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TQM, innovation and the role of cultural change

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TQM, innovation and the role of cultural change

TQM, innovation
and cultural
change

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Abstract

Purpose – The purpose of this paper is to better understand the influence of total quality management (TQM) practices on incremental and radical innovation, examining the role of diverse cultural change as a mediator, particularly in firms where ever-increasing competitive pressure demands a combination of quality and innovation.

Design/methodology/approach – From previous research on the influence of TQM practices on innovation, the paper proposes a model which is tested through a survey carried out on a sample of 72 Spanish firms that have been drastically hit by competition from Asian companies, achieving a 51.42 percent valid return rate.

Findings – None of the sets of TQM practices directly affects radical innovation, while all of them have a significant and positive relationship with incremental innovation. However, when the paper introduces cultural change as a mediating factor, the model's goodness of fit improves substantially, and all the relations are significant.

Research limitations/implications – The results reveal the power of cultural change to connect the diversity of the TQM practices and incremental and radical innovation. Further research is needed for a more comprehensive understanding of the role of cultural change in these relationships and to test the model in a longitudinal study.

Practical implications – Managers can use the potential inherent in TQM to stimulate a paradoxical cultural context that favours innovation. This is especially relevant for enhancing radical innovation.

Social implications – Given the extent to which TQM has been applied over the last 20 years, the social impact of this study is relevant, particularly in the current environment of economic crisis which calls for an increase in efficiency and innovation, adaptation and change.

Originality/value – The paper introduces a multidimensional analysis of TQM and a broad perspective of innovation. The paper also develops an original definition of cultural change made up of apparently contradicting values, including exploitation and exploration, and introduces it as a mediating variable in the TQM-innovation model.

Keywords Total quality management, Cultural change, Incremental innovation, Radical innovation, Multidimensionality

Paper type Research paper



1. Introduction

The intensification of global competition requires an effort on the part of organizations to promote innovation at the same time as improving quality as a means of survival

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and growth (Cho and Pucik, 2005). While the importance of this fact has often been emphasized, much more remains to be understood on this topic.

The arguments that underpin each of the viewpoints on the relationship between total quality management (TQM) and innovation are diverse. It is argued that the principles and practices that promote the use of TQM are consistent with those of innovation (Gustafson and Hundt, 1995). Several current empirical studies conclude that quality management practices assist firms in developing innovation capabilities (Perdomo-Ortiz *et al.*, 2006), innovation results (Prajogo and Hong, 2008).

Although empirical support for a positive relation is stronger than for a negative one, conclusive results are yet to appear. It has been claimed that standardization brought about by TQM inhibits creativity and innovation and leads to analytical, linear thinking, focusing only on the specifications of the customer (Slater and Narver, 1998). Some empirical research finds a negative relationship between process management and radical innovation (Benner and Tushman, 2002, 2003) and between formalization and technological innovation (Moura E Sá and Abrunhosa, 2007), or do not reveal any significant connection (Sing and Smith, 2004).

In this sense, the contributions of Prajogo and Sohal (2001) and Kim *et al.* (2012) are fundamental, as they offer a broad review of the literature on this topic. Even though this is a widely researched topic that has engendered a sizeable body of literature, it is still open to new perspectives.

Relevant scholars have called for a deeper understanding of the complexity of innovation (Linton, 2009; Chang *et al.*, 2012), and this is of particular importance in our case because a narrow view of innovation may be a barrier to understanding with regard to the impact of TQM on innovation (Kim *et al.*, 2012). Taking on board the complexity of the TQM principles and practices has also been pinpointed as a factor of utmost relevance (Bou-Lusar *et al.*, 2009). Hitherto, studies have mainly examined the direct relationship between TQM practices and innovation, and there is a great potential in discovering mediating variables (Kim *et al.*, 2012).

This study contributes to a deeper understanding of the relationships between TQM and innovation by first dealing with the complexity of the TQM application and its multidimensional character (Moreno-Luzon and Valls-Pasola, 2011). In order to understand the amplitude of the applications of TQM, we can see its origins and how it has evolved from an entirely technical approach, strictly linked to the manufacturing department, to a global management approach that includes human, organizational, marketing and strategic elements. In order to reflect this essential aspect in our study, we classify these principles and practices into three major groups: processes, people and customers (Bou-Lusar *et al.*, 2009; Dean and Bowen, 1994).

The second contribution of our study lies in adopting a wide perspective of innovation in the analysis, embracing incremental as well as radical innovation (Linton, 2009; Chang *et al.*, 2012). Radical innovation occurs in entirely new products or processes that require new knowledge, allowing them to satisfy new customers or emerging markets (Herrmann *et al.*, 2006), while incremental innovation implies progressive improvements in characteristics of already existing products and processes (Green *et al.*, 1995; Chang *et al.*, 2012).

