Available online at www.sciencedirect.com
ScienceDirect
Technovation 27 (2007) 514–532
technovation
www.elsevier.com/locate/technovation

Innovativeness and organizational innovation in total quality oriented firms: The moderating role of market turbulence

María Leticia Santos-Vijande[a,*], Luis Ignacio Álvarez-González[b]

[a]Department of Business Administration, Business School, University of Oviedo, Avda. Del Cristo, s/n, 33071 Asturias, Spain
[b]Department of Business Administration, Business School, University of Oviedo, Asturias, Spain

Abstract

This paper analyses the contribution of TQM implementation to the firms' innovative culture and their overall innovation effort in the technical and administrative organizational domains. The research seeks to contribute to a further understanding, under different market turbulence conditions, of the TQM–innovation relationship and the interactions between the organization's innovativeness and the intensity and newness of the innovations adopted. The findings indicate that TQM strongly influences firm's innovative culture and higher administrative innovation levels with a greater degree of incorporated novelty, whereas the mediating role of innovativeness is required for TQM to achieve this impact on technical innovation. These relationships significantly vary under different levels of market turbulence, but results reinforce the consideration of TQM as an appropriate resource to foster innovativeness and organizational innovation. The study provides an unexpected result as innovativeness does not influence administrative innovations, which seem to be ultimately determined by TQM. Finally, the findings provide empirical support regarding the coordinated development in practice of technical and administrative innovations.

Keywords: Innovative culture; Technical innovation; Administrative innovation; Radical innovation; Total quality management; Competitive advantage

1. Introduction

In recent years, globalization, severe competition, the improvement of communication flows, and the rapid transfer of technology are characteristics widely spread in most competitive environments. The new competitive challenges demand the firms' ability to accurately understand their global environment, to precisely satisfy their customers' needs and to continuously anticipate and adapt to the new market rules in order to guarantee their long-term survival. To gain greater flexibility and effectiveness in the achievement of these objectives, it is internationally recognised that firms confer an increasingly greater preponderance to management practices based on the total quality principles (Baidoun, 2004). Thus, the total quality management (TQM) philosophy is rooted in a wide definition of the term customer, which steers the firms' focus on all the collectives involved in the organizational operations and allows a broader understanding of the competitive context (Crosby, 1979; Deming, 1986; Juran, 1986). TQM also priorizes an overall commitment to the satisfaction of customers' needs and, therefore, it is regarded as capable of sustaining the development of a competitive strategy that aligns the firm with its various relevant publics (Oakland, 2000). To this end, a fundamental role is given to leadership, teamwork, and the continuous improvement of products, services and procedures (Ahire et al., 1996).

However, the literature has discussed if TQM fosters innovation or if, on the contrary, hinders the firm's interest in new developments (innovative culture) and limits innovation to incremental changes or small modifications that only allow the gradual adaptation to the evolution customers' preferences (Prajogo and Sohal, 2001). Innovation has always been essential for the organizations' long-term survival; however, it currently plays an even more crucial role in the company's future to follow the rapid pace of markets' evolution. Therefore, although

*Corresponding author. Tel.: +34 98 510 28 23; fax: +34 98 510 37 08.
E-mail addresses: lsantos@uniovi.es (M.L. Santos-Vijande), alvarezg@uniovi.es (L.I. Álvarez-González).

0166-4972/$ - see front matter © 2007 Elsevier Ltd. All rights reserved.
doi:10.1016/j.technovation.2007.05.014

incremental innovation can turn out to be profitable in the short term, it has a more limited potential to support a long-term corporate development and competitiveness, for which it is usually unavoidable the adoption of more radical innovations (Atuahene-Gima, 1996).

Prior research has analysed the relationship between TQM and firms' organizational ability to develop the critical factors associated with the success of innovation identified in the literature (Perdomo-Ortiz et al., 2006), the project management success (Jung and Wang, 2006), as well as the TQM's impact on the technical innovation performance (Prajogo and Sohal, 2004, 2006a). However, this research contributes to a further understanding of the TQM–innovation relationship in two ways. First, the study analyses the effect of TQM on the firms' cultural predisposition to innovate or innovativeness. This concept is similar to what Zaltman et al. (1973) call an "openness to innovation" and reflects the organization's tendency to seek the development of new products or processes. The firms' innovativeness constitutes an antecedent of the innovative activity widely recognised in the literature (Hurley and Hult, 1998), although it has not been previously considered among the possible effects of TQM. Second, the research also examines the TQM's impact on the organizational innovation effort, defined as the firms' actual ability to regularly adopt or implement more innovations with a greater degree of incorporated novelty, relative to their main competitors, in the administrative and technical domains. Thus, this concept tries to capture the firm's innovation from a comprehensive viewpoint, considering the full set of organizational operations (Daft, 1978). In this sense, the research evaluates for the first time the effects of TQM on administrative innovation, referred to any business process different from the productive one, which is regarded as an unavoidable support of technical innovation, that takes place in products, services or the processes of producing them (Damanpour, 1991). The study also introduces an explicit reference to the innovation effort relative to firm's major competitors and the consideration of innovations' perceived radicalness, which allows estimating the TQM contribution to the achievement of competitive advantage in the long-term (Grant, 1991). The study of the interactions just described additionally involves evaluating the implications of firms' innovativeness in the technical and administrative domains, which have been scarcely explored despite the favourable arguments put forward in the literature (Hurley and Hult, 1998). Therefore, in our model innovativeness acts as a partial mediator that helps to delineate the process through which TQM's effects on firms' innovative effort occur.

The research also addresses the role of market turbulence in the relationship between TQM and innovation. Organizations must be aligned with their environment, as its characteristics moderate the adequacy of the strategies undertaken (McKee et al., 1989; Porter, 1980, 1985). In this sense, TQM can be considered a strategic choice to guide the management practices (Mehra et al., 2001; Yam et al., 2005) and, therefore, it is important to establish its effects under different competitive scenarios. Accordingly, this study addresses the lack of empirical evidence of the impact of the environmental conditions on the relationship between TQM, firms' innovativeness and their actual innovation effort. Market turbulence is chosen as a relevant variable in this analysis since prior research recognises its influence on the relationship between the firms' strategic orientation and innovation (Han et al., 1998).

In order to measure TQM, we resort to the EFQM Excellence Model. This framework constitutes the prevailing reference in the European context to evaluate total quality practices. However, although the works inspired by other excellence models are frequent on the international level, the empirical research on the EFQM model based on causal relationships is more scarce and, for this reason, especially necessary.

From this general approach, the present work is organised in four sections. In the first place, we proceed to the review of the literature referred to the relationship between TQM and business innovation, and the moderating role of market turbulence, thus formulating the research hypotheses. Next, the fieldwork is described and the measures used in the empirical study are justified. Then, the analyses carried out and the results obtained are presented to finally, discuss the main conclusions and limitations of the study.

2. Literature review and hypothesis development

The idea that innovation is a competitive instrument essential for firms' long-term success and survival is widely recognised (Deshpandé et al., 1993). Through innovation organizations diversify and adapt, and even rejuvenate or "reinvent" to fit the changing conditions of the technology and the market (Nonaka and Yamanouchi, 1989). A true innovative firm must be embedded of a strong culture that stimulates the engagement in innovative behaviour. This proclivity to innovation is referred to in this study as *innovativeness*. Innovativeness is determined by "*whether the members of an organization are willing to consider the adoption of or are resistant to innovation*" (Hurley and Hult, 1998, p. 44). Thus, innovativeness is an organizational culture that encourages employees to be innovative and indicates an organization's receptiveness to pursue the development of new products or processes (Zaltman et al., 1973). Innovativeness "*implies a firm being proactive by exploring new opportunities rather than merely exploiting current strengths*" (Menguc and Auh, 2006, p. 65) and, therefore, it is regarded as essential to an innovative effort capable of exceeding the customer's expectations.

However, there is no unanimous agreement about what we can understand exactly by innovation and which types of innovation do exist. With reference to the concept of innovation, the literature agrees on transmitting the idea of

change, of something new, and that innovation is such when it is really adopted in practice (Schumpeter, 1934). The typologies of innovation are also numerous (Han et al., 1998), although the most frequently used are those that distinguish between product versus process innovation, incremental versus radical, and technical versus administrative innovations. The categorization of innovations either as technical or administrative responds to the "dual core" model developed by Daft (1978) who classifies the organizational operations into these two scopes.

Administrative innovations occur in the administrative process and affect the social system of an organization, that is, its rules, roles, procedures and structures that are related to the communication and exchange between organizational members. Technical innovations pertain to products, services and the organization's production process or service operations (Damanpour, 1991). Consequently, administrative innovation refers, for example, to the adoption of new ideas in the marketing, financial or managerial processes, the introduction of a staff development program or changes in the management team. Administrative innovations do not provide a new product or a new service but indirectly influence the basic work activities of an organization. This type of innovations escort, sustain and promote the technical innovation. In this respect, it is assumed that both types of innovation must be congruently developed (Damanpour et al., 1989) and that the technical-administrative dichotomy uniquely provides a complementary view of the organizational innovation effort (Han et al., 1998). Nevertheless, the word "innovation" is frequently found in the literature referred to "technical innovation", with relatively fewer studies having been conducted on organizational innovation based on the viewpoint of the organization as a whole, although both technological and non-technological innovations can lead to competitive advantage (Weerawardena, 2003).

Additionally, this research, together with the innovation effort undertaken by the organizations in the administrative and technical areas, evaluates the innovations' degree of novelty (incremental versus radical). In this respect, it is recognised that the degree of radicalness of innovation is a relevant factor when it comes to establishing the determinants of innovation or the type of necessary resources to carry it out (Subramanian and Nilakanta, 1996).

In summary, the conceptualization of organizational innovation adopted in this study tries to capture the "*extent*" of the innovation effort, jointly with its "*strength*", in terms of its importance and effect on long-term profitability.

Once the innovation perspective has been established we can illustrate the different arguments for and against the effects of TQM in this field. The discussion, according to the excellent review of the literature carried out by Prajogo and Sohal (2001), focuses on three basic properties of TQM: customer orientation, continuous improvement and emphasis on teamwork, empowerment and commitment. However, it is necessary to admit that such arguments have not been formulated establishing a specific distinction between administrative and process innovation, but they rather refer to the degree of novelty of innovations or to the firm's receptivity to innovation. The debate is next revised and new arguments are presented in favour of TQM, assuming that if TQM benefits organizational innovation, this effect must be coherently translated to the administrative and technical innovations.

