernandez and Vazquez, 2001; Claver, Tari and Molina, 2002; Gotzamani and Tsiotras, 2002). In fact, some papers have studied the ISO 9000's impact on performance by referencing the TQM system (Taylor, 1995; Tummala and Tang, 1996; Skrabec, 1999; Sun, 2000; Escanciano *et al.*, 2001).

Therefore, it seems that companies can mature in their implementation of ISO 9000 by taking the actual practices beyond merely conforming to the letters of the guidelines and by internalizing the reasons and actually making changes in their quality practices. When that happens, what they end up showing would be the ample evidence for TQM practices. Applying ISO 9000 for internal reasons is likely to mean the same thing as implementing quality practices.

Hypothesis 8: ISO 9000 certified companies that score high on internal motivation will exhibit higher levels of implementation of TQM practices than ISO 9000 certified companies with lower internal motivations.

3. Methodology

3.1 Population and Sample

This research focuses on industrial companies, the originally intended target of ISO 9000. Sample population comprised of Spanish industrial companies with more than 100 employees that are included in the “SABI” (Sistema de Analisis de Balances Ibericos) database. This database was employed because it offers longitudinal data on financial as well as general information.

The questionnaire was sent to 2986 companies in the sample population. This type of survey methodology is widely used for confirmatory studies with quality management focus, listed as one of the five primary areas of interest in operations management (Rungtusanatham, Choi, Hollingworth, Wu, and Forza, 2003). The questionnaire was pre-tested by researchers at Universidad de Murcia and managers of 10 pilot companies in the Region of Murcia.

The questionnaire, originally in Spanish, was sent to the attention of the “quality manager.” When a company felt that a different manager was more qualified to answer the questions, it was instructed to do so. There were a few cases where someone other than a quality manager completed the survey. We checked later for the differences among their responses and did not detect any statistical significance to be concerned about. When the survey was first mailed, inside each envelope we included a cover letter, a questionnaire form, and a pre-paid, pre-addressed envelope to be returned with the

completed questionnaire. In the letter, quality managers were offered a summary of the survey results upon the completion of the study.

The first wave of mailing to 2986 companies was conducted in March 2003. In May 2003, with the objective of improving the response rate, as advised by Frohlich (2002), a second wave was done to 1500 randomly selected companies that had not responded the first time. From the originally sent 2986 letters, 36 were returned due to unknown address—it was likely that those companies had probably changed their address or were extinguished. Also, 12 companies that initially were thought to be manufacturing turned out to be in services, so the target sample in the end became 2938 companies.

The number of valid, completed questionnaires was 713. It constituted a response rate of 24.3%. Response rate is usually interpreted as evidence of the interest showed for the research by managers. In this sense, a nearly 25% response rate is a considerable success given the cultural bias in Spain against mailed surveys and is higher than the suggested minimum discussed in Malhotra and Grover (1998).

3.2 Variables

3.2.1 TQM

To measure TQM implementation, the scale of Flynn et al. (1994) was translated into Spanish. We heeded Malhotra and Grover's (1998) advice to use previously tested scales in the literature. In fact, as an example of a good TQM scale, they recommend the Flynn et al.'s scales. We used a 5 point-scale, because according to some authors (e.g., Lissitz and Green, 1975), scales with 5 points tend to be more reliable, and also because our pre-test demonstrated that 5 point scales were easier to answer and would improve

the response rate. In addition to those perceptual measures, we also asked a yes-no question to the responding manager if the company had implemented a TQM system and if so when they started to that. The intent behind this binary question was to examine the internal consistency of the responses received on Flynn's et al.'s TQM scales.

3.2.2 ISO 9000

The questionnaire asked if the company had implemented ISO 9001:1994, 9002:1994, and/or ISO 9001:2000. For the present study, ISO 9001:1994 was considered as equivalent to ISO 9002:1994. The difference between these two standards addresses only the design activities and for our purposes it was not a significant difference. Either way, they are ISO-9000 certified. We also asked for the year of implementation to those companies that are ISO 9000 certified.