Nevertheless, the main contribution of this research is to measure the role of the diverse cultural change generated by TQM as a mediator. Following the research that analyzes the cultural implications of TQM (Naveh and Erez, 2004; Dellana and

Hauser, 1999; Prajogo and McDermott, 2005) and taking into account the concepts of exploitation and exploration expressed by March (1991), we have conceptualized the cultural change brought about by TQM including values related to exploitation such as control, discipline, precision, and improvement; and related to exploration like experimentation, creativity, risk taking and flexibility. This cultural change, made up of apparently contradicting values, has not been previously employed in the analysis of this relationship. Furthermore, this contribution provides an important practical implication: knowing the potential of this paradoxical cultural change allows managers to also promote and audit it in order to make TQM a platform for innovation.

We propose two models: one that measures the direct relations between TQM and innovation, and another that includes the cultural change brought about by TQM as a mediating variable. We test these models by carrying out a survey on Spanish companies from the textile and furniture sectors.

In the next section, we present the literature review and hypotheses. After describing our research methodology, we present the findings of the survey, ending with a discussion of the results and its implications.

2. Theoretical framework and proposed model of relations

An analysis of the literature suggests that the discrepancies on the relation between TQM and innovation might come from the interpretation of the reality of TQM, which, due to its complex nature has a tremendous diversity of principles and practices (Prajogo and Sohal, 2001; Kim *et al.*, 2012), which is why it is worth taking a closer look at these differences.

2.1 Processes

The first influential empirical study that maintains that process management has a negative influence on radical innovation consists of a longitudinal study in the sectors of photography and painting in the USA. It concludes that ISO 9001:1994 standard implementation is related to incremental innovation, but also to a reduction in radical innovation, which arises from patents based on totally new knowledge (Benner and Tushman, 2002, 2003).

There are theoretical arguments that can explain these results; one of the most convincing is that when TQM programmes are mechanically focused, formalization can make people act in an “unconcerned way” (Hackman and Wageman, 1995, p. 333), trusting in the same routines when they really should be completely changed. In case studies, we find evidence to suggest that process management can raise barriers to innovation by creating a “comfortable zone” of work in an environment with clear standards that are related to solid results, and thus change is avoided (Prajogo and Sohal, 2004b).

However, the conclusions obtained by Benner and Tushman (2002, 2003) are the result of a study in firms that implement the ISO 9001:1994 standards, which imply a merely technical and closed quality management focus, i.e. a quality assurance approach. In a TQM approach, processes management operates interdependently with other practices, which is why it is implemented in a flexible way on the basis of people commitment and customer orientation.

Prajogo and Sohal (2004a) obtained some highly interesting results in relation to this debate in a study carried out in Australia. Its findings show that the mechanical elements of TQM, process management and customer orientation, better explain quality results,

while leadership and human resource management practices are related to innovation. As the authors themselves recognize this does not allow immediate conclusions to be drawn as, for example, it would be erroneous to state that organizations can ignore the human aspect and concentrate on the mechanics if they wish to exclusively obtain results in quality. These authors suggest continuing to investigate the multidimensionality of TQM and its capacity for reconciling juxtaposed elements for understanding its relations with innovation.

There is no lack of argument to support the idea that process management can positively affect incremental and radical innovation, as it is based on the belief that a firm's capability is rooted in processes and can be reinforced through their effective management (Das and Joshi, 2011). The literature indicates that the introduction of systematic efforts for improvement avoids complacency and a lack of discipline, stimulating creativity and the generation of ideas (Prajogo and Sohal, 2001). Equally, it has been shown that process management systems can be configured as enablers to coordinate people without removing flexibility (Adler and Borys, 1996).

Moreover, management of the innovation process itself enhances the objectives being pursued through efficient processes and methods (Hoang *et al.*, 2006). In general, the increase in norms and standards improves the processes of the implementation and diffusion of innovation (Moreno-Luzon and Lloria, 2008) and thus contributes to improving their performance.

Several empirical studies have found a positive and significant relationship between process management practices in a TQM framework and business innovation capability (Perdomo-Ortiz *et al.*, 2006) and product innovation (Prajogo and Hong, 2008). However, the strongest support for our first hypotheses comes from the recent research of Kim *et al.* (2012); their results indicate that process management directly and positively relates to all types of innovation, including incremental as well as radical ones (Kim *et al.*, 2012 p. 305).

With these starting points we present our first hypotheses:

- H1. The application of process management practices within the framework of TQM has a positive effect on incremental innovation.
- H2. The application of process management practices within the framework of TQM has a positive effect on radical innovation.

2.2 People

In terms of the commitment and participation of people, the positive impact on innovation is often stressed. The main doubts arise concerning teamwork, in that radical innovation requires individualistic people who are capable of coping with a high level of conflict and are entrepreneurial and competitive. The conclusions of some case studies find evidence to suggest that innovation teams are differentiated from quality ones via their greater degree of conflict (Bossink, 2002). Furthermore, the connection between employee empowerment and innovation has also turned out to be non-significant in recent research on Polish SMEs (Kmieciak *et al.*, 2012).