2.1. TQM customer focus and innovation

Total quality oriented firms strongly focus on customer orientation, which may lead to an excessive emphasis on incremental innovation derived from the desire to continuously adapt to the evolution of customer needs. This would neglect the development of more radical projects to meet in the future the latent market needs or cope with the market discontinuities. Similarly, the development of proactive strategies can be hindered, both because of the neglect of prospective market research, and because of the fear of disturbing with proactive behaviour the relations with the existing customer base. This, in short, would imply that firms could develop aversion to the inherent risk in innovation and could become less receptive to it (Prajogo and Sohal, 2001). The accumulation of generative learning can also be reduced in favour of adaptive learning, that is, that based on the exploitation of previous knowledge and which does not question either its validity or the organization's patterns of behaviour, mental models or prevailing logic (Argyris and Schön, 1978). Nevertheless, if only adaptive learning occurs, the organizational response does not go beyond the pre-established view of what the firm is or does, the firm limits itself to adapt or take advantage of the opportunities confined to its current markets (Slater and Narver, 1995) and, consequently, radical innovation, which frequently comes from alternative responses to known demands, is limited (Baker and Sinkula, 1999).

In favour of these arguments, Hayes and Abernathy (1980) and Bennet and Cooper (1981) criticise the customer orientation itself as a source of innovation. These authors defend that this orientation leads to the development of merely incremental innovations and worse products in the long term, since only possible or feasible products within the customers' system of reference are created. In this way, radical innovations that are not suggested and to which the objective public reaction is unknown are never generated, in a clear attempt to avoid innovation risks. This idea has prevailed in many firms, and especially, in those organizations where technology plays a prominent role (Santos-Vijande and Vázquez-Casielles, 1997, 1998). Nevertheless, there are several theoretical arguments as well as some empirical evidence that contradict the previous reasoning.

In the first place, a well-understood principle of customer orientation implies obtaining information from both current and future customer needs, taking into

account all the environmental forces that could shape their expectations. In this way, the view of the environment, present and future, allows the development of new products with a greater degree of incorporated novelty (Jaworski and Kohli, 1996). In other words, the real customer orientation must involve a continuous innovative effort or the predisposition to regularly commercialise new products not limited to incremental innovations, but that also anticipate the most novel latent needs. In this respect, in the development of radical innovation are also of crucial importance for the so-called "*leader users*", those that experience demands long in advance with respect to the remaining users and who are, as a result, capable of anticipating emergent markets (Lilien et al., 2002; Von Hippel, 1986). The need for orientation to this type of customers and their practical capacity to successfully lead radical innovation is strengthened by the recent study of Lettl et al. (2006).

Furthermore, Hurley and Hult (1998) argue that market orientation (concept focused on the creation of added value for customers and which, as a result, priorizes the organizations' customer orientation), constitutes an antecedent of firms' innovativeness or predisposition to accept new ideas, the dimension of organizational culture that influences positively the capacity to develop new products and services. In this respect, Han et al. (1998) show that market orientation favours the number of commercialised innovations and, in this same line, Vázquez-Casielles et al. (2001) establish that market orientation constitutes an antecedent of the novelty and intensity of the innovations commercialised by the firms.

Finally, it is also argued that the adoption of market orientation and of an "entrepreneurial" management style (proactive, ready to assume risks and with a clear preference for innovation), implies similar behavioural processes, like the study of the environment and the opportunities this offers for its exploitation, in such a way that both attitudes not only interact, but marketing is the natural "home" of the "entrepreneurial" initiative in a firm (Lawton and Parasuraman, 1980). In this sense, Santos-Vijande et al.'s (2005) research determines that market orientation promotes two dimensions of the firms' strategic behaviour strongly linked to the innovative behaviour: aggressiveness and proactiveness. Aggressiveness entails an immediate resource allocation when new market opportunities are detected to capture the advantages associated with being the first to market. Proactiveness shows the firms' interest in continuously searching for new market opportunities and experimenting with responses to changing market conditions. The latter dimension is coherent with the proactiveness concept defined in Miles and Snow's (1978) strategic typology, and thus reflects firms' interest in establishing the market rules and directing their evolution. Therefore, if market-oriented firms are capable of behaving proactively, then we can additionally infer that they can also question their system of beliefs and undertake a generative learning, which will allow them to develop new markets and impose new competitive rules, characteristic qualities of this type of behaviour.

In accordance with all these considerations, we understand that TQM does not have to limit innovation to the purely incremental, or create organizations that are less prone to innovate in practice, but even this management system can also encourage innovativeness, which, in its turn, is an antecedent of effective innovation.

2.2. TQM continuous improvement and innovation

As it happens in the preceding case, continuous improvement, as another key dimension, of TQM is questioned with regard to its effects on innovation, since it emphasises incremental changes, which can generate an organizational climate not very ambitious in the matter of innovation, basically focused on maintaining the competitive parity, and in which the capacity to provide novel, innovative and striking solutions is diminished. This phenomenon would be reinforced by the interest in avoiding failures and in doing things well, which would induce certain risk aversion associated with the trial and error processes crucial in any innovation process. Additionally, concern about the improvement of efficiency could also involve the reduction, if not the elimination, of the "slack" resources necessary to make it possible the starting of the innovation activity. Moreover, the continuous improvement requires the standardization of the processes which produces several effects: (a) it reduces any ambiguity in the design of tasks, which makes its innovation difficult; (b) it results in some organizational conformism, as the employees do not want to suffer the opportunity cost of breaking routines or assume the effort of the alternative thought; and (c) it leads to lower flexibility and openness to change as a result of the "adhesion" that is finally generated to the repeated behaviour (Prajogo and Sohal, 2001).

Despite these considerations, Adler (1989) defends that the consistent development of gradual innovations could result in an important technological break, more characteristic of radical innovations. Moreover, TQM also seems to offer a solid basis to facilitate the development of radical innovation within the organizational processes (Collins and Hill, 1998). Thus, thanks to the TQM formalization, teamwork and empowerment, the necessary balance between autonomy, discipline and underlying control to lead this type of innovation is created; the process is also benefited as interdepartmental trust increases and the knowledge available in the firm becomes more explicit. In fact, the six sigma method (a quality measurement and improvement program based in prior quality initiatives such as TQM, although it also comprises another tools and techniques) is rapidly becoming a major driving force for many technology-driven organizations to improve their innovation efforts (Kwak and Anbari, 2006). Moreover, Nijhof et al. (2002) question that the existence of a certain amount of slack resources is really necessary

for innovation; on the contrary these authors defend that innovation must obtain the necessary resources to be implemented once there is a total organizational agreement on its potential. With regard to the possible pernicious effects of standardization, Perdomo-Ortiz et al. (2006) demonstrate that the dimension of TQM responsible for achieving such standardization, process management, is essential for the development of the capacity of innovating in firms, which contributes to dispel fears to this respect.

Therefore, the previous reasoning sustains that TQM should not necessarily prevent the firm's predisposition to develop innovation breakthroughs or the optimal organizational conditions to foster innovation.

2.3. TQM teamwork, empowerment, involvement and innovation

Finally, the literature reiterates that TQM favours responsibility delegation and the commitment of all the employees, which results in its turn in a greater sense of autonomy and responsibility that have a beneficial effect on innovation, as employees take on wider roles in generating and screening ideas in the context of continuous improvement and paradigm shift improvement (McAdam, 2004). Nevertheless, Prajogo and Sohal (2001) argue that these qualities are usually limited in practice to the area of continuous improvement. In its turn, teamwork, although it involves greater communication within the firm, essential to innovate, is interpreted as a threat to the individual creativity and independent innovative spirit.

However, there is no empirical evidence that confirms these undesirable effects of TQM, while the literature defends the positive effects on radical innovation of teamwork (Humble and Jones, 1989), workers' autonomy (Spreitzer, 1995) and the commitment to this innovation. In fact, Prajogo and Sohal (2004) themselves conclude that leadership and people management are related to the greater novelty of the product's innovations. Both dimensions of TQM include the allocation of responsibilities, the promotion of teamwork and the commitment to shared values.

From the preceding debate, we consider that there are arguments to defend that TQM could generate in firms a cultural feeling favourable to innovate, together with the adoption of a larger number of innovations with a greater degree of novelty incorporated, arguments that are also applied to administrative and technical innovations which have to be coherently developed. Consequently, the following hypotheses are formulated:

H1. TQM influences directly and positively the firms' innovativeness.

H2. TQM influences directly and positively the adoption of administrative innovations with a greater degree of novelty incorporated.

H3. TQM influences directly and positively the adoption of technical innovations with a greater degree of novelty incorporated.

Together with Hurley and Hult (1998) several scholars recognise in the literature the importance of a culture favourable to innovation in the organizations' innovative behaviour (Chandler et al., 2000; Claver et al., 1998; Damanpour, 1991; Menguc and Auh, 2006; Woodman et al., 1993), and thus it is assumed that a greater cultural commitment to innovation will result in greater levels of this, which must be shown in a coherent way both in the technical and the administrative domains. Hence, in this study, innovativeness is conceived as a partial mediator between TQM and the organization's innovation effort, given that it partially accounts for the relation between these variables (Baron and Kenny, 1986). The theoretical basis for the mediating effect of innovativeness is outlined by Prajogo and Sohal (2001) who argue that TQM establishes a system and culture that provides a fertile environment for organizations to innovate. Accordingly, innovativeness, as a form of organizational culture that encourages innovation, emerges in total quality-oriented firms and reinforces the process through which TQM fosters organizational innovation.

H4. Innovativeness influences directly and positively the adoption of technical innovations with a greater degree of novelty incorporated.

H5. Innovativeness influences directly and positively the adoption of administrative innovations with a greater degree of novelty incorporated.

Fig. 1 shows graphically the relations proposed in which we can observe that the predisposition to innovate has a mediating effect between TQM and the firm's innovative activity.