3.2.3 Company Performance

Although there is no clear guideline in the literature on measuring performance, there is a general agreement that it should not be limited just to the financial results (Quinn and Rohrbaugh, 1983; Venkatraman and Ramanujam, 1986). Financial results would only partially reflect the business situation (Curkovic, Vickery and Dröge, 2000). Another area of consideration regarding performance is the use of primary or secondary sources. It is recommended to use both sources, if possible, for the purpose of data triangulation (Venkatraman and Ramanujam, 1986). In our study, the primary data source is the responses of the managers responding to our survey, and the secondary data come from the SABI database.

In other words, two types of measures of company performance results were used—a subjective one based on respondents' opinions and an objective one from the financial database. Of course, both types of measures have their problems. Reliability of subjective measures depends on the truthfulness of managers and how well they are informed. Financial data are influenced by the sector situation and this is difficult to isolate from the analysis. Therefore, the use of both types may improve the validity of results.

The subjective measure tried to assess the operational results of the company. Managers were asked on how their companies compared with their competitors on: Production costs; Fast delivery; Flexibility to change production volume and adapt stocks; Cycle time; Internal quality; External quality; Customer satisfaction; Market share; and Employees satisfaction. The performance questions called for a response on a 1 to 7 scale with 1 being far below competitors and 7 far over competitors. We used the 7-point scale for the performance measures because during our pre-testing we learned that a 5-point scale tended to bias the response toward the center point and a 7-point scale worked much better. Furthermore, we asked managers about the improvements in specific performance measures from the date they implemented TQM and ISO 9000. Our intent was to obtain performance data with respect to the specific time when they made the implementation.

We turned to the SABI database for financial measures. We chose two measures—Productivity (income per employee) and ROA (return on assets). SABI includes longitudinal data on these two variables. So, we chose a period range of two years before and two years after implementation of TQM and ISO 9000. Had we chosen

three years instead of two, we would have lost too many observations. With two years before and after implementation plus the year of implementation, it gives us a five year time window and we felt that was sufficient. With such longitudinal data, it is now possible to analyse the evolution of performance between before and after implementation.

4. Analysis and results

4.1 Reliability and validity

The Cronbach's alpha has been calculated for each measure and is presented in Table 1. All the scales are reliable with values higher than 0.7. It is important to note that each of the dimensions in the chosen TQM scale may be composed of more than one scale, corresponding to more than one concept.

(Table 1 about here)

Content validity in our research can be assumed, at least in the TQM scale, since it has been previously tested in the literature (Flynn *et al.*, 1994). Construct validity can be tested by convergent and discriminant validity. The latter is usually checked by applying factor analysis to each scale and analysing if all its components score into one factor with eigenvalue higher than 1. We found that all the scales except performance scored into one factor. Performance scale's items were weighted into two factors, as shown in Table 2.

(Table 2 about here)

Based on these results, the performance scale should be divided into two scales. Given the nature of the variables merged together, factor 1 was called “Internal Results” and factor 2 was called “External Results”. The Cronbach alpha was calculated again for the new scales. The loadings were 0.73 for the internal results and 0.81 for the external results, so in later analyses two scales of results are used instead of one.

Convergent validity is theoretically grounded on the basis that one scale used to measure one concept is correlated with another with the same purpose. In our questionnaire, we introduced a direct question about the implementation of TQM. Consequently, we are able to test if both measurements are correlated. As one of them is a categorical variable we did an analysis of variance (ANOVA) comparing the means of values for each scale, dividing the sample into companies that said in the affirmative to implementing TQM and companies that did not. Table 3 shows the results. The results demonstrate convergent validity.

(Table 3 about here)

4.2 Possible Sample Bias

By design, the companies surveyed were also listed in SABI. So, we could obtain information about size (number of employees), sector and financial results and examine if there are important differences between sample and population.

The first difference analysed was the industrial sector distribution. Table 4 shows the number of companies in each industry (percentage in brackets).

(Table 4 about here)

To analyse if there is a difference between the sample and the population we correlated the number of companies existing in each sector in the population with the number of companies of each sector in the sample. The Pearson correlation was 0,957 and significant at the 1% level. It means that the sample is a good representation of the population regarding to the industry distribution.

An analysis of variance (ANOVA) comparing the average of employees in the population and the sample was done in order to examine if there was any difference in relation to company size. ANOVA did not reject the null hypothesis of equal means ($F=0,034$, $p=0,854$), so it was not possible to affirm that means are different. The averaged ROA was also compared, and the results of ANOVA did not prove that means of population and sample were different ($F=0,724$, $p=0,395$).