However, other convincing arguments are in favour of a positive relationship. Teamwork and the participation that TQM introduces enables the coordination of the efforts of different departments, favouring speed in launching new products and taking

advantage of localized knowledge at an employee level and a cross-fertilization of ideas (Adams *et al.*, 2006), all of which favours innovation.

Moreover, the continuous training that TQM promotes improves knowledge as a lever for creativity (Amabile, 2000) and the ability to unlearn via which people are able to question current situations (Herrmann *et al.*, 2006). A TQM framework means that trust is put in people, they are offered a greater degree of freedom for problem-solving without constant supervision (Adams *et al.*, 2006). This trust is fundamental for facing up to the risks inherent in radical innovation (Santos-Vijande and Alvarez-Gonzalez, 2007).

Empirical quantitative studies coincide in underlining leadership and people management due to their positive relation with innovation outcomes (Prajogo and Sohal, 2004a; Prajogo and Hong, 2008) and business innovation capability (Perdomo-Ortiz *et al.*, 2006). Some case studies underline the positive repercussions of employee participation and training and the advantages of teamwork in obtaining better incremental and radical innovation outcomes (McAdam *et al.*, 1998). Montes *et al.* (2003) also reinforce the positive relationship between TQM and innovation through human resources; TQM creates an appropriate climate for encouraging the adoption of innovations.

Based on the theoretical and empirical studies cited above, we propose the following hypotheses:

- H3.* The application of people commitment practices within the framework of TQM has a positive effect on incremental innovation.
- H4.* The application of people commitment practices within the framework of TQM has a positive effect on radical innovation.

2.3 Customers

The literature primarily refers to Slater and Narver (1998), who describe the dangers involving an orientation limited to current customers because of the narrow-minded view, which harms innovation outcomes, and may prevent companies from anticipating market changes. In addition, studies such as those of Prajogo and Sohal (2004a) link these mechanical practices to quality results and not to innovation, as it happens with process management.

However, TQM does not appear to maintain a narrow conceptualization of customer orientation. As Santos-Vijande and Alvarez-Gonzalez (2007) point out, a well understood principle of customer orientation requires continuous innovative effort, with a predisposition to accepting new, even anticipating latent needs, in order to satisfy more complex customers, stimulating a continued search of new opportunities in the face of market changes.

Numerous quantitative studies have concluded that close relations with customers and suppliers have a positive impact on the speed and success of development of new products (Gustafson and Hundt, 1995) and on process and product innovation (Prajogo and Sohal, 2003). Good relations with customers are fundamental for incorporating their needs into the development of new products and they also enable feedback on the degree of satisfaction. Recent research also points to a positive view, such as the study by Sainio *et al.* (2012), who prove that customer relationship management promotes technologically radical innovation, as it reinforces close collaboration with current leading-edge customers.

We thus present two additional hypotheses:

- H5. The application of customer orientation practices within the framework of TQM has a positive effect on incremental innovation.
- H6. The application of customer orientation practices within the framework of TQM has a positive effect on radical innovation.

Our first model is based on the six formulated hypotheses proposing direct TQM-innovation relations (Figure 1).

2.4 The role of cultural change

In the search for the key variables to understand the impact of TQM on innovation, the path of analysis that incorporates cultural values is a promising one. On the one hand, some studies have shown the mediating role that an innovative culture plays in the TQM-innovation relationship (Santos-Vijande and Alvarez-Gonzalez, 2007) according to the results of their research, TQM is a management system capable of creating an open to innovation organizational culture. On the other, the importance of the principles and values for applying TQM has been reiterated (Moreno-Luzon and Valls-Pasola, 2011), and obtaining a true cultural change is recognized as a key factor for the success of TQM implementation, although the cultural change driven by TQM is neither simple nor quick, as cultural values are complex and will resist in the face of direct manipulation (Denison, 1990).

This study draws on March's (1991) concepts of exploration and exploitation to define the diverse cultural change. Other research has made similar theory developments; Dellana and Hauser (1999) on competing values were pioneers in empirically showing that TQM is simultaneously related to different cultures, applying a model of competing values that was initially created by Quinn and Rohrbaugh (1981), and has been used in studies within the framework of TQM (Prajogo and McDermott, 2005). Moreover, the empirical study by Naveh and Erez (2004) points out that if different TQM practices are applied jointly they have a positive impact not only on values such as control and attention to detail, but also on creativity and experimentation.