2.4. The role of market turbulence

The basic premise associated with the study of the moderating variables is that the effects of firms' strategies may differ under different market conditions and, therefore, the convenience of a strategic choice may ultimately be contingent on the specific characteristics of the relevant competitive environment. Therefore, firms that implement TQM as a fundamental strategy for their activities must be

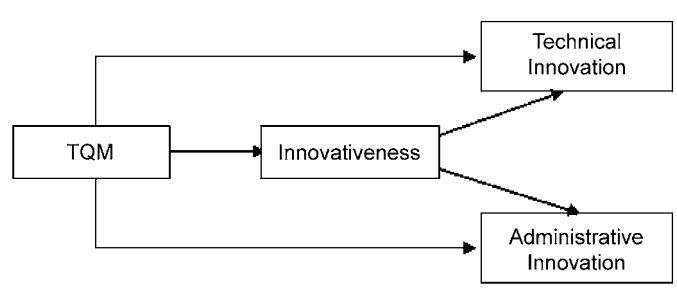

Fig. 1. Conceptual model.

aware of the features of their relevant environment that make this behaviour more advisable. A complementary reasoning to this respect is that once the firms have opted for TQM, the coordinated quality practices also become an organizational resource (Castresana Ruiz-Carrillo and Fernández Ortiz, 2005) which may result more valuable depending on the market conditions. Thus, the organizational resources' ability to sustain competitive advantage is also determined by their suitability to the market forces' demands (Amit and Schoemaker, 1993).

In this respect, the research on TQM has mainly focused on the relationship between quality practices and organizational performance. This study, however, focuses on the TQM–innovation interface, and the fundamental research question in this respect refers to whether TQM reinforcement of the firms' innovative culture and innovation capacity depends on the perceived market turbulence.

Market turbulence, has been conceptualised in different ways by different authors. Thus, Kohli and Jaworski (1990) and Slater and Narver (1994) associate market turbulence with the changes in the composition of customers and their preferences; Greenley (1995) also includes the modifications in the marketing operations, and for Hult et al. (2004, p. 432), market turbulence reflects rapidly changing buyer preferences, wide-ranging needs and wants, ongoing buyer entry and exit from the market place and constant emphasis on offering new products. In this investigation, the market turbulence concept also tries to capture the dynamism in the customer base and needs, but two additional components are introduced in its definition: the rate of change of the firms' competitors and the market uncertainty. Market uncertainty is associated with predicting accurately the future of the market preferences, the state of the competition and the evolution of the environmental forces (Milliken, 1987). In this respect, the market turbulence concept employed tries to simultaneously evaluate the change that the companies face in their sets of clients and competitors (market dynamism), and the difficulty to prepare the organization to cope with the new competitive scenarios (market uncertainty).

TQM-oriented firms assume that customer focus (i.e., to meet or exceed the customer requirements) is the cornerstone to achieve competitive advantage, for which an ongoing evaluation of customer needs is undertaken. As in *dynamic* environmental settings product preferences are constantly changing, total quality-oriented firms should be aware of this information and react consequently engaging in wider innovative activities to meet customers' exigencies. This would allow a superior corporate response to the market needs through organizational innovation.

Additionally, under *uncertain* market conditions, the identification of customers' changing needs and the influences exerted on those needs by the competitors' behaviour and the environmental forces' evolution becomes more difficult. This situation increases the likelihood that the company's offerings will become mismatched with customers' needs over a period of time. To avoid this situation, firms may opt for a proactive behaviour trying to anticipate and steer the new demands (Miles and Snow, 1978). This involves the development of more discontinuous innovations.

Since a balanced adoption of technical and administrative innovations is required to guarantee the equilibrium between the technical system and the social structure, we propose the following hypotheses:

H6. Market turbulence strengthens the TQM's positive impact on both technical and administrative innovations with a greater degree of novelty incorporated.

Firms' innovativeness indicates the openness to proactive search for new ideas (Hurley and Hult, 1998) in both the technical and administrative organizational domains (Han et al., 1998). Under market turbulent conditions, the firms' innovativeness is particularly important to satisfy the evolving market needs. As we forward that TQM facilitates organizational innovativeness, and that more radical innovation is required under turbulent environmental settings, we expect this relationship to be stronger. In this way the firm would articulate the higher need to innovate to provide customer value.

H7. Market turbulence strengthens the TQM's positive impact on firms' innovativeness.

Hurley and Hult (1998) show that the receptivity to new ideas and innovation is associated with higher levels of innovation. Firms' innovativeness is a basic cultural feature to recognise the importance of innovation in the organizational strategy and it acts as forerunner of the innovation effort undertaken by firms in terms of the number of new ideas (technical or administrative) effectively adopted. In turbulent markets, we believe that the innovative orientation should lead to a stronger recognition of the need to innovate to satisfy customers' changing needs, as well as to the conviction that incremental innovations may not be enough to satisfy them in the long term. Market turbulence is also deemed to moderate the relationships between a firm's culture and performance in the marketing domain (Slater and Narver, 1994, 1995). In highly turbulent markets, firms with a market orientation culture achieve a more precise tracking of the rapid pace of customers evolution and, therefore, a more accurate definition of the required innovations, which ultimately benefits the firm's performance (e.g., Han et al., 1998; Hurley and Hult, 1998; Zaltman et al., 1973). Innovativeness is deemed to be particularly important when the firm is faced with substantial market turbulence and other types of environmental disturbances (Hult et al., 2004) because it encourages a wider and stronger innovation effort to cope with the environmental changes. Innovativeness provides a better starting point for organizations to undertake the required innovation effort which, in the end, also results in better organizational outcomes, as shown by Hult et al. (2004) and Matsuo (2006). Therefore, in this study the

effect of firms' innovativeness on both technical and administrative innovation is postulated to be stronger under high market turbulence:

H8. Market turbulence strengthens the positive impact of innovativeness on both technical and administrative innovations with a greater degree of novelty incorporated.

3. Research methodology

3.1. Source of empirical data

Empirical data were obtained by means of a mail survey. The research population consisted of all the ISO 9000 registered firms in the region of Asturias, a total of 451 organizations according to the data provided by the Regional Quality Club. Certified firms were selected to guarantee a certain interest in quality management practices as well as familiarity with the issues addressed in the questionnaire (Curry and Kadasah, 2002). Similarly, ISO 9000 implementation may be seen as a stepping-stone towards TQM (Antony et al., 2002). The questionnaire was mailed to the General Manager or Managing Director of each organization to ensure a good knowledge of the firms' TQM practices and organizational culture and behaviour (Agus et al., 2000; Taylor and Wright, 2003; Weerawardena, 2003). The questionnaire delivery included a cover letter and a prepaid return envelope. The covering letter outlined the objectives and importance of the study, was signed by the President of the Regional Quality Club and included an assurance of confidentiality. The study was conducted between January and March of 2005. Telephone calls were made three weeks after the start to follow up the study and another copy of the questionnaire was sent to several organizations when required. A final response rate of 20.6% was obtained, representing 93 firms from a range of manufacturing and service sectors. The proportion of respondents was equally distributed between manufacturing and non-manufacturing sectors (41.8% and 58.2%, respectively). The majority of the respondents (78.5%) were senior managers (General Manager or Managing Director), so they had the knowledge to answer the questions appropriately. Approximately 53% of the firms had less than 50 employees, 37% employed between 50 and 249 workers and 10% had more than 250 employees.

3.2. Research instrument

There is a basic difficulty in measuring TQM. Despite the plethora of studies published in the last 20 years, there is still a debate on the scope of the concept or the range of dimensions that it should comprise (Sila and Ebrahimpour, 2002). In fact, this is a logical consequence of the attempt to measure a holistic concept as TQM in the absence of a broad-based common frame of reference. As a result, more recent work (Eskildsen and Dahlgaard, 2000; Prajogo and Sohal, 2004; Rahman, 2001; Woon, 2000) establishes measuring criteria and scales based on the TQM model prevalent in the geographic area targeted in each study.

Applying this approach in this case leads to the European Foundation for Quality Management's Model of Excellence, counterparts of which elsewhere are, for example, the Malcolm Baldrige model in the USA and the Deming Prize in Japan. We have drawn up a specific scale based on the critical constructs of the EFQM Excellence Model (2006) to assess the degree to which companies follow TQM principles. This framework is structured around nine criteria, grouped into five "Enablers" (leadership, people, policy strategy, partnership & resources, and processes) describing what a firm should do to achieve four types of "Results" (people results, customer results, impact on society results and business results) considered as probable outcomes of quality management (EFQM, 2006). Each of the criteria breaks down into sub-criteria, which are used to assess companies in relation to the ideal of business excellence embodied in the model, and to pinpoint opportunities for improvement. Furthermore, TQM measuring scales employed in a range of key empirical papers have been reviewed in order to compose a list of statements relating to the TQM Enablers. The items comprised in these scales (Ahire et al., 1996; Ahire and O'Shaughnessy, 1998; Anderson et al., 1995; Anderson and Sohal, 1999; Antony et al., 2002; Badri et al., 1995; Black and Porter, 1996; Brah et al., 2002; Flynn et al., 1994; Grandzol and Gershon, 1998; Powell, 1995; Quazi and Padibjo, 1998; Samson and Terziovski, 1999; Saraph et al., 1989; Zhang et al., 2000) show in many cases a clear correspondence with the EFQM sub-criteria and have come through a validation process, which fully justifies using them in this study. Once a draft version of the questionnaire had been drawn up, it was pre-tested in six in-depth interviews with expert professionals in the field recommended by the Regional Quality Club, who supported the study. As a result, several items were rewritten to facilitate their interpretation, to avoid confusion and thus prevent research bias. Appendix A lists the items that were finally used. Each variable was evaluated on a seven-point scale ranging from total disagreement to full agreement, mirroring the extent to which the individual variable described each organization.

Innovativeness is quantified using five items adapted from Hurley and Hult (1998). The measurement scale explicitly focuses on the firms' cultural predisposition to innovate rather than on the innovative behaviour (see Appendix A). Again, a seven-point Likert scale anchored by "strongly disagree" and "strongly agree" is used to measure all the items.