Further, it could be thought that the respondents were more interested in quality than the non-respondents and, if so, this could mean that the responses would be biased toward being on the high side. To address this issue, we first assumed that the quality levels of non-respondents would be equivalent to the levels of the latest respondents. The TQM averages of both the first ten days respondents and the last 10 days were then compared. No important differences ($F=2,821$; $p=0,094$) were detected. We also compared the TQM averages of responses in the first and second survey. We again did not find any difference ($F=3,596$; $p=0,058$).

4.3 Testing of Hypotheses

4.3.1 TQM and Performance (Hypotheses 1 and 2)

In order to test the effect of TQM on company performance, TQM is first measured by the mean of points in each dimension. Company performance is then measured by the means of external and internal results from the survey data. To test the association between TQM implementation and company performance, we use the Pearson correlation. Results are shown in table 5 and provide support for Hypothesis 1.

(Table 5 about here)

Since the data from survey are cross-sectional, we need to turn to SABI to examine Hypothesis 2. As discussed before, a 5-year data range, 2 years before and 2 years after implementation of TQM, was selected for each company. We ended up using only the companies that had information for all the years considered. SABI contained data until 2001, so the last year of TQM implementation was 1999. It meant that a number of companies were excluded from the sample, but the data is more reliable in this way and there is still a significant sample size left. The procedure was then to compare for each variable the two-year average before implementation and the two years after. The Student's T was used for this purpose as it applies to related samples. Table 6 shows the results that lend support for Hypothesis 2. On both performance dimensions, companies have shown improvement by implementing TQM.

(Table 6 about here)

However, these results do not allow us to argue with certainty if the increase is due to TQM implementation or is something that might be expected due to a general economic growth. Therefore, we created a control group consisting of all companies in the sample that did not implement TQM during the entire time span of the study. The

performance difference between two years before and two years after was computed for both groups—TQM and control. The mean performances differences were then compared and the results are shown on Table 7. Indeed, TQM companies did improve more than non-TQM companies on both performance measures.

(Table 7 about here)

4.3.2 ISO 9000 and Performance (Hypotheses 3 and 4)

Since ISO 9000 variable is categorical, the data analysis approach changes from one used for TQM. We conduct ANOVA to see if any difference between the performance means between the groups of certified and non-certified companies. Table 8 shows the results. Only one of the two measures shows significant difference, lending partial support for Hypothesis 3.

(Table 8 about here)

In order to draw causal linkage between ISO 9000 implementation and financial performance, we use the same approach we used for TQM. Results are presented in the Table 9. Only ROA shows improvement, lending partial support for Hypothesis 4.

(Table 9 about here)

In order to confirm that these results are due to ISO 9000 and not to the general improvement in all companies we tested if the control group had improved the same way. Again, as in TQM, the control group is composed by all non ISO 9000 companies in the sample. The results in Table 10 show no statistical difference between the ISO 9000 group and the control group. Consequently, the partial support for Hypothesis 4 we

established above needs to be qualified in that the increase in ROA among the ISO 9000 firms may not have been caused solely by the implementation of ISO 9000.

(Table 10 about here)

4.3.3 Motivation and ISO 9000 Implementation (Hypotheses 5, 6, and 7)

Motivation is considered a moderating factor in attaining performance results from ISO 9000. In order to test hypothesis 5, ANOVA involving all levels of motivation ranging from external, starting at value of 1, to internal, ending at value of 5, was conducted for both types of performance results. The analysis outcome is shown in Table 11. As evidenced in the table, the average results in different groups are higher when the motivation is more internal and lower when more external, lending support for Hypothesis 5.

(Table 11 about here)

We also applied the same approach we used before to ascertain causality using ROA and Productivity variables. Due to the limited sample size, we transformed the 5-point motivation scale into a binary variable. Companies with 1 or 2 were coded as externally motivated and companies with 4 or 5 as internally motivated. Companies with the neutral value of 3 were not taken into account. Then, the same analysis was performed for each group. Results are presented in table 12.

(Table 12 about here)

The results show that the internally motivated ISO 9000 certified companies do improve after the certification. However, the externally motivated ISO 9000 companies failed to show improvement after the certification. These results support Hypotheses 6 and 7.