Innovation literature normally emphasizes values such as risk-taking or creativity to define an innovative culture (Santos-Vijande and Alvarez-Gonzalez, 2007). However, some authors suggest that an innovation culture must, by definition, be paradoxical (Khazanchi *et al.*, 2007), requiring flexibility and empowerment, as well as control and efficiency. Similarly, Tatikonda and Rosenthal (2000) highlight the fact that not only

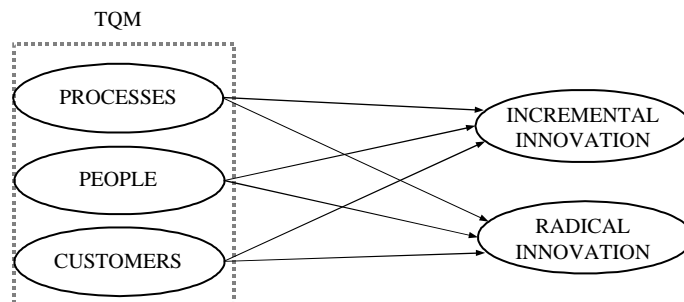


Figure 1.
TQM-innovation model

flexibility is necessary, but also firmness to achieve greater project execution effectiveness in incremental and radical innovation projects.

Although the creation of a contradictory culture with the application of TQM has been studied by certain authors, and others have highlighted the need for a paradoxical innovation culture, there is an absence of studies that empirically connect a TQM culture defined in this way with innovation results. We connect this literature to formulate our seventh hypothesis:

- H7.* The cultural change brought about by the application of TQM practices positively mediates the effects of these practices on radical and incremental innovation.

Including this hypothesis leads us to propose our second research model (Figure 2).

3. Method

3.1 Sample

Our empirical study examines Spanish firms in the furniture and textile sectors that apply TQM and who work under highly competitive conditions, due to increased imports from Asian countries. These traditional sectors are mainly made up of SMEs and the level of qualifications for their employees is medium-low. They are very labour-intensive industries which represent important sources of employment and economic contribution in Spain, and especially in the region of Valencia. In response to this increase in competition, companies have moved towards offering high quality products as a means of addressing their strategic shortcomings.

Figure 3 shows the sizeable drop in Spanish exports in the furniture and textile sectors, along with the growth in imports since the year 2001 (DataComex, 2012). This fact is clearly reflected in the steady decrease in the number of firms and in employment figures. For example, in 2005 in the textile sector, 5 percent of the total number of businesses was forced to close and 7 percent of the jobs in the industry were lost (Pla *et al.*, 2007).

Our empirical study was initiated by carrying out in-depth semi-structured interviews with six managing directors and four experts, which enabled us to improve knowledge on the companies included in the population and to pilot the survey. We produced our own database, made up of 140 firms located in the Valencia region that have introduced TQM systems. For this purpose, we obtained the support of the most relevant quality certification bodies in the textile and furniture sectors and several public institutions.

The information gathering process took place in 2007-2008, and began by sending out the questionnaire through postal mail. Letters were addressed to the general manager and

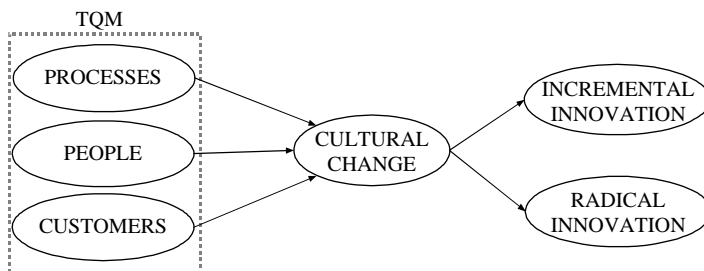


Figure 2.
TQM-innovation model
including cultural change

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Figure 3.
Imports-exports, textiles
and furniture,
Spain (1995-2011)

Note: Figures in thousand euros

we offered a feedback report on the results to the participating firms so as to encourage them to answer. The questionnaire was sent with a presentation letter describing the objective of our research and underlining the confidentiality of the responses.

This was followed up by an exhaustive series of telephone calls. Having obtained the first 36 completed questionnaires, a second stage was put into operation via telephone interviews, for which we contracted a firm, specialized in such activity. We thereby obtained an additional 39 responses, making a total of 75 firms that participated in the study, although three were discarded as they were incomplete or invalid. Therefore, we had 72 valid responses out of 140 questionnaires sent, resulting in a valid return rate of 51.4 percent.

Table I shows, the distribution of the responses among industries is balanced, most of our sample consists of mature SMEs (half of them were founded before 1980), and many of them began the implementation of quality management systems in the 1990s.

	Furniture	Textile
<i>Founded</i>		
Before 1980	16	20
1981-2000	20	15
After 2000	0	1
<i>Employees</i>		
1-99	25	30
100-249	7	5
250-500	4	1
<i>Quality program starts</i>		
1981-1990	0	3
1991-2000	20	19
After 2000	16	14

Table I.
Sample description

3.2 Measurement and validation of constructs

To develop the measures, we created the items on a seven-point scale by carefully examining the literature, to ensure content validity. All the items, the questionnaire and their related references can be consulted in the Appendix. The survey instrument was assessed by seven researchers with relevant knowledge of the topic and ten practitioners, leading to enhancements in presentation and clarity of the content of each item.