*Technical and administrative innovation*s are measured adopting the scale developed by Weerawardena (2003). Thus, the number of innovations really adopted by the firm over the last five years (1 = degree of adoption much lower than the competitors and 5 = intensity much higher) and their degree of novelty (1 = marginal improvements and 5 = totally new, radical) is measured in relation to the

firm's major competitor in the industry. This information is gathered, on the one hand, in the domain of the organization's products and productive processes, and on the other hand, in the set of the processes of organizational management in general and the function of marketing in particular. In this way, the study of the firms' effort to adopt technological and administrative innovations relative to their main competitors is completed with the level of separation of this from usual practices. Higher values in the scales dedicated to both types of innovation reflect a greater level of radical innovative activity. The reference to the major competitor in the industry allows both minimising the industry effect and decreasing the response's subjectivity establishing a point of reference to make the comparison (Kraft, 1990); likewise, this fact allows assessing the achievement of competitive advantages in this matter in the period under consideration (Grant, 1991).

Market turbulence: To define and measure this variable Jaworski and Kohli's (1993) work as well as subsequent studies (Greenley, 1995; Hult et al., 2004) which analyse in depth the meaning of this concept was taken as a starting point. The scale finally used to quantify this concept (see Appendix A) includes eight items that explicitly refer to the market dynamism (markturb 1 to markturb 4) and uncertainty (markturb 5 to markturb 8).

4. Data analysis

Results were analysed in two stages. First, the psychometric properties (reliability, convergent and discriminant validity) of the constructs used in the research model were evaluated following the suggestions of Churchill (1979), Anderson and Gerbing (1988) and Deng and Dart (1994). Then, structural equation modeling was used to check the hypotheses in the conceptual model.

4.1. Reliability and validity of the measurement scales

The reliability of all the scales used in the research was initially calculated using Cronbach's alpha coefficient. The result shows that the Cronbach's alpha measure for the constructs exceeds the threshold point of 0.7 suggested by Nunnally (1978), although some items, marked in italics in Appendix A, were eliminated in subsequent analyses as they diminished the coefficient value.

Initially, principal component analysis with varimax rotation was carried out to test that the statements corresponding to the same dimension load on a single factor or that the underlying dimensions proposed for TQM and market turbulence were identified. A factor loading of 0.50 was used as the cut-off point. As expected, a single factor was obtained for each of the innovativeness and technical and administrative innovation scales. The market turbulence scale provided two underlying factors referred to the market dynamism and market uncertainty. The TQM scale provided the expected five underlying sub-dimensions, although these exhibited a different configuration to that initially considered (% accumulated variance explained higher than 65% in all cases). Some items referred to resource management from the Partnership and Resources criterion (Part&res5 to Part&res8) loaded on the Processes factor. This fact is not conceptually surprising, given that resource management involves implementing certain organizational processes. For this reason, a new factor labelled Processes and Resources will be considered in further confirmatory factor analyses (CFA), while the Partnership and Resources criterion will subsequently be referred to as Partnerships. It is noteworthy that in the previous scales none of the variables failed to meet the cut-off point considered; nor were there cross loads among factors when feasible.

To further evaluate the reliability of the measures employed in the analysis as well as their convergent and discriminant validity, we used CFA with EQS 6.1. As we could not include all the criteria in a single model (allowing correlation of all the constructs) without violating the ratio of sample size to number of parameters (Jöreskog and Sörbom, 1995), we divided the set of scales into various sub-models, grouping related constructs to obtain correlations. This approach is well established in the literature (Atuahene-Gima and Li, 2002; Bentler and Chou, 1987; Doney and Cannon, 1997).

Thus, initially, the convergent validity and the reliability of each of the TQM sub-dimensions were tested (Table B1, Appendix B). All sub-scale items load significantly on their hypothesised latent variable and have loadings of 0.5 or better, which confirms convergent validity (Gerbing and Anderson, 1988; Steenkamp and Van Trijp, 1991). Reliability is also confirmed since composite reliabilities of all construct exceed the 0.7 benchmark and average variances extracted (AVE) surpass the 0.5 value (Hair et al., 1999). Next, we checked the fit of a model in which each of the dimensions of TQM correlate in order to complete the discriminant validity analyses. Here, in order to increase sample size relative to the parameter estimates, we used single-scale score indicators to measure the Enablers' latent constructs except for one: the Partnerships criterion was estimated considering its two indicators. This last procedure was necessary to achieve degrees of freedom. Thus, the actual level of the remaining constructs was represented by the median of the measurement items that survived the scales' validation process. The measurement error terms for each of these constructs were fixed at (1-composite reliability coefficient) times the variance of each scale score in the final model to determine the extent to which measurement error affected the observed pattern of relationships (MacKenzie et al., 1998). The discriminant validity test was performed following the method used by Prajogo and Sohal (2006b), i.e., by constraining the correlation between any two constructs to 1.0 and then performing a chi-square difference test at $p<0.01$ between the constrained and unconstrained models (Anderson and Gerbing, 1988). When a chi-square value for the constrained model is significantly greater than that of the

unconstrained model, discriminant validity is achieved (Bagozzi and Phillips, 1982). The chi-square difference between the constrained and unconstrained models always has one degree of freedom; therefore, the chi-square difference should be greater than 3.84 to be considered significant. The results provide support for the discriminant validity given that this stringent criterion is accomplished (see Table B2, Appendix B).

Once analysed the discriminant validity of the TQM dimensions, the discriminant validity of the constructs used in the research model was also evaluated. To this end we tested a model where innovativeness, technical and administrative innovation and TQM (represented by its dimensions) correlate. This model also allows checking the convergent validity and the reliability of the measures of innovativeness, technical and administrative innovation as well as the unidimensionality of the TQM concept (Table B3, Appendix B), or whether its sub-dimensions (represented by the mean value of the items that survived the depuration process) satisfactory converge in a single latent construct (loadings of 0.5 or better). The discriminant validity of the research measures according to the aforementioned criterion is shown in Table B4 (Appendix B).

During the prior process some of the explanatory variables in each sub-dimension (shown in bold type in Appendix A) had to be eliminated when the scales' purification criteria were not accomplished. In those cases Cronbach's alpha value was re-calculated for each subscale, as shown in Appendix B.

4.2. Research model testing

We used structural equation modeling to test our hypotheses with the maximun likehood estimation method using the model illustrated in Fig. 1 as the base model. In this analysis the error correlations between the technical and administrative innovations have been established. This method should be allowed only if there is a logical and theoretical justification (Gerbing and Anderson, 1988). In this case this explanation is given because the correct operation of the organization requires that the adoption of technical and administrative innovations should be carried out in a balanced way, that is, a firm should not introduce innovations of one type, unless changes are also adopted in the other system, since this unbalance would cause a lower operation.

Given the measurement validity of the scales used in this study, and in order to reduce the complexity of our model, we treated the TQM construct as a latent factor with five observable indicators (one corresponding to the mean value of each Enabler). Similarly, the rest of constructs were also estimated by an aggregated measure obtained as the mean value of their indicators.

SEM results of the relationship between the constructs operationalised in this study are shown in Fig. 2. The model's goodness-of-fit statistics, which are the same as those used to test the measurement models, reveal a good fit of the model to the data.

The results of the research allow confirming that TQM favours the organizations' cultural predisposition to accept new ideas related to innovation; thus, the first hypothesis formulated (H1) is corroborated. The predisposition to innovate, in turn, exerts a positive and significant effect on technical innovation (H4), acting like this as a mediating variable in the effect exerted by TQM on this type of innovation. In fact, it is a pure mediating effect as there is no direct effect of TQM on technical innovation, which forces us to refuse the second hypothesis of the work (H2).

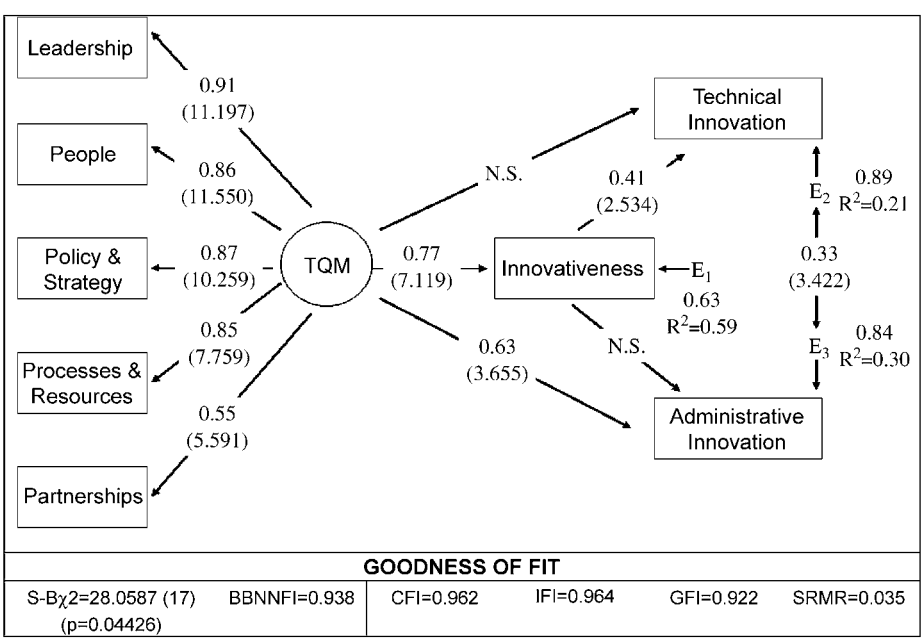

Fig. 2. Research model fit.

Nevertheless, TQM does exert a direct and significant effect on administrative innovation (H3), which, is not affected, however, by the cultural predisposition to innovate, which leads us to reject the last hypothesis put forward (H5).