4.3.4 Motivation for ISO 9000 and TQM Implementation

It is clear then that motivation appears as a determinant factor in obtaining better performance from the ISO 9000 implementation. Building on that observation, we now proceed to investigate if the level of motivation for implementation is also correlated with a higher value of TQM implementation. The results are showed in the table 13 and lend support for Hypothesis 8 that high internal motivation is associated with high level of TQM practices among the ISO 9000 certified companies.

(Table 13 about here)

5. Conclusions

In this present study, we tried to first replicate some basic relationships involving TQM, ISO 9000, and company performance. The relationship between TQM and company performance has been well established and we found strong support for it, as expected. TQM showed strong correlations with both internal performance and external performance factors (see Table 5). However, the relationship between ISO 9000 and company performance was not so clear cut. Perhaps, this was to be expected—we observed in our literature review that the impact of ISO 9000 on performance was more

mixed compared to the impact of TQM on performance which was much more unanimous. What are the underlying issues for the mixed results?

Certified companies performed better than non-certified companies on the internal performance results, but certified companies did not do better than non-certified companies on the external performance results (see Table 8). In addition to the fundamental relationships shown in Hypotheses 1 and 3, we also studied the causal relationships by marking the time of implementation and using the SABI database for performance in productivity and ROA. These relationships were captured in Hypotheses 2 and 4. Again, it was quite straight forward for TQM that companies that implemented TQM performed better after the implementation (see Tables 6 & 7). However, as before, it was not so straight forward for ISO 9000. Among the companies that did implement ISO 9000, only ROA seemed to have improved after implementing ISO 9000 (see Table 9). Furthermore, based on results shown in Table 10, it was entirely inconclusive that the increases in performance among the ISO 9000 certified companies were due to the implementation of ISO 9000.

Hypotheses 5, 6, and 7 addressed the motivational issues surrounding ISO 9000 implementation. When we compared the level of motivation with performance results among the certified companies, we learned that more internally motivated companies saw better performance outcomes, for both internal and external performance factors (see Table 11). Furthermore, when we looked across the time table with respect to the time of implementation, internally motivated companies saw increase in ROA and productivity, while externally motivated companies did not (see Table 12).

We have come far from the days of wondering whether TQM might or might not affect the company performance or how might ISO 9000 benefit a company beyond just getting a certificate. We demonstrated that both TQM and ISO 9000 do affect company performance in a positive way. However, the performance implication of ISO 9000 still needs to be studied further, given the mixed results. We ascertained unequivocally that TQM causes performance improvement and ISO 9000 also causes performance improvement though limited to external results. We demonstrated the importance of internal motivation when implementing ISO 9000, and how internal motivation in fact points to improved quality practices. We learned that when motivation of implementing ISO 9000 is internal, what the company is doing is in essence to increase TQM practices.

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Table 1. Reliability Analysis¹

<i>Dimensions</i>	<i>Scale included in each dimension</i>	<i>Cronbach alpha</i>
Leadership	Leadership	0,8202
	Rewards system	0,8157
Information	Process control	0,7925
	Feedback	0,8597
Process management	Process management	0,8501
Design	New product's design	0,7699
	Interfunctional design	0,7134
HRM	Selection	0,8539
	Teamwork	0,8781
Suppliers	Suppliers relationship	0,7305
Customers	Customers orientation	0,7363
	Performance	0,8295

1. Cronbach alpha for scales used in the research

Table 2. Factor Analysis of Performance

Factor 1: Internal Results	Factor 2: External results
Unit production costs	Manufacturing quality
Fast delivery	Design quality
Flexibility	Customers satisfaction
Cycle time	Market share
	Employees satisfaction