Measurement items for TQM practices were adapted from the classic study by Saraph *et al.* (1989), and the later works of Ahire *et al.* (1996). The variable of cultural change was developed starting from the concepts of exploitation and exploration defined by March (1991). Innovation was measured on the basis of the *Oslo Manual* (OECD-EUROSTAT, 2006), as well as recent innovation studies (Benner and Tushman, 2002, 2003; Jansen *et al.*, 2006).

Partial least squares (PLS) was used to evaluate the proposed theoretical model (Tenenhaus *et al.*, 2005). We opted for PLS over covariance-based structural equations model (SEM) techniques for several reasons (Hair *et al.*, 2012). First, PLS does not require normality assumptions as it employs bootstrapping to test the significance of relationships (Efron, 1988). Second, PLS allows formative and reflective scales, and is appropriate when developing theory and using measures that are less developed, as happens in our case, because we are novel in applying the concepts of exploitation and exploration (March, 1991). Third, it is suitable for small samples due to the partial nature of the estimation procedure, where only a portion of the model is involved at any one time; therefore the recommendations are between 30 and 100 cases (Chin and Newsted, 1999). Finally, but not less important, PLS provides the opportunity to measure interaction effects (Chin, 1998) and allows us to configure cultural change as variable simultaneously explained by TQM practices, while explaining innovation.

4. Results

The analysis of a PLS model is carried out in two steps (Barclay *et al.*, 1995). First, we assess the measurement model to evaluate if the theoretical concepts are measured correctly through the observed variables. Second, we consider the structural model, estimating the weight and magnitude of the relationships between the different variables.

4.1 Measurement model

We evaluate the individual reliability of each item by examining the simple correlations of the indicators with their respective construct. We verified that the correlation of each indicator with its construct, the loading, was greater than that obtained with the rest of the constructs, the cross-loadings (Table II).

To evaluate the reliability of the constructs we must differentiate depending on their reflective or formative nature. The ones that measure TQM practices are reflective, as through the items that make them up we gather some measurements that reflect that these practices have been adopted. To test reliability, we calculate the Cronbach's α and the explained variance for each of the components of the scales (Table III).

Explained variance test was very satisfactory in all cases, given that the first value λ_1 is greater than one, and the variance explained by the second component λ_2 is much less than that explained by the first component (Table III). Cronbach's α results were

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Item	Processes	People	Customers	Radical innovation	Incremental innovation	Cultural change
1	<i>0.87</i>	0.40	0.56	0.40	0.43	0.39
2	<i>0.74</i>	0.35	0.58	0.35	0.52	0.36
3	<i>0.67</i>	0.38	0.15	0.27	0.20	0.35
4	0.49	<i>0.77</i>	0.52	0.22	0.20	0.54
5	0.51	<i>0.79</i>	0.40	0.29	0.30	0.49
6	0.36	<i>0.82</i>	0.43	0.29	0.42	0.62
7	0.38	<i>0.82</i>	0.46	0.29	0.32	0.57
8	0.41	<i>0.90</i>	0.48	0.32	0.38	0.62
9	0.31	<i>0.82</i>	0.40	0.25	0.35	0.59
10	0.56	0.43	<i>0.88</i>	0.38	0.48	0.53
11	0.47	0.53	<i>0.91</i>	0.42	0.51	0.60
12	0.22	0.12	0.23	<i>0.71</i>	0.46	0.47
13	0.34	0.16	0.27	<i>0.70</i>	0.53	0.37
14	0.44	0.43	0.48	<i>0.85</i>	0.79	0.59
15	0.26	0.23	0.39	0.39	<i>0.63</i>	0.37
16	0.50	0.37	0.51	0.68	<i>0.90</i>	0.54
17	0.43	0.36	0.45	0.80	<i>0.87</i>	0.55
18	0.42	0.61	0.59	0.51	0.51	<i>0.80</i>
19	0.37	0.55	0.65	0.46	0.55	<i>0.82</i>
20	0.34	0.46	0.49	0.51	0.44	<i>0.79</i>
21	0.14	0.37	0.16	0.18	0.01	<i>0.38</i>
22	0.44	0.59	0.35	0.50	0.51	<i>0.72</i>
23	0.21	0.37	0.29	0.48	0.32	<i>0.65</i>

Table II.
Loadings, in italic emphasis, and cross-loadings

	α	λ_1	% variance	λ_2	% variance
Processes	<i>0.64</i>	1.76	58.7	0.86	28.8
People	<i>0.90</i>	4.07	67.8	0.71	11.8
Customers	<i>0.70</i>	1.60	80.0	0.40	20.0

Table III.
Scales reliability and validity

above the limit of 0.7 suggested by Nunnally (1978) in all cases, unless in the construct related to process management.

In the case of formative constructs the variable we are measuring is made up of a group of indicators that should not necessarily reflect a single reality. Therefore, it should be verified that there is not a high level of multicollinearity between the indicators, as this would produce unstable estimations.

The results of the variance of each indicator explained by the other indicators in the group ($R^2_{i.Others}$), which must be under 80 percent, and the factor inflation test (FIV), which demands a level lower than 5 are very positive (Table IV).