In examining the moderating relationships, the sample was split at the medium value of market turbulence[1] (median = 4.2049, S.D. = 0.81242) into two groups representing low ($n = 49$, mean = 3.5879, S.D. = 0.46411) and high ($n = 44$, mean = 4.8920, S.D. = 0.50477) market turbulence. Thus, H6–H8 were tested using the multi-sample analysis included in the EQS package (Bentler, 1995). In order to test the interaction effects, two steps are required (Jaccard and Wan, 1996). The first step involves a "multiple-group" solution in which EQS derives parameter estimates for each group separately as well as a measure of goodness-of-fit of the model for both groups (low market turbulence and high market turbulence) considered simultaneously. The step 1 analysis does not formally evaluate the interaction effect. The overall test of goodness-of-fit indicated a reasonable fit between the multi-sample model and the data ($\chi^2 = 62.2968$, d.f. = 39 and $p = 0.01029$, BBNNFI = 0.903, CFI = 0.932). In step 2, the model is re-estimated but this time imposing the constraint that the regression coefficients in the structural model be equal in the two groups. If there is no interaction effect and the path coefficients are equal in the populations, such constraints should not adversely affect the model fit relative to the analysis in step 1. If there is a sizeable interaction effect, the constraints will adversely affect the model fit. The results obtained in step 2 are then compared to the unconstrained solution in step 1 (Jaccard and Wan, 1996).

Following this procedure we have identified two moderating effects of the main causal relationships. In the first place, market turbulence moderates the direct effect of TQM on technical innovation (univariate test of Lagrange: $\chi^2 = 3.162$, $p = 0.075$). TQM does not exert a direct effect on technical innovation when the degree of market turbulence is low, but it does exert a direct and positive effect on this type of innovation in the more turbulent markets ($\beta = 0.377$; $t = 2.166$). As no moderating effect of market turbulence on the relationship TQM-administrative innovation is observed, we can consider hypothesis H6 partially confirmed. Secondly, market turbulence moderates the direct effect of TQM on innovativeness (univariate test of Lagrange: $\chi^2 = 7.658$, $p = 0.006$). This effect is stronger for low degrees of turbulence ($\beta = 0.855$, t-value = 8.382) than for high degrees of market turbulence ($\beta = 0.600$; t-value = 5.073). These results contradict hypothesis H7 as the effect of TQM on the cultural predisposition to innovate is greater in more stable environments. Finally, we have not proved that market turbulence moderates the effect of innovativeness on technical and administrative innovation, thus H8 is rejected (univariate test of Lagrange: $\chi^2 = 0.235$, $p = 0.628$).

5. Discussion and managerial implications

According to the results of this research, TQM is a management system capable of creating an open or receptive to innovation organizational culture. The development of an organizational culture is not an easy task, as it consists of a group of shared norms and values formed over a long period of time and that influence the way the organization functions. The culture favourable to the adoption of innovations allows recognising in a more active way the need to innovate, the new ideas that appear within the firm and the information that must be shared for their development; consequently, it is the first necessary step to initiate the innovative process. The strength of the causal relationship ($\beta = 0.77$; $t = 7.119$) allows considering that TQM does not generate organizations dominated by risk aversion or unwilling to innovate but, on the contrary, it is an important antecedent of innovation orientation. The empirical research on the TQM effects on organizational culture is scarce (Bright and Cooper, 1993). Researchers discuss whether TQM practices bring about cultural change (Irani et al., 2004) or if it is the organizational culture that affects TQM implementation and its results (Prajogo and McDermott, 2005). This finding contributes to the limited empirical evidence on the antecedents of the firm's cultural predisposition to innovate and suggests that the implementation of TQM may influence the organization's basic beliefs and values related to the innovation activities. This evidence is also consistent with the research of Hurley and Hult (1998), who identify two key variables in the development of the innovative culture: the participatory decision taking and the employees' learning and professional development. Thus, TQM through its dimension of people management is actively involved in offering the employees a real role in the organization management, as well as in guaranteeing their satisfaction as they are internal customers of the entity itself, reason why their continuous formation and adaptation to the post they hold is taken care of.

The effect of TQM on the predisposition to innovate is moderated by market turbulence in an opposed sense to what was expected. Thus, under conditions of high turbulence the effect of TQM on the entrepreneurial culture favourable to innovation is lower than when the market is more stable. In the contexts in which the

[1]The measurement properties of the market turbulence scale were evaluated following the same procedures described in the body of the paper. The measurement model provided a good fit to the data considering two underlying constructs: market dynamism and market uncertainty (S-B$\chi^2 = 8.9928$, d.f. = 19 and $p = 0.97360$, NNFI = 1.144, CFI = 1.000, IFI = 1.090, GFI = 0.970, SRMR = 0.035). Both scales prove to be reliable (composite reliability > 0.7) and their convergent (λ-standardizez > 0.5) and discriminant validity (correlation among constructs < square root of the variance shared between the constructs) are also satisfactorily checked (see Appendix B).

customers' preferences and composition are known and there is low uncertainty about the future competitive conditions, firms can perceive a weaker need to undertake innovations and, consequently, a lower need to lay emphasis on innovation. However, it is in this situation when TQM stimulates more strongly the cultural predisposition to innovate. This fact, at first sight surprising, must be interpreted bearing in mind that the result of the firms' innovative effort is not immediate; consequently, the preparation of new products/processes should not be interrupted when the market does not seem to demand them immediately. In this respect, the role of TQM can be interpreted that prevents the erosion of the firm's competitive position assuming a greater fostering role of the predisposition to innovate in the absence of the environmental pressure.

The analysis of the TQM's impact on innovation shows that TQM exerts a direct and positive effect on the adoption of a larger number of administrative innovations with a greater degree of novelty incorporated relative to firm's major competitors. Specifically, TQM stimulates innovation in the management systems of the firms analysed as well as in the development of the function of marketing ($\beta = 0.63$; $t = 3.655$). This result allows the inclusion of this management system among the antecedents of more disruptive administrative innovations. Likewise, this relationship is maintained irrespective of the market turbulence, and we can therefore affirm that TQM contributes to a greater renovation of the management processes independently of the competitive context.

However, it is surprising to find that when we transfer this analysis to the effects on innovation in firms' goods and services or in the processes associated with their obtention, the relationship of TQM is mediated by the existence of a culture favourable to innovation. Nevertheless, the previous studies by Prajogo and Sohal (2004, 2006a) obtain results in agreement with the findings of this research. Thus, initially Prajogo and Sohal (2004) analyse the effects of TQM on product innovation concluding that only two dimensions of TQM, leadership and people management, have a significant influence in this domain. Subsequently, these same researchers establish that TQM does not exert a direct influence either on product or process innovation, but its influence is mediated by the management organizational resource of total innovation management (TIM) (Prajogo and Sohal, 2006a). Therefore, the conclusion to be drawn is that TQM needs, in principle, to be integrated with other organizational resources to influence more radical technical innovation, just as it happens in our work with innovativeness which is also deemed an organizational resource (Menguc and Auh, 2006).

However, the relationship we have just analysed is moderated by the market turbulence. Thus, when the environment is very unstable and dynamic, TQM continues to influence technical innovation by means of innovativeness and, in addition, it also exerts a direct effect on the adoption of a larger number of more novel technical innovations. Consequently, although in highly turbulent environments TQM, contrary to market demands, promotes to a lesser extent the culture proclive to innovation, results also indicate that under a stronger pressure of the environment TQM exerts a direct effect on technical innovation that is not shown in more stable markets. TQM under low market turbulence stimulates a firm's innovative culture to a greater extent to avoid self-indulgency and to maintain both the ability to anticipate the market (if required) and an adequate sensibility to alternatively approach the satisfaction of current needs. Under turbulent markets, TQM exerts a lower effect on innovativeness balanced by a direct impact on the development of technical innovations, which are strongly required by the market. The overall results of the model reinforce the exceptional convenience of TQM as management system that effectively helps firms to deal with the challenges derived from their competitive environment.

With regard to the predisposition to innovate, it is necessary to reiterate that it influences directly and positively the number and degree of novelty of the technological innovations adopted by the firms of the sample; therefore, the innovation-oriented culture appears as an effective antecedent of the firms' innovative capacity in the technical domain. Nevertheless, the absence of a significant effect of the cultural predisposition to innovate on the administrative innovation is undoubtedly a startling result. However, there are not too many studies that analyse empirically the relationship between organizational culture and the innovative activity (Anderson and King, 1993) which would allow a more thorough evaluation of this finding. Hurley and Hult (1998) analyse this relationship without distinguishing between types of innovation. Thus, in the light of our results it seems that the firms' management system (TQM) is, for administrative innovation, a stronger determinant than the innovative culture itself.

Empirical findings confirm the effects of innovativeness on technical and administrative innovation regardless of the market turbulence in which the firm operates. This implies that irrespective of the level of market turbulence facing the firm, the management should seek to maintain a continuous state of innovativeness to sustain a higher capacity to develop technical innovations and assume that the organizational management system is the ultimate forerunner of administrative innovation.

Another result of the research refers to the relationship between technical and administrative innovation. Both variables are significantly correlated (0.33) which implies that the adoption of one type of innovation influences the other positively. To verify whether this relationship is genuine or spurious, as a result of the influence of TQM on innovativeness as the common antecedents, the partial correlation between the two types of innovation was calculated controlling for the common antecedents. The

partial correlation was positive and significant (confidence level 95%) confirming that the causal relationship is genuine. Consequently, the results of this research support the theoretical presumption that both technical and administrative innovations are developed simultaneously in organizations.

The present study has also allowed us to obtain a measurement scale of the practices of TQM according to the EFQM Model, which confirms the presence of five Enablers although with a different configuration from the one put forward in the model. Specifically, the evidence available points to the joint consideration of the activities of process and resource management. One of the main conclusions of this research is that the TQM practices proposed by the EFQM Excellence Model cannot be seen as an obstacle to firms' innovative activity. TQM favours both the intensity of the technical and administrative innovation and their degree of novelty, and for this reason, it can be included among the group of organizational factors that influence the development of the innovation. Thus, although there exists an important body of literature that defends the importance of creativity and innovation to keep organizations strong, feasible and competitive, the research referred to the organizational factors that take part in this process is much more scarce and, as a result, especially necessary (Chandler et al., 2000). As this innovative activity is also assessed with regard to the extent to which it surpasses the firms' major competitors, we can affirm that TQM contributes to the achievement of competitive advantages in this matter. In this way, to the consideration of the total quality practices according to the EFQM Excellence Model as an important organizational resource (Castresana Ruiz-Carrillo and Fernández Ortiz, 2005), is now added their crucial role in the development of other essential organizational resources like innovation capacity.

