The Role of Human Resource-Related Quality Management Practices in New Product Development: A Dynamic Capability Perspective

ABSTRACT

Purpose: In this paper, we adopt the dynamic capabilities view as a theoretical framework to empirically investigate the relationships among human resource (HR)-related quality management (QM) practices, new product development (NPD) as a specific dynamic capability, learning orientation, knowledge integration, and strategic flexibility. Learning orientation and knowledge integration represent two antecedents of strategic flexibility, and strategic flexibility is the developed ability that facilitates NPD.

Design/methodology/approach: To empirically test the relationships, we used data from 236 European firms and performed Structural Equation Modeling.

Findings: Results indicate that HR-related QM practices contribute to (1) creating a learning-oriented company, (2) integrating knowledge, and (3) supporting successful new product development (NPD). Furthermore, knowledge integration is positively related to NPD through strategic flexibility.

Practical implications: This study is relevant for practitioners because it identifies key points in QM implementation that enable firms to be more strategically flexible and thus better able to regularly develop new products.

Originality/value: When organizations must sustain their competitive positions by continuously adapting to environmental changes, it is important to study not only how QM implementation is

positively related to the firm performance on which a significant portion of QM literature has focused but also to study whether QM implementation is related to strategic variables and can make a contribution to strategic processes. To fill the void in the HR and QM literature, this study offers an integrated framework with empirical support that identifies the role of HR-related QM practices in learning orientation, knowledge integration, strategic flexibility, and NPD.

Key words: Environmental Adaptation, Strategic Flexibility, Dynamic Capabilities, Quality Management, New Product Development, Competitive Advantage

Introduction

In recent decades, the importance of Quality Management (QM) as a key competitive variable has been widely recognized by scholars and practitioners who generally agree that QM practices have a positive effect on firms' performance (e.g., Powell, 1995; Nair, 2006; Kaynak and Hartley, 2008). However, current business environments are characterized by high levels of dynamism and complexity (Teece, 2007), but even companies with excellent quality levels in a particular period cannot be certain that they will sustain their position. Toyota, Sony, and Mercedes-Benz are examples of companies that have challenges sustaining such long-term performance (Su et al., 2014; Su and Linderman, 2016).

If organizations want to sustain their positions by continuously adapting to environmental changes (Eisenhardt and Martin, 2000; Teece, 2007), it is important to study not only how QM implementation is positively related to the firm performance on which a significant portion of QM literature has focused, but also to study whether QM implementation is related to strategic variables and can make a contribution to the development of strategic abilities. The dynamic

capabilities (DCs) perspective serves as an appropriate theoretical framework for investigating the possible relationships between QM and the strategic variables linked to environmental adaption. DCs are organizational abilities that help firms sustain their positions as they formulate an organizational response to environmental changes (Teece et al., 1997; Eisenhardt and Martin, 2000; Zollo and Winter, 2002; Teece, 2007).

As discussed in the literature on organizational change, highly capable managers with multi-skilled workforces, effective use of teamwork, and the creation of a unique culture that fosters organizational learning and innovation are essential for encouraging employees to adapt to change (Cf. Beughelsdijk, 2008; Wei and Lau, 2010). Human resource (HR) practices allow employees to discover and employ knowledge and experience in organizations to develop creative ideas and discover new opportunities (Scarbrough, 2003; Lopez-Cabrales et al., 2009; Chen and Huang, 2010; Prajogo and Oke, 2016). Thus, they provide an infrastructure that facilitates the development of DCs—NPD in this paper—(Nielsen, 2006; Chiang and Shih, 2011). In this endeavor, HR-related QM practices with their different focus—e.g. explorative or exploitative—(Herzallah et al., 2017) can make organizations more sensitive to variations in the environment, become more strategically flexible and thus better able to adapt to changes (Gómez-Gras and Verdú-Jover, 2005; Hackman and Wageman, 1995).

HR-related QM practices (Kaynak, 2003) with their specific focus on quality have never been empirically analyzed from a DC perspective. The literature on QM and DCs does not offer an integrated framework with empirical support that identifies the role of HR-related QM practices in the development of a DC such as NPD and the development of strategic abilities. Thus, following the new line of research suggesting that QM should be integrated with a DC framework (Su et al., 2014; Su and Linderman, 2016), this paper fills the gap in the literature by

empirically analyzing the relationship between HR-related QM practices, strategic flexibility, and NPD. More specifically, this study addresses the following research question: how are HR-related QM practices related to strategic flexibility as the developed ability and NPD?

Our study contributes to the body of research by enabling identification of HR-related QM practices that can promote the development of adaptation abilities such as strategic flexibility, which finally enables firms to stand out in NPD. So far, issues related to HR practices from a DC perspective have been ignored in the managerial research agenda (Vogel and Guttel, 2013). Thus this study also offers valuable contributions for managers because it recommends ways to foster and identify key points in QM implementation that enable firms to be more strategically flexible and better able to develop regularly new products.

To analyze the development of a DC in this study, we conceptualize NPD as a DC. Frequently, empirical studies have attempted to describe the nature of DCs through the analysis of NPD as a best practice that illustrates how organizations reconfigure their resources and capabilities to respond to the environment (e.g. Barrales-Molina et al., 2015; Pavlou and El Sawy, 2011; Schilke, 2014). Companies such as Apple, Intel, and Gillette responded to environmental changes and even imposed a specific rhythm on their environments by developing new products (e.g., Danneels, 2011; Helfat and Winter, 2011; Teece, 2012). At the same time, NPD is closely connected to QM. Firms that have implemented QM initiatives are likely to have a better foundation for implementing new NPD approaches (Sun and Zhao, 2010). HR-related QM practices in particular increase communication and information exchange, assign responsibilities to employees, and facilitate autonomy to experiment, all of which enhance innovative processes (Prajogo and Sohal, 2001; Perdomo-Ortiz et al., 2006).

Results regarding the relationship between QM and innovation have been mixed (e.g., Kim et al., 2012; Perdomo-Ortiz et al., 2006; Prajogo and Sohal, 2001, Zeng et al. 2017). The findings of our study may indicate that there is a positive relationship between QM and innovation, and they may offer empirical evidence supporting the line of research that affirms the existence of this relationship.

The study is structured as follows. Section 2 provides theoretical background and justifies the hypotheses and proposed model. Section 3 then presents the research methodology used in the study: the construction of the measurement instruments, the survey procedure, the sampling performed, and the validation of the scales. Section 4 includes the results obtained by contrasting the hypotheses, and Section 5 discusses the results as well as the implications for research and management. Finally, we present the study's limitations and suggestions for future research.

Theoretical background; the research model and hypotheses development

The dynamic capabilities view is an extension of the well-established resource-based view (RBV). RBV proposes that firm resources and its heterogeneity determine the possibility of obtaining sustainable competitive advantages (Barney, 1991). But RBV is being challenged by today's dynamic and turbulent environments, and these challenges have prompted scholars to extend RBV to the dynamic capabilities view (Teece et al., 1997; Eisenhardt and Martin, 2000; Helfat and Peteraf, 2003; Hitt et al., 2016). DCs are "(t)he firm's ability to integrate, build and reconfigure internal competencies and thus to address rapidly changing environments" (Teece et al., 1997, p. 516). Based on this definition, we can affirm that DCs allow continuous modification of the configuration of organizational resources, thereby achieving better adaptation to the environment.

With the aim of illustrating the nature of DCs, scholars have pointed to identifiable processes[1] that can be recognized as best practices when responding to environmental dynamism (Ambrosini and Bowman, 2009; Eisenhardt and Martin, 2000; Schilke, 2014; Pavlou and El Sawy, 2011). Initially, Eisenhardt and Martin (2000) proposed a wide set of best practices that can be considered specific to DCs (e. g., alliancing, mergers and acquisitions, product development, decision-making processes, and knowledge management). However, further research has established alliance management capability and NPD as the most widely recognized DCs for understanding how firms adapt to the environment (Schilke, 2014). These specific processes also help us understand the role of DCs as higher order processes that impact ordinary capabilities (Winter, 2003). In this way, manufacturing, marketing, and logistic capabilities are key to maintaining the status quo in a company. However, DCs such as alliance management or NPD serve to trigger the reconfiguration of routines embedded in ordinary capabilities (Drnevich and Kriaucinas, 2011; Helfat and Winter, 2011; Hine et al., 2014; Wilden and Gudergan, 2015). In particular, the literature provides empirical support for the suggestion that managers invest in NPD as a strategic solution for survival in some dynamic environments (e.g., Pavlou and El Sawy, 2011; Schilke, 2014). Regular introduction of products involves a great variety of activities that act as driving forces to renew organizational routines or even customers' habits and competitors' strategies, thus ensuring environmental adaptation in different industries (Helfat and Winter, 2011).

[1] Although some studies have claimed that identifiable processes show many commonalities in companies that ensure a competitive advantage, some recent debates (e.g., Peteraf et al., 2013) argue that although these identifiable processes can be similar between companies, they become different because the presence of factors such as experience, context, or timing modify and adapt these processes to the specific characteristics of each organization and thereby becoming idiosyncratic capabilities.

Interest in understanding the components or underlying processes of DCs has led researchers to identify prospective mechanisms or antecedents for their development (e.g., Zollo and Winter, 2002; Nielsen, 2006; Zahra et al., 2006; Teece, 2007; Wang and Ahmed, 2007; Ambrosini and Bowman, 2009). In particular, scholars have argued that the roles of absorptive capacity (Wang and Ahmed, 2007), knowledge management (Nielsen, 2006) and learning mechanisms (Zollo and Winter, 2002) are key components in the development of DCs. These antecedents have usually been identified based on a key premise: organizational learning is the most important component of DCs because it is the mechanism organizations use to update and refine organizational knowledge (Eisenhardt and Martin, 