4.2 Structural model

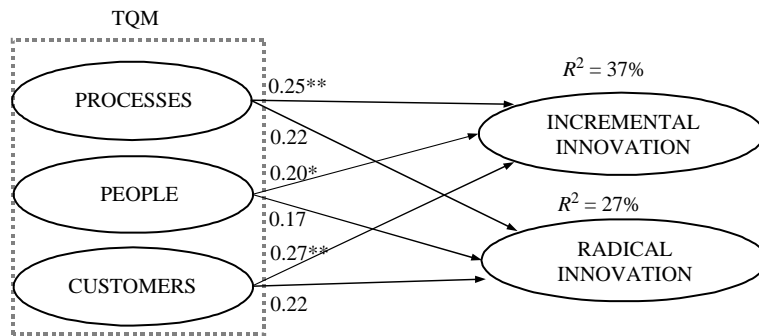
The structural model enables analysis of the amount of variance in each endogenous constructs explained by their precedent constructs. The R^2 coefficient provides information on how good a target variable is explained. The β -coefficients are standardized regression weightings and evaluate the relative strength of the statistical relationships between pairs of constructs. The results for our first model are shown in Figure 4.

Construct	Item	FIV	$R^2_{i.others}$ (%)
Incremental innovation	12	1.17	14.2
	13	1.32	24.1
	14	1.42	29.6
Radical innovation	15	1.19	15.6
	16	2.16	53.8
	17	2.03	50.7
Cultural change	18	1.98	49.6
	19	2.25	55.6
	20	1.85	45.9
	21	1.18	15.2
	22	1.47	31.9
	23	1.36	26.7

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Table IV.
Multicollinearity test



Note: Significant at: *80 and **95 percent levels, respectively

Figure 4.
TQM-innovation
model results

As PLS has no assumption about data we use bootstrapping techniques (Efron and Tibshirani, 1993) to assess the significativity of the R^2 coefficients, taking 1,000 samples consisting of 72 individuals, with re-emplacment, starting with the original sample. The results are positive (Table V).

With regard to the results of the structural coefficient β , Chin (1998) indicates that, in order to be significant, it should reach a level of at least 0.2 and should ideally be over 0.3. Additionally, as shown in Table VI, we show the results of the bootstrap analysis.

The results of the study do not allow us to state that TQM has a direct and positive impact on radical innovation. Therefore, $H2$, $H4$ and $H6$ are not confirmed. On the other hand the results show the people-incremental innovation relation is significant but at a more modest level of 80 percent.

	R^2	P _{2.5}	P ₅₀	P _{97.5}
Radical innovation (%)	27	16	31	46
Incremental innovation (%)	37	23	40	56

Table V.
 R^2 coefficients and
bootstrapping – first
model

However, when we introduce the consideration of cultural change we obtain a more explicative model, as can be seen in Figure 5.

In Table VII we show the R^2 coefficients and the bootstrap analysis results.

With regard to coefficient β , all paths turn out to be significant, underlining the intensity of the relation between cultural change and innovation, as shown in Table VIII.

The excellent fit of the second model, which includes cultural change, supports *H7*, outlining the importance of considering the role of change in the research model.

5. Discussion and conclusions

5.1 Implications for research

Our empirical findings ratify the suitability of considering the multidimensionality of TQM and the two types of innovation: incremental and radical, as well as introducing the cultural change as a mediator construct. In our direct model, the most significant relationships are between incremental innovation and process management ($\beta = 0.25^{**}$) and customer orientation practices ($\beta = 0.27^{**}$). The relationship between people-related practices and incremental innovation is also significant, but at

Table VI.
 β -coefficients and bootstrapping – first model

From	To	β	P _{2.5}	P ₅₀	P _{97.5}
Processes	Radical innovation	0.22	0.05	0.23	0.46
Processes	Incremental innovation	0.25	0.12	0.27	0.40
People	Radical innovation	0.17	0.15	0.18	0.43
People	Incremental innovation	0.20	0.09	0.21	0.44
Customers	Radical innovation	0.22	0.09	0.23	0.48
Customers	Incremental innovation	0.27	0.07	0.28	0.47

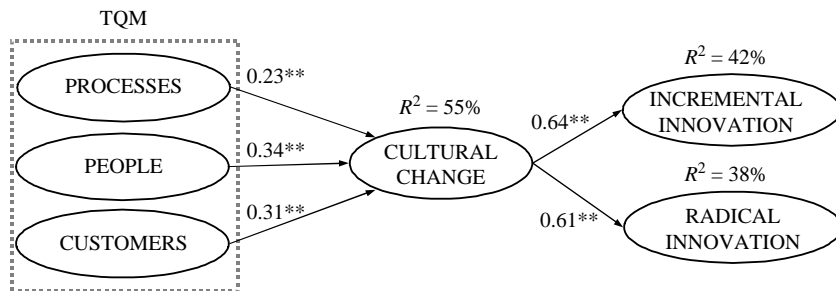


Figure 5.
TQM-innovation model including cultural change results

Note: Significant at: **95 percent level

Table VII.
 R^2 coefficients and bootstrapping – second model

	R^2	P _{2.5}	P ₅₀	P _{97.5}
Cultural change (%)	55	36	57	74
Incremental innovation (%)	42	27	44	62
Radical innovation (%)	38	18	41	62