Table 3. Convergent Validity¹

		N	Mean	F	Sig.
Leadership	<i>Do not apply TQM</i>	486	3,4729	17,869	0,000
	<i>Apply TQM</i>	216	3,7473		
Rewards system	<i>Do not apply TQM</i>	486	2,1317	39,058	0,000
	<i>Apply TQM</i>	216	2,6358		
Process control	<i>Do not apply TQM</i>	485	2,5165	56,464	0,000
	<i>Apply TQM</i>	216	3,0756		
Feedback	<i>Do not apply TQM</i>	484	2,3216	75,669	0,000
	<i>Apply TQM</i>	216	3,1451		
Process management	<i>Do not apply TQM</i>	484	3,6257	12,452	0,000
	<i>Apply TQM</i>	216	3,8796		
New products design	<i>Do not apply TQM</i>	479	3,4706	13,850	0,000
	<i>Apply TQM</i>	213	3,6925		
Interfunctional design	<i>Do not apply TQM</i>	478	3,1555	25,710	0,000
	<i>Apply TQM</i>	212	3,5079		
Selection	<i>Do not apply TQM</i>	483	3,2008	23,487	0,000
	<i>Apply TQM</i>	215	3,5558		
Teamwork	<i>Do not apply TQM</i>	484	3,1818	37,597	0,000
	<i>Apply TQM</i>	216	3,6543		
Suppliers	<i>Do not apply TQM</i>	486	3,5869	9,584	0,002

	<i>Apply TQM</i>	216	3,7689		
Customers	<i>Do not apply TQM</i>	484	3,6402	22,945	0,000
	<i>Apply TQM</i>	216	3,9568		

1. T-test for differences in TQM scales between companies that affirmed to have implemented TQM and companies that did not.

Table 4. Industry Distribution¹

SECTOR	POPULATION	SAMPLE
Food and beverages	417 (14,8%)	97 (14 %)
Tobacco	7 (0,2%)	0 (0%)
Textiles	137 (4,8%)	16 (2,3%)
Confectionery	68 (2,4%)	6 (1%)
Leather	36 (1,3%)	67(0,9%)
Wood	59 (2,1%)	24 (3,5%)
Paper	96 (3,4%)	25 (3,6%)
Printing	164 (5,8%)	20 (2,9%)
Petrol	6 (0,2%)	3 (0,4%)
Chemical	270 (9,6%)	64 (9,3%)
Plastics	165 (5,8%)	49 (7,1%)
Non metallic minerals	245 (8,7)	65 (9,4%)
Iron	110 (3,9%)	31 (4,5%)
Metals	235 (8,3%)	60 (8,7%)
Machinery and mechanical equipment	185 (6,6%)	57 (8,2%)
Office and computer systems	9 (0,3%)	3 (0,4%)
Machinery and electric equipment	122 (4,3%)	38 (5,5%)
Electronic equipment. Radio, TV and communication equipment	47 (1,7%)	13 (1,9%)
Medical, surgery and optician equipment	28 (1%)	9 (1,3%)
Automobile industry	177 (6,3%)	45 (6,5%)
Other transportation industry	62 (2,2%)	17 (2,5%)
Furniture	89 (3,2%)	25 (3,6%)
Recycling	6 (0,2%)	2 (0,3)
Production and distribution of electric energy, gas and hot water	23 (0,8%)	8 (1,2%)
Water distribution	46 (1,6%)	4 (0,6%)
Building	14 (0,5%)	3 (0,4%)

1. Number of companies grouped by sectors in population and sample (percentage in brackets)

Table 5. Effect of TQM on Performance Results¹

Correlation TQM-Results			
Variables	Internal results		External results
TQM	0,381***		0,510***
Main Descriptives			
	N	Average	Standard deviation
TQM	711	3.2354	0.59286
Internal Results	700	4.9077	0.87703
External results	700	5.0157	0.84233

1. Correlation between TQM scales and subjective measures of performance grouped into two factors.

* p<0,10; **p<0,05; *** p<0,01

Table 6: Effect of TQM on Financial Measures¹

Variables	N	Average before TQM	S.D.	Average after TQM	S.D.	T	Sig.
ROA	65	3.4744	8.24212	6.2789	7.01703	-2.125	0.037**
Productivity	65	1.7813	1.13982	1.9688	1.07041	-1.706	0.093*

1. T-test for differences in the average results two years after TQM implementation and two years before. (Related samples). Objective measures of performance from SABI database.

* p<0,10; **p<0,05; *** p<0,01

Table 7: Control group for the effect of TQM on Financial Measures¹

		N	Mean	S.D.	T	Sig.
ROA after-ROA before	<i>Non TQM</i>	1697	1.4984	7.87083	-1.872	0.061*
	<i>TQM</i>	44	3.7755	11.14502		
Productivity after – productivity before	<i>Non TQM</i>	1697	0.0439	0.78359	-1.984	0,047**
	<i>TQM</i>	44	0.2818	0.85080		

1. T-test for differences of TQM and non TQM companies in a new variable created as the difference between the two years average ROA and Productivity after and before TQM implementation . Objective measures of performance from SABI database.