The managerial implications of this study also involve the need to make practitioners aware of all the range of potential effects of TQM. Specifically, it can be defended that the adoption of TQM fosters the development of firms' innovative culture and, furthermore, it contributes to a greater practical capacity of adoption of innovations with respect to the competition. Consequently, TQM is an adequate way to obtain the necessary innovation capacity to guarantee entrepreneurial survival and competitiveness in the long term.

5.1. Limitations and future research

Finally, this research acknowledges a series of limitations that it is necessary to bear in mind when interpreting its results. In the first place, it is a regional study with a limited number of cases, although previous studies on TQM and innovation have worked with a number of firms similar to ours (Chong and Rundus, 2004; Perdomo-Ortiz et al., 2006). Nevertheless, it is necessary to obtain empirical evidence in wider contexts that allows confirming the results obtained, as well as to consider a larger number of administrative processes than those assessed in this work. Moreover, it is necessary to take into account that this is a cross-sectional research in which the value of the variables analysed is obtained by means of subjective appreciations from an only expert. The ideal situation would be to have more objective data with regard to the number of innovations adopted, and also to have the joint view of several managers in relation to the management system developed and the organizational culture.

Appendix A. Research scales

A.1. Total quality management

Leadership:

Leader1.	*Long-term customer satisfaction is laid down as the organization's mission and basic principle.*
Leader2.	Organizational leaders take on the responsibility for developing quality-oriented management systems.
Leader3.	Leaders personally assess the application and progress of total quality principles.
Leader4.	Leaders allocate resources for continuous improvement of the management system.
Leader5.	*Leaders interact with customers and keep in mind their contributions when designing goods and services.*
Leader6.	*Leaders always bear in mind stakeholder groups.*
Leader7.	*Leaders' activities seek to provide value for the community and protect the environment.*
Leader8.	Leaders listen and support employees and encourage them to take part in deciding and managing total quality policies and plans.
Leader9.	Leaders acknowledge and reward employees' contributions to bettering quality.
Leader10.	Leaders pre-empt change needed in the organization and pinpoint the factors that lead to a need for change.
Leader11.	Leaders provide a plan detailing the different stages of change, and secure the investment, resources and support needed to achieve change.
Leader12.	Leaders measure and review the effectiveness of organizational change and share the knowledge that is obtained.

People:

People1.	In human resource planning, the employee is considered an "internal customer" who participates in policy, strategies and organizational structure.

People2. Employees know that quality is their responsibility, and they are encouraged to meet customers' and the organization's objectives.

People3. Continuous improvement is consistently fostered and facilitated.

People4. Employees are given tailor-made preparation for their jobs and are qualified to solve quality problems.

People5. Staff is continuously trained in the principles of quality, teamwork and job-specific skills.

People6. Employees are actively involved in quality-related activities and the success of the company, and many of their suggestions are implemented.

People7. Employees are responsible for quality and end results of the product/service. They can take decisions independently.

People8. There are quality circles and/or interdepartmental teams to improve quality.

People9. The company has effective two-way communication links with its employees.

People10. The pay and promotion systems acknowledge efforts to improve quality.

People11. Pay and acknowledgement systems are based on quality-related objectives and on company results.

People12. Employees receive the right occupational health and safety training at work.

Policy and strategy:

Polest1. The company draws up strategic action plans (used to regularly review and to establish the organization's short-term and long-term objectives and to pre-empt competitive situations). Their "gold standard" is a commitment to quality.

Polest2. Strategic plans and related policies always consider customers' needs, suppliers' capacities and the needs of any other stakeholders in the company's activities.

Polest3. Detailed information about such things as competitors' actions, other market agents' behaviour, legal and environmental issues, etc. is collected to help formulate strategy.

Polest4. Information from all the company's processes is analysed when strategy is defined.

Polest5. Progress towards achieving strategic objectives is regularly assessed.

Polest6. SWOT analysis is regularly used to review and update business strategy.

Polest7. Resources are allocated to achieve strategic objectives.

Processes:

Process1. Processes are designed ensuring that skills and capacities are right for company needs.

Process2. All processes, procedures and products are assessed regularly in an attempt to bring in change and improvement.

Process3. New products and/or services are designed thoroughly and meticulously before being manufactured and marketed so as to ensure that clients' present and future expectations are met.

Process4. Quality-related criteria predominate over speed and cost when developing new products.

Process5. The different company departments liaise during the development of new products/services.

Process6. We regularly ask our clients what they want from our products now and in the future.

Process7. Our clients' needs are passed on and are understood at all levels.

Process8. Clients' leave is thoroughly analysed.

Process9. We use clients' complaints and grievances to improve our products.

Process10. Present relationships with clients are analysed and regular attempts are made to improve them.

Process11. We strive to increase our level of commitment towards our client via policies designed to encourage customer loyalty, guarantees, etc.

Partnerships and resources:

Part&res1. We have close, long-term relationships with our supplies designed to resolve quality-related problems.

Part&res2. Our suppliers help to improve our products and/or services and also provide technical assistance.

Part&res3. The company is prepared to form alliances with partners and collaborators in the market in an attempt to achieve competitive advantage.

Part&res4. Work is organized around reducing and optimising physical, economic and financial resources.

Part&res5. Our company makes ongoing efforts to keep their facilities clean and in order.

Part&res6. The company coordinates its strategies and its technological equipment, machinery and know-how.

Part&res7. Our company strives to improve operational efficiency by efficient use of technology.

Part&res8. Our company creates databases and files with the information it has in order to analyse and learn.

Part&res9. There is updated quality-related data available to all members of the company.

Innovativeness:

Innovat1. Innovation proposals are welcome in the organization.

Innovat2. Management actively seeks innovative ideas.

Innovat3. Innovation is perceived as too risky and is resisted (*R*).

Innovat4. People are not penalised for new ideas that do not work.

Innovat5. Program/Project managers promote and support innovative ideas, experimentation and creative processes.

Note: $R =$ item was reverse scored.

Technical and administrative innovation:

Intensity 1/Novelty 1.
Product and service innovations introduced by the firm in the last five years.

Intensity 2/Novelty 2.
Production processes or service operations innovations introduced by the firm in the last five years.

Intensity 3/Novelty 3.
Managerial innovations (e.g., computer-based administrative innovations, new employee reward/training schemes, new departments or project teams, etc.) introduced by the firm in the last five years.

Intensity 4/Novelty 4.
Marketing innovations (entering new markets, new pricing methods, new distribution methods, etc.) introduced by the firm in the last five years.

Market turbulence:

Markturb1. Our customer's preferences are constantly changing.

Markturb2. Our set of client changes on a regular basis.

Markturb3. Our firm experiments a high rate of change of its competitors.

Markturb4. New competitors enter the market place on a regular basis.

Markturb5. We can accurately predict the future characteristics of our competitive environment (*R*).

Markturb6. We can anticipate how to satisfy our customer's future preferences (*R*).

Markturb7. We are secure about how to presently deal with our clients to keep them in the future (*R*).

Markturb8. We can predict the evolution of the environmental forces (*R*).

Note: $R =$ item was reverse scored.

Appendix B. Scales' psychometric properties

Test results of the reliability and validity of the measurement scales are shown in Tables B1–B4.

Table B1

Factor item	Loadings	*t*-Value	Composite reliability	AVE	Cronbach's alpha
Leadership					
Leader2	0.86	7.816	**0.946**	**0.716**	**0.945**
Leader3	0.87	9.304			
Leader4	0.88	10.931			
Leader8	0.77	7.713			
Leader10	0.84	10.156			
Leader11	0.87	12.065			
Leader12	0.83	10.458			
Goodness-of-fit	*S-B* χ^2 (14) = 27.8937 $P = 0.01470$	BBNNFI = 0.922 CFI = 0.959		IFI = 0.960 GFI = 0.888	SRMR = 0.034
People					
People1	0.82	13.702	**0.951**	**0.611**	**0.934**
People2	0.78	9.788			
People3	0.80	8.675			
People4	0.76	9.831			
People5	0.87	10.966			
People6	0.83	12.829			

Table B1 (*continued*)

Factor item	Loadings	*t*-Value	Composite reliability	AVE	Cronbach's alpha
People7	0.72	8.381			
People8	0.65	7.104			
People9	0.75	7.877			
People10	0.77	11.058			
Goodness-of-fit	*S-B* χ^2 (35) = 42.7784 $P = 0.17182$	BBNNFI = 0.928 CFI = 0.986		IFI = 0.986 CFI = 0.837	SRMR = 0.052
Policy and strategy					
Polst1	0.85	10.432	**0.938**	**0.685**	**0.936**
Polst2	0.88	9.650			
Polst3	0.73	8.008			
Polst4	0.83	9.972			
Polst5	0.87	12.289			
Polst6	0.74	9.638			
Polst7	0.88	11.163			
Goodness-of-fit	*S-B* χ^2 (14) = 22.0982 $P = 0.07662$	BBNNFI = 0.943 CFI = 0.978		IFI = 0.978 GFI = 0.923	SRMR = 0.030
Processes and resources					
Process1	0.70	7.275	**0.971**	**0.615**	**0.951**
Process 2	0.86	9.132			
Process 5	0.74	8.407			
Process 6	0.75	8.500			
Process 7	0.82	8.144			
Process 8	0.71	7.398			
Process 9	0.77	8.137			
Process 10	0.91	9.191			
Process 11	0.83	10.239			
Part&res5	0.72	7.855			
Part&res6	0.75	5.955			
Part&res7	0.78	7.788			
Part&res8	0.75	7.069			
Partnerships					
Part&res1	0.95	8.754	**0.807**	**0.682**	**0.773**
Part&res2	0.68	7.955			
Goodness-of-fit	*S-B* χ^2 (89) = 133.7315 $P = 0.00153$	BBNNFI = 0.909 CFI = 0.923		IFI = 0.925 GFI = 0.813	SRMR = 0.050

Table B2

	χ^2 unconstrained (d.f.)	χ^2 constrained (d.f)	$\Delta\chi^2$
Leadership–people	237.45 (118)	311.38 (119)	73.93
Leadership–policy and strategy	139.28 (76)	255.37 (77)	116.09
Leadership–processes and resources	189.57 (103)	353.69 (104)	164.12
Leadership–partnerships	142.68 (64)	225.89 (65)	83.21
People–policy and strategy	209.45 (118)	366.40 (119)	156.95
People–processes and resources	261.82 (151)	502.45 (152)	240.63
People–partnerships	215.20 (103)	338.18 (104)	122.98
Policy and strategy–processes and resources	199.56 (103)	340.73 (104)	141.17
Policy and strategy–partnerships	148.16 (64)	231.71 (65)	83.56
Processes and resources–partnerships	183.15 (89)	194.60 (90)	11.46