a lower level ($\beta = 0.20^*$). Therefore, *H1*, *H3* and *H5* regarding incremental innovation are supported, while *H2*, *H4* and *H6* are not confirmed. Our findings show that the direct impact of TQM on innovation is always positive, but only significant in relation to incremental innovation. These results indicate the inadequacy of expecting radical innovation results to improve just by the implementation of a TQM program, which is clearly insufficient on its own. No contribution to radical innovation can be expected from TQM when the implementation of new management practices does not bring about a profound transformation of people's values.

Although we only find support for a direct relationship between TQM practices and incremental innovation, it is important to underline that our study does not confirm the expulsion effect in relation to radical innovation proposed by Benner and Tushman (2002, 2003). On the contrary, the direct influence of the three groups of TQM practices on radical innovation is positive, though not significant (process $\beta = 0.22$; people $\beta = 0.17$ and customers $\beta = 0.22$). This result is aligned with our proposal that process management, in a TQM framework, will necessarily have a different effect on innovation than in the case of a limited approach based on quality assurance.

The most surprising result of our study is that the practices that reflect people commitment and participation do not directly and significantly affect radical innovation, despite the fact that many studies have underlined their role enabling the participation of different departments on the fast launch of new products, making the most of localized knowledge on an employee level (Adams *et al.*, 2006) and improving the capacity to unlearn (Santos-Vijande and Alvarez-Gonzalez, 2007). To explain this result we need to take into account the conclusions from our second model.

When we introduce cultural change as a mediating construct, the model's goodness of fit improves substantially and all the relations are significant. Therefore, *H7* is supported. One would have to look for the key to this effect, in our view, in the way we measure cultural values taking as starting point March (1991), including apparently opposing values: such as improvement, safety, control, precision and discipline, and as flexibility, creativity, tolerance to uncertainty, risk-taking and interest in experiencing new environments.

These results give us the clue to understanding the complex relationships between TQM and innovation, indicating that the relationship is significant only when people's commitment and participation generates a diverse cultural change towards apparently contradictory values. This result reinforces the convenience, underlined by Kim *et al.* (2012) of not being over simplistic in the interpretation of this phenomenon.

5.2 Implications for management practice and society

With regard to the managerial implications of our study, we provide support to top management when attempting to exploit TQM to obtain strategic innovation

From	To	β	P _{2.5}	P ₅₀	P _{97.5}
Processes	Cultural change	0.23	0.15	0.24	0.30
People	Cultural change	0.34	0.26	0.34	0.41
Customers	Cultural change	0.31	0.23	0.31	0.37
Cultural change	Incremental innovation	0.64	0.52	0.66	0.77
Cultural change	Radical innovation	0.61	0.43	0.64	0.77

Table VIII.
 β -coefficients and
bootstrapping –
second model

objectives, which is relevant bearing in mind the extent to which TQM has been applied recently and the need for firms to combine quality and innovation. We present a dual means of nurturing innovation through TQM practices, depending on the kind of innovation the company is aiming for.

When incremental innovation is needed, managers could merely apply TQM practices and promote better results via improvements in the efficiency and efficacy of processes, close relationships with customers and suppliers, and leadership and people commitment. All of these quality management practices will be relevant, though in particular our results point to the importance of making efforts to control and improve business processes, as well as engendering a bidirectional and collaborative communication with customers, which will pave the way for continuous improvement and incremental innovation.

If radical innovation is also needed, managers should take into account the importance of a paradoxical organizational culture. Our results encourage managers to avoid viewing such a culture as conflicting, looking instead to establish supporting policies and systems.

In this case, the power of human resource practices to engender cultural change is the relevant key factor. We would therefore suggest that organizations adopt the following policies:

- Empower employees and expand internal communication to improve people commitment. Managers will have to instill confidence, explain policies, interact frequently with employees, and not be afraid of complexity or conflict.
- Inspire employees to be creative and flexible while also being disciplined, reconciling the need to standardize practices while continuing to search for new approaches to solving problems.
- Encourage people to explore and take risks, but with a measure of caution, developing constructive attitudes towards change and a disposition to take calculated risks. A supportive response to failures is critical for stimulating a paradoxical culture-oriented change.
- We recognize the difficulty of directly influencing cultural values by general managers and therefore we suggest systematically carrying out cultural audits to assess the results of the actions taken and detect any unbalanced change towards exploitation.

These appraisals should measure paradoxical cultural values including values related to exploitation such as control, discipline, precision, and improvement; and others related to exploration, such as experimentation, creativity, risk taking and flexibility.