* p<0,10; **p<0,05; *** p<0,01

Table 8. ISO 9000 and Performance Results¹

		N	Mean	S.D.	F	Sig.
Internal results	<i>Non certified</i>	227	4,8051	0.86597	4,828	0,028**
	<i>Certified</i>	467	4,9602	0.87583		
External results	<i>Non certified</i>	227	4,9778	0.79856	0,707	0,401
	<i>Certified</i>	467	5,0352	0.86520		

1. ANOVA for differences in the subjective measures of performance between ISO 9000 certified companies and non ISO 9000 certified companies..

* p<0,10; **p<0,05; *** p<0,01

Table 9. Effect of ISO 9000 on Financial Performance¹

Variables	N	Average before ISO 9000	S.D.	Average after ISO 9000	S.D.	T	Sig.
ROA	209	3.5913	7.74248	5.3440	6.63267	-2.960	0.003***
Productivity	207	1.7529	1.03460	1.8052	0.76439	--0.789	0.431

1. T-test for differences in the averaged results two years after ISO 9000 implementation and two years before. (Related samples). Objective measures of performance from SABI database.

* p<0,10; **p<0,05; *** p<0,01

Table 10: Control group for the effect of ISO 9000 on Financial Measures¹

		N	Mean	S.D.	T	Sig.
ROA after-ROA before	<i>Non ISO 9000</i>	818	1.3696	8.55737	0.187	0.852
	<i>ISO 9000</i>	187	1.2405	8.41144		

Productivity after – productivity before	<i>Non ISO 9000</i>	812	0.0924	0.73190	1.207	0.228
	<i>ISO 9000</i>	185	0.0153	0.97928		

1. T-test for differences of ISO 9000 and non ISO 9000 companies in a new variable created as the difference between the two years average ROA and Productivity after and before ISO 9000 implementation. Objective measures of performance from SABI database.

* p<0,10; **p<0,05; *** p<0,01

Table 11: Motivation as a moderating variable in the ISO 9000-Results relationship¹

	Motivation level	N	Average	S.D.	F	Sig.
Internal results from certification	1	43	4,4651	0.64913	7,645	0,000***
	2	109	4,4694	0.65741		
	3	132	4,7424	0.82190		
	4	140	4,8000	0.78726		
	5	97	4,9897	0.78222		
External results from certification	1	45	4,7544	0.78393	10,118	0,000***
	2	109	4,8683	0.72542		
	3	132	4,9830	0.75252		
	4	140	5,1782	0.68526		
	5	97	5,3918	0.71512		

1. ANOVA for differences in the subjective measures of performance between ISO 9000 certified companies with different levels of motivation (From externally motivated=1 to internally motivated=5).

* p<0,10; **p<0,05; *** p<0,01

Table 12. Motivation as a Moderating Variable¹

EXTERNALLY MOTIVATED ISO 9000 COMPANIES							
Variables	N	Average before ISO 9000	S.D.	Average after ISO 9000	S.D.	T	Sig.
ROA	59	3.9692	5.78746	5.1049	8.45348	-1.090	0.280
Productivity	59	1.6106	0.73426	1.6499	0.55932	-0.511	0.611
INTERNALLY MOTIVATED ISO 9000 COMPANIES							
Variables	N	Average before ISO 9000	S.D.	Average after ISO 9000	S.D.	T	Sig.
ROA	83	2.6429	9.73612	5.4927	5.12310	-2.971	0.004***
Productivity	83	1.7659	0.84609	1.9271	0.91024	-1.867	0.066*

1. T-test for differences in the averaged results two years after ISO 9000 implementation and two years before (Related samples) in companies that implemented ISO 9000 externally and internally motivated (externally motivated: companies that are in the groups 1 and 2 of table 11; Internally motivated: companies in the groups 4 and 5; group 3 not considered). Objective measures of performance from SABI database.

* p<0,10; **p<0,05; *** p<0,01

Table 13. TQM and Motivation among ISO 9000 Certified Companies¹

Motivation level	N	Average TQM	S.D.	F	Sig.
1	46	2.8785	0.61104	18.379	0.000***
2	113	3.0622	0.55510		
3	136	3.1736	0.56357		
4	149	3.3119	0.52258		
5	100	3.5821	0.56385		

1. ANOVA for differences in the TQM average between ISO 9000 certified companies with different levels of motivation (From externally motivated=1 to internally motivated=5).