Table B3

Factor item	Loadings	*t*-Value	Composite reliability	AVE	Cronbach's alpha
TQM					
Leadership	0.914	11.221	**0.909**	**0.671**	**0.900**
People	0.856	11.495			
Policy and strategy	0.864	10.204			
Processes and resources	0.845	7.746			
Partnerships	0.573	5.565			
Innovativeness					
Innovat1	0.672	6.588	**0.867**	**0.566**	**0.865**
Innovat2	0.773	6.181			
Innovat3	0.720	6.340			
Innovat4	0.802	9.544			
Innovat5	0.787	10.245			
Technical innovation					
Intensity1	0.523	5.310	**0.816**	**0.537**	**0.830**
Intensity1	0.788	7.864			
Novelty1	0.628	6.475			
Novelty2	0.926	12.218			
Administrative innovation					
Intensity3	0.462	4.747	**0.810**	**0.532**	**0.813**
Intensity4	0.814	8.985			
Novelty3	0.607	5.818			
Novelty4	0.940	13.796			
Goodness-of-fit	*S-B* χ^2 (129) = 257.7515 $P = 0.00001$	BBNNFI = 0.804 CFI = 0.835		IFI = 0.840 GFI = 0.758	SRMR = 0.076

Table B4

	χ^2 unconstrained (d.f.)	χ^2 constrained (d.f)	$\Delta\chi^2$
TQM–innovativeness	67.20 (34)	105.87 (35)	38.67
TQM–technical innovation	108.82 (26)	227.23 (27)	118.41
TQM–administrative innovation	75.52 (26)	161.10 (27)	85.58
Innovativeness–technical innovation	92.49 (26)	184.93 (27)	92.45
Innovativeness–administrative innovation	63.95 (26)	168.10 (27)	104.16
Technical innovation–administrative innovation	148.15 (19)	227.70 (20)	79.55

References

Adler, P., 1989. Technology strategy: a guide to the literatures. In: Rosembloom, R.S., Blurgeman, R.A. (Eds.), Research on Technological Innovation, Management and Policy, vol. 4. Jai Press, Greenwich, Conn, pp. 25–151.

Agus, A., Krishnan, S.K., Latifah, S., Kadir, S.A., 2000. The structural impact of total quality management on financial performance relative to competitors through customer satisfaction: a study of Malaysian manufacturing companies. Total Quality Management 11 (4–6), 814–819.

Ahire, S.L., O'Shaughnessy, K.C., 1998. The role of top management commitment in quality management: an empirical analysis of the auto parts industry. International Journal of Quality Science 3 (19), 5–37.

Ahire, S.L., Golhar, D.Y., Waller, M.M.A., 1996. Development and validation of TQM implementation constructs. Decision Sciences 27 (1), 23–56.

Amit, R., Schoemaker, P.J.H., 1993. Strategic assets and organizational rents. Strategic Management Journal 14, 33–46.

Anderson, J.C., Gerbing, D.W., 1988. Structural equation modeling in practice: a review and recommended two-step approach. Psychological Bulletin 103 (39), 411–423.

Anderson, J.C., Rungtusanatham, M., Schroeder, R.C., Devaraja, S., 1995. A path analytic model of a theory of quality management underlying the Deming management method: preliminary empirical findings. Decision Sciences 26 (59), 637–658.

Anderson, M., Sohal, A.S., 1999. A study of the relationship between quality management practices and performance in small business. International Journal of Quality & Reliability Management 16 (9), 859–877.

Anderson, N., King, N., 1993. Innovation in organizations. In: en Cooper, C.L., Robertson, I.T. (Eds.), International Review of Industrial and Organizational Psychology. Wiley, New York, pp. 1–34.

Antony, J., Leung, K., Knowles, G., Gosh, S., 2002. Critical success factors of TQM implementation in Hong Kong industries. International Journal of Quality & Reliability Management 19 (5), 551–556.

Argyris, C., Schön, D., 1978. Organizational learning: a theory of action perspective. Addison-Wesley, Reading, MA.

Atuahene-Gima, K., 1996. Market orientation and innovation. Journal of Business Research 35, 93–103.

Atuahene-Gima, K., Li, H., 2002. When does trust matter? Antecedents and contingent effects of supervisee trust on performance in selling new products in China and the United States. Journal of Marketing 66 (3), 61–81.

Badri, M.A., Davis, D., Davis, D., 1995. A study of measuring the critical factors of quality management. International Journal of Quality & Reliability Management 12 (2), 36–53.

Bagozzi, R.P., Phillips, L., 1982. Representing and testing organizational theories: a holistic construal. Administrative Science Quarterly 27, 459–489.

Baidoun, S., 2004. The implementation of TQM philosophy in Palestinian organizations: a proposed non prescriptive generic framework. The TQM Magazine 16 (3), 174–185.

Baker, W.E., Sinkula, J.M., 1999. The synergistic effect of market orientation and learning orientation on organizational performance. Journal of the Academy of Marketing Science 27 (4), 411–427.

Baron, R.M., Kenny, D.A., 1986. The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology 51, 1173–1182.

Bennet, R.C., Cooper, R.C., 1981. The misuse of marketing: an American tragedy. Business Horizons 25, 51–61.

Bentler, P.M., 1995. EQS Structural Equations Program Manual. Multivariate Software, Inc., Encino, CA.

Bentler, P.M., Chou, C.-P., 1987. Practical issues in structural modeling. Sociological Methods and Research 16 (August), 78–117.

Black, S.A., Porter, L.J., 1996. Identification of the critical factors of TQM. Decision Sciences 27 (1), 1–21.

Brah, S.A., Tee, S.S.L., Rao, B.M., 2002. Relationship between TQM and performance of Singapore companies. International Journal of Quality & Reliability Management 19 (4), 356–379.

Bright, K., Cooper, C.L., 1993. Organizational culture and the management of quality. Towards a new framework. Journal of Managerial Psychology 8 (6), 21–27.

Castresana Ruiz-Carrillo, J.I., Fernández Ortiz, R., 2005. Theoretical foundation of the EFQM model: the resource-based view. Total Quality Management 16 (1), 31–55.

Chandler, G.N., Keller, C., Lyon, D.W., 2000. Unravelling the determinants and consequences of an innovation-supportive organizational culture. Entrepreneurship: Theory and Practice 25 (1), 59–77.

Chong, V.K., Rundus, M.J., 2004. Total quality management, market competition and organizational performance. The British Accounting Review 36 (2), 155–172.

Churchill, G.A., 1979. A paradigm for developing better measures for marketing constructs. Journal of Marketing Research 16 (1), 64–73.

Claver, E., Llopis, J., García, D., Molina, H., 1998. Organizational culture for innovation and new technological behaviour. Journal of High Technology Management Research 9 (1), 55–69.

Collins, L.K., Hill, F.M., 1998. Leveraging organizational transformation through incremental and radical approaches to change: three case studies. Total Quality Management 9 (4–5), 30–34.

Crosby, P.B., 1979. Quality is Free: The Art of Making Quality Certain. New American Library, New York.

Curry, A., Kadasah, N., 2002. Focusing on key elements of TQM—evaluation for sustainability. The TQM Magazine 14 (4), 207–216.

Daft, R.L., 1978. A dual-core model of organizational innovation. Academy of Management Journal 21 (2), 193–210.

Damanpour, F., 1991. Organizational innovation: a meta-analysis of effects of determinants and moderators. Academy of Management Journal 34 (3), 555–590.

Damanpour, F., Szabat, K.A., Evan, W.M., 1989. The relationships between types of innovation and organizational performance. Journal of Management Studies 26, 587–601.

Deming, W.E., 1986. Out of the Crisis. Quality, Productivity and Competitive Position. Cambridge University Press, Cambridge.

Deng, S., Dart, J., 1994. Measuring market orientation: a multi-factor, multi-ítem approach. Journal of Marketing Management 10, 725–742.

Deshpandé, R., Farley, J.U., Webster, J., 1993. Corporate culture, customer orientation and innovativeness in Japanese firms: a quadrad analysis. Journal of Marketing 57 (1), 22–27.

Doney, P.M., Cannon, J.P., 1997. An examination of the nature of trust in buyer–seller relationships. Journal of Marketing 61 (April), 35–51.

Eskildsen, J.K., Dahlgaard, J.J., 2000. A causal model for employee satisfaction. Total Quality Management 11 (8), 1081–1094.

European Foundation for Quality Management. Homepage of EFQM. Available from: 〈http://www.efqm.org/〉 (1/11/2006).

Flynn, B.B., Schroeder, R.C., Sakakibara, S., 1994. A framework for quality management research and an associated measurement instrument. Journal of Operations Management 11, 339–366.

Gerbing, D.W., Anderson, J.C., 1988. An updated paradigm for scale development incorporating unidimensionality and its assessment. Journal of Marketing Research 25 (2), 186–192.

Grandzol, J.R., Gershon, M., 1998. A survey instrument for standardizing TQM modeling research. International Journal of Quality Science 3 (1), 80–105.

Grant, R., 1991. A resource-based theory of competitive advantage: implications for strategy formulation. California Management Journal 33 (3), 114–135.

Greenley, G.E., 1995. Forms of market orientation in UK companies. Journal of Management Studies 32 (1), 46–66.

Hair, J.F., Anderson, R.E., Tatham, R.L., Black, W.C., 1999. Análisis Multivariante, fifth ed. Prentice-Hall, Madrid.

Han, J.K., Kim, N., Srivastava, R.K., 1998. Market orientation and innovation performance: is innovation a missing link? Journal of Marketing 62 (4), 30–45.

Hayes, R.H., Abernathy, W.J., 1980. Managing our way to economic decline. Harvard Business Review July–August, 67–77.

Hult, G.T.M., Hurley, R.F., Knight, G.A., 2004. Innovativeness: its antecedents and impact on business performance. Industrial Marketing Management 33 (5), 429–438.