This cultural change powered by managers can avoid the phenomenon noted by McLaughlin *et al.* (2008, p. 300) that “companies often lose the propensity to be innovative, as some of the cultural enablers of previous incremental changes become the current cultural inhibitors of radical innovation”.

With regard to the social implications of the results, in our view, this research can help to increase the competitiveness of these industries that represent important sources of employment and economic contribution in Spain, by pointing out ways to improve innovation results and reorienting the focus of their quality systems. It is clear that, to succeed in such a challenging economic environment, innovation

is a fundamental factor, together with quality. In fact the focus of many firms, in response to market pressure, has moved towards offering high quality products as a means of addressing their strategic shortcomings. Paradoxical cultural change can help them to break away from established and hitherto successful routines, which is indispensable to achieve “radical innovation”.

6. Limitations and future research directions

When interpreting our results, we must also consider a series of research limitations. This study focuses on the Spanish furniture and textiles sectors, which have been subjected in recent times to a sharp increase in competitiveness. Extending the conclusions of the study to other environments of an entirely different nature may not be possible. In terms of future research, we believe it would be interesting to study the case of emerging sectors, in which the majority of firms are “born innovative”. In this case, the pattern would be inverted, and quality management systems are introduced when the company has grown intending to improve efficiency and effectiveness.

In addition, in terms of future research, we believe it would be interesting to develop an in-depth understanding of the relationships between the values we have used to measure cultural change. We believe it would be interesting to consider the cultural values related to exploitation and exploration separately, to assess their mutual relationships, as well as their individual connections with incremental and radical innovation. In this sense, case studies would also represent a useful tool for achieving a better understanding of the phenomenon. It is also worth noting that the main determinants of cultural change in a TQM framework may not be identified. Other factors, such as maturity in TQM implementation, or country and sector culture may need to be considered in future studies.

Moreover, the assessment of the variables analyzed is obtained by using subjective appreciations from managers and experts. Other actors could have been included, such as auditors, employees or customers, so as to improve the richness of the data gathered. The ideal circumstances would be to combine this data with more objective ones, referring to the quantity and depth of innovation in each company. Another weakness could be the cross-sectional nature of the empirical study. We consider it is necessary to obtain empirical proof from a longitudinal study that allows the confirmation of the results obtained. We also find it relevant to continue this line of research to achieve a larger sample size, which would allow us to make the most of the statistical analyses and improve the conclusions, as in our case we only have 72 respondents.

Finally, a new relationship might also be considered in the model: the link between incremental and radical innovation. We can find literature that argues that systematic and incremental innovations would eventually result in radical innovations (Smed, 1997). Therefore, it is possible that TQM not only stimulates radical innovation through a diverse cultural change, but also through the promotion of incremental innovation. Studying this relationship could open a new interesting line of research.

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Variables	References
<i>TQM practices-processes</i>	
Item-1. The quality program has given us a clear insight into our processes and the relationships between them	
Item-2. The information gathered by using tracking and control of processes carried out enables us to improve quality	
Item-3. Service and product design have clear and precise procedures and specifications	
<i>TQM practices-people</i>	
Item-4. Employees understand the quality program well and actively participate in it	Ahire <i>et al.</i> (1996), Bou-Lusar <i>et al.</i> (2009), Dean and Bowen (1994), Saraph <i>et al.</i> (1989)
Item-5. Quality training is continuous and includes all of the managerial and non-managerial staff	
Item-6. Our quality system is backed by team work and collective confidence	
Item-7. The employees know about the results of their work and suggest ways of improvement	
Item-8. The management promotes the quality program and actively participates in its design and implementation	
Item-9. The management considers quality objectives to be strategic and takes part in fixing and tracking them	
<i>TQM practices-customers</i>	
Item-10. We use customer suggestions and complaints in order to improve the quality of the product/service	
Item-11. The quality program has meant us working more closely with suppliers	
<i>Radical innovation</i>	
Item-12. Market launch of completely new products	Jansen <i>et al.</i> (2006), Benner and Tushman (2002, 2003)
Item-13. Complete redesign of processes	
Item-14. Incorporation of new knowledge and technology into a business	
<i>Incremental innovation</i>	
Item-15. Market launch of substantially improved products	
Item-16. Incremental improvement of processes	
Item-17. Improvement in existing knowledge and technology	
<i>Cultural change</i>	
Item-18. Interest in improving and refining what already exists (current products and processes, knowledge [. . .])	March (1991), Dellana and Hauser (1999), Naveh and Erez (2004)

Table AI.
(continued) Measurement and items

IMDS
113,8

Variables

References

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Item-19. Preference to choose more secure options and those where sufficient information is already available
Item-20. Searching for and being actively interested in experimentation in new areas
Item-21. Mentality of control, precision and discipline
Item-22. Tolerance towards uncertainty and risk-taking
Item-23. We value flexibility and creativity very highly

Table AI.

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