* p<0,10; **p<0,05; *** p<0,01

APPENDIX: QUESTIONNAIRE

SECTION A

1. Please, mark your position in the company at the moment.

<input type="checkbox"/> General Manager	<input type="checkbox"/> Quality manager	<input type="checkbox"/> Member of the production department
<input type="checkbox"/> General manager for Spain	<input type="checkbox"/> Production manager	<input type="checkbox"/> Member of the quality department
<input type="checkbox"/> Plant manager		<input type="checkbox"/> Other:

2. Please, specify the product with higher production volume in your company

3. How many product lines are manufactured in your company?

4. Please, specify the average number of employees in 2002

5. What is the nationality of the main stakeholders in your company?

<input type="checkbox"/> Spanish	<input type="checkbox"/> USA	<input type="checkbox"/> Other. Please say
<input type="checkbox"/> Other EU	<input type="checkbox"/> Japanese	

6. What is the percentage of sales for each of the following markets?

Country	Percentage
1. Spain	
2. Other EU	
3. Rest of the world	
TOTAL	100%

7. Position of your company between the points below:

Workers have the higher importance in the production process	1	2	3	4	5	Machinery have the higher importance in the production process
It is workforce intensive	1	2	3	4	5	It is capital intensive
Our competence is strong	1	2	3	4	5	Our competence is weak
Our customers are loyal. They never change of supplier	1	2	3	4	5	Our customers change often of supplier
Competence in our sector is based mainly on prices, not in differentiation	1	2	3	4	5	Competence in our sector is based mainly on differentiation, not in prices
Our sector is saturated. There are a lot of companies	1	2	3	4	5	Our sector is growing. There is still room for more companies

SECTION B: If your company is not registered please go directly to section C

8. Mark the certificate/s of quality assurance that your company has got and the year of certification:

<input type="checkbox"/> ISO 9001:1994 Year:	<input type="checkbox"/> ISO TS 16949 Year:
<input type="checkbox"/> ISO 9002:1994 Year:	<input type="checkbox"/> ISO 9001:2000 Year:

9. The decision of being registered by ISO 9000 may basically be caused by external pressures (customers or the fact that being certified is a previous condition to be able to sell in some markets), internal reasons (belief that the company will increase its performance) or both reasons. Indicate the importance of these reasons in your company at the time of obtaining the registration. ("1" would be external reasons and "5" main reason is internal)

External pressures	1	2	3	4	5	Internal causes
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10. What registration body did your company chose?

- AENOR
- Bureau Veritas
- Lloyds Register
- DNV
- TÜV
- Other:

11. Please mark the main reason for choosing the registration body:

- It was the most known in Spain
- It was the most known in the market in which we act
- It was "permissive"
- It was recommended by our customers
- It was the cheapest
- Other:

SECTION C

12. Mark your level of agreement/disagreement in these statements (1: completely agree; 5: completely disagree)

	Completely disagree			Completely agree	
All major department heads within our plant accept their responsibility for quality	1	2	3	4	5
Plant management provides personal leadership for quality products and quality improvement	1	2	3	4	5
The top priority is evaluating plant management in quality performance	1	2	3	4	5
Our top management strongly encourages employee involvement in the production process	1	2	3	4	5
Workers are rewarded for quality improvements	1	2	3	4	5
We pay a group incentive for quality improvement ideas	1	2	3	4	5
Our plant has a annual bonus system based on plant productivity	1	2	3	4	5
Non financial incentives are used to reward quality improvement	1	2	3	4	5
Processes in our plant are designed to be "fool proof"	1	2	3	4	5
A large percent of the equipment or processes on the shop floor are currently under statistical quality control	1	2	3	4	5
We make extensive use of statistical techniques to reduce variance in processes	1	2	3	4	5
Charts showing defect rates are posted on the shop floor	1	2	3	4	5
Charts showing schedule compliance are posted on the shop floor	1	2	3	4	5
Charts plotting the frequency of machine breakdowns are posted on the shop floor	1	2	3	4	5
Workers are always told when they do a good job	1	2	3	4	5
Information on productivity is readily available to employees	1	2	3	4	5
My manager always comments about the quality of my work	1	2	3	4	5
Our plant emphasizes putting all tools and fixtures in their place	1	2	3	4	5
We take pride in keeping our plant neat and clean	1	2	3	4	5
Our plant is kept clean at all times	1	2	3	4	5
I never have trouble finding the tools I need	1	2	3	4	5
Our plant is disorganized and dirty	1	2	3	4	5
New product designs are thoroughly reviewed before the product is produced and sold	1	2	3	4	5
Customer requirements are thoroughly analyzed in the new product design process	1	2	3	4	5
New product quality is a more important priority than new product cost	1	2	3	4	5
Quality is more important than schedule concerns in the new product development process	1	2	3	4	5
Direct labour employees are involved to a great extent before introducing new products or making product changes	1	2	3	4	5
There is little involvement of manufacturing and quality people in the early design of products, before they reach the plant	1	2	3	4	5
We work in teams, with members from a variety of areas to introduce new products	1	2	3	4	5
We use ability to work in a team as a criterion in employee selection	1	2	3	4	5
We use problem solving ability as a criterion in selecting employees	1	2	3	4	5
We use work values and ethics as a criterion in employee selection	1	2	3	4	5
Our plant is organized into permanent production teams	1	2	3	4	5
During problem solving sessions, we make an effort to get all team members' opinions and ideas before making a decision	1	2	3	4	5
Our plant form teams to solve problems	1	2	3	4	5
In the past three years, many problems have been solved through small group sessions	1	2	3	4	5
We strive to establish long-term relationships with suppliers	1	2	3	4	5
Our suppliers are actively involved in our new product development process	1	2	3	4	5
Quality is our number one criterion in selecting suppliers	1	2	3	4	5
We rely on a small number of high quality suppliers	1	2	3	4	5
We frequently are in close contact with our customers	1	2	3	4	5
Our customers often visit our plant	1	2	3	4	5
Our customers give us feedback on quality and delivery performance	1	2	3	4	5

SECTION D

13. Please, select in which competitive position is your company in comparison with its competitors relating to these performance measurements (1: Much worse, 7: Much better)

	Much worse			Much better			
Unit production costs	1	2	3	4	5	6	7
Fast deliveries	1	2	3	4	5	6	7
Flexibility to change production volume and inventories	1	2	3	4	5	6	7
Cycle time	1	2	3	4	5	6	7
Design quality	1	2	3	4	5	6	7
Manufacturing quality	1	2	3	4	5	6	7
Customers satisfaction	1	2	3	4	5	6	7
Employees satisfaction	1	2	3	4	5	6	7
Market share	1	2	3	4	5	6	7

14. **ONLY FOR COMPANIES APPLYING ISO 9000** Since your company obtained the ISO 9000 certification How these performance measures have evolved (in average)? (1: Strong decrease; 7: Strong increase)

	Strong decrease			Strong increase			
Unit production costs	1	2	3	4	5	6	7
Fast deliveries	1	2	3	4	5	6	7
Flexibility to change production volume and inventories	1	2	3	4	5	6	7
Cycle time	1	2	3	4	5	6	7
Design quality	1	2	3	4	5	6	7
Manufacturing quality	1	2	3	4	5	6	7
Customers satisfaction	1	2	3	4	5	6	7
Employees satisfaction	1	2	3	4	5	6	7
Market share	1	2	3	4	5	6	7

15. IS YOUR COMPANY APPLYING THE PHILOSOPHY OF A TQM SYSTEM?

<input type="checkbox"/> NO	<input type="checkbox"/> YES. (tell us the approximate date in which it started)
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16. **ONLY FOR COMPANIES APPLYING TQM** Since your company implemented a TQM system How these performance measures have evolved (in average)? (1: Strong decrease; 7: Strong increase)

	Strong decrease			Strong decrease			
Unit production costs	1	2	3	4	5	6	7
Fast deliveries	1	2	3	4	5	6	7
Flexibility to change production volume and inventories	1	2	3	4	5	6	7
Cycle time	1	2	3	4	5	6	7
Design quality	1	2	3	4	5	6	7
Manufacturing quality	1	2	3	4	5	6	7
Customers satisfaction	1	2	3	4	5	6	7
Employees satisfaction	1	2	3	4	5	6	7
Market share	1	2	3	4	5	6	7