Humble, J., Jones, G., 1989. Creating a climate for innovation. Long Range Planning 22 (4), 46–51.

Hurley, R.F., Hult, G.T., 1998. Innovation, market orientation and organization learning: an integration and empirical examination. Journal of Marketing 62 (3), 42–54.

Irani, Z., Beskese, A., Love, P.E.D., 2004. Total quality management and corporate culture: constructs of organisational excellence. Technovation 24 (8), 643–650.

Jaccard, J., Wan, C.K., 1996. Lisrel Approaches to Interaction Effects in Multiple Regression. Sage Publications, Thousand Oaks, CA.

Jaworski, B.J., Kohli, A.K., 1993. Market orientation: antecedents and consequences. Journal of Marketing 57, 53–70.

Jaworski, B.J., Kohli, A.K., 1996. Market orientation: review, refinement, and roadmap. Journal of Market Focused Management 1, 119–135.

Jöreskog, K.G., Sörbom, D., 1995. LISREL 8. Scientific Software International, Inc., Chicago.

Jung, J.Y., Wang, Y.J., 2006. Relationship between total quality management (TQM) and continuous improvement of international project management (CIIPM). Technovation 26 (5–6), 716–722.

Juran, J., 1986. The quality trilogy. Quality Progress (9), 19–24.

Kohli, A.K., Jaworski, B.J., 1990. Market orientation: the construct, research propositions and managerial implications. Journal of Marketing 54 (2), 1–18.

Kraft, K., 1990. Are product and process innovations independent of each other? Applied Economics 22 (8), 1029–1038.

Kwak, Y.H., Anbari, F.T., 2006. Benefits, obstacles, and future of six sigma approach. Technovation 26 (5–6), 708–715.

Lawton, L., Parasuraman, A., 1980. The impact of marketing concept on new product planning. Journal of Marketing 44, 19–25.

Lettl, C., Herstatt, C., Gemuenden, H.G., 2006. Users' contributions to radical innovation: evidence from four cases in the field of medical equipment technology. R&D Management 36 (3), 251–272.

Lilien, G.L., Morrison, P.D., Searls, K., Sonnack, M., Von Hippel, E., 2002. Performance assessment of the lead user idea-generation process for new product development. Management Science 48 (8), 1042–1059.

MacKenzie, S.B., Podsakoff, P.M., Ahearne, M., 1998. Some possible antecedents and consequences of in-role and extra-role salesperson performance. Journal of Marketing 62 (3), 87–98.

Matsuo, M., 2006. Customer orientation, conflict, and innovativeness in Japanese sales departments. Journal of Business Research 59, 242–250.

McAdam, R., 2004. Knowledge creation and idea generation: a critical quality perspective. Technovation 24 (9), 697–705.

McKee, D.O., Varadarajan, P.R., Pride, W.M., 1989. Strategic adaptability and firm performance. Journal of Marketing 53, 21–35.

Mehra, S., Hoffman, J.M., Sirias, D., 2001. TQM as a management strategy for the next millennia. International Journal of Operations and Production Management 21 (5–6), 855–877.

Menguc, B., Auh, S., 2006. Creating a firm-level dynamic capability through capitalizing on market orientation and innovativeness. Journal of the Academy of Marketing Science 34 (1), 63–73.

Miles, R.E., Snow, C.C., 1978. Organizational Strategy, Structure and Process. McGraw-Hill, New York.

Milliken, F.J., 1987. Three types of perceived uncertainty about the environment: state effect and response uncertainty. Academy of Management Review 12, 133–143.

Nijhof, A., Krabbendam, K., Looise, J.C., 2002. Innovation through exemptions: building upon the existing creativity of employees. Technovation 22 (11), 675–683.

Nonaka, I., Yamanouchi, T., 1989. Managing innovation as a self-renewing process. Journal of Business Venturing 4 (5), 299–316.

Nunnally, J.C., 1978. Psychometric Theory, second ed. McGraw-Hill, New York.

Oakland, J.S., 2000. Total Quality Management—Text with Cases, second ed. Butterworth-Heinemann, London.

Perdomo-Ortiz, J., González-Benito, J., Galende, J., 2006. Total quality management as a forerunner of business innovation capability. Technovation 26 (10), 1170–1185.

Porter, M., 1980. Competitive Strategy: Techniques for Analysing Industries and Competitors. The Free Press, New York.

Porter, M., 1985. Competitive Advantage: Creating and Sustaining Superior Performance. The Free Press, New York.

Powell, T.C., 1995. Total quality management as competitive advantage: a review and empirical study. Strategic Management Journal 16, 15–37.

Prajogo, D.I., McDermott, C.M., 2005. The relationship between total quality management practices and organizational culture. International Journal of Operations and Production Management 25 (11), 1101–1122.

Prajogo, D.I., Sohal, A.S., 2001. TQM and innovation: a literature review and research framework. Technovation 21 (8), 539–558.

Prajogo, D.I., Sohal, A.S., 2004. The multidimensionality of TQM practices in determining quality and innovation performance—an empirical examination. Technovation 24 (6), 443–453.

Prajogo, D.I., Sohal, A.S., 2006a. The integration of TQM and technology/R&D management in determining quality and innovation performance. Omega 34 (3), 296–312.

Prajogo, D.I., Sohal, A.S., 2006b. The relationship between organization strategy, total quality management (TQM) and organization performance-the mediating role of TQM. European Journal of Operational Research 168 (1), 35–50.

Quazi, H.A., Padibjo, S.R., 1998. A journey toward total quality management through iso certification—a study on small- and medium-sized enterprises in Singapore. International Journal of Quality & Reliability Management 15 (5), 489–508.

Rahman, S.-U., 2001. A comparative study of TQM practice and organisational performance of SMEs with and without ISO 9000 certification. International Journal of Quality & Reliability Management 18 (1), 35–49.

Samson, D., Terziovski, M., 1999. The relationship between total quality management practices and operational performance. Journal of Operations Management 17, 393–409.

Santos-Vijande, M.L., Vázquez-Casielles, R., 1997. La estrategia de marketing como instrumento competitivo en las empresas de alta tecnología. Revista Asturiana de Economía 9, 25–52.

Santos-Vijande, M.L., Vázquez-Casielles, R., 1998. El proceso de desarrollo de nuevos productos como factor clave en el resultado de la innovación: el papel de las actividades de marketing. Economía Industrial (319), 77–90.

Santos-Vijande, M.L., Sanzo Pérez, M.J., Álvarez-González, L.I., Vázquez-Casielles, R., 2005. Effects of market orientation on business strategic behaviour. Journal of Strategic Marketing 13 (1), 17–42.

Saraph, J.V., Benson, P.G., Schroeder, R.C., 1989. An instrument for measuring the critical factors of quality management. Decision Sciences 20 (4), 810–829.

Schumpeter, J.A., 1934. The Theory of Economic Development. Harvard University Press, Boston.

Sila, I., Ebrahimpour, M., 2002. An investigation of the total quality management survey based research published between 1989 and 2000: a literature review. International Journal of Quality & Reliability Management 19 (7), 902–970.

Slater, S.F., Narver, J.C., 1994. Does competitive environment moderate the market orientation-performance relationship? Journal of Marketing 58 (1), 46–55.

Slater, S.F., Narver, J.C., 1995. Market orientation and learning organisation. Journal of Marketing 59 (3), 63–74.

Spreitzer, G.M., 1995. Psychological empowerment in the workplace: dimensions, measurement, and validation. Academy of Management Journal 38 (5), 1442–1465.

Steenkamp, J.B., Van Trijp, H.C.M., 1991. The use of LISREL in validating marketing constructs. International Journal of Research in Marketing 8, 283–299.

Subramanian, A., Nilakanta, S., 1996. Organizational innovativeness: exploring the relationships between organizational determinants of innovation, types of innovation and measures of organizational performance. Omega 24 (6), 631–647.

Taylor, W.A., Wright, G.H., 2003. A longitudinal study of TQM implementation: factors influencing success and failure. Omega 31, 97–111.

Vázquez-Casielles, R., Santos-Vijande, M.L., Álvarez-González, L.I., 2001. Market orientation, innovation and competitive strategies in industrial firms. Journal of Strategic Marketing 9 (1), 69–90.

Von Hippel, E., 1986. Lead users: a source of new product concepts. Management Science 32 (7), 791–805.

Weerawardena, J., 2003. The role of marketing capability in innovation-based competitive strategy. Journal of Strategic Marketing 11 (1), 15–36.

Woodman, R.W., Sawyer, J.E., Griffin, R.W., 1993. Toward a theory of organizational creativity. Academy of Management Journal 18 (2), 293–321.

Woon, K.C., 2000. TQM implementation: comparing Singapore's service and manufacturing leaders. Managing Service Quality 10 (5), 318–331.

Yam, R.C.M., Tam, A.Y.K., Tang, E.P.Y., Mok, C.K., 2005. TQM: a change management model for market orientation. Total Quality Management & Business Excellence 16 (4), 439–461.

Zaltman, G., Robert, D., Holbek, J., 1973. Innovations and Organizations. Wiley, New York.

Zhang, Z., Waszink, A., Winjgaard, J., 2000. An instrument for measuring TQM implementation for Chinese manufacturing companies. International Journal of Quality & Reliability Management 17 (7), 730–755.

María Leticia Santos Vijande is an Associate Professor in the Department of Business Administration at the University of Oviedo. Her current research interest focuses on the marketing of product innovations, quality management, marketing orientation, organizational learning and marketing strategy. Dr. Santos-Vijande's research on these topics has been published in the European Journal of Marketing, the International Journal of Quality & Reliability Management, the Journal of Strategic Marketing, the Industrial Marketing Management and the Journal of Marketing Management. She has also participated in various co-operation projects with both private and public sector organizations and is a reviewer in several Spanish journals.

Luis Ignacio Álvarez González has received his Ph.D. in Marketing from the University of Oviedo. Currently, he is an Associate Professor at the Business Administration Department. His research interest has mainly focused on the study of the practical implementation of the marketing concept and the quality practices in the private non-profit organizations' domain. He has published in journals such as the Journal of Strategic Marketing, the European Journal of Marketing, or the Industrial Marketing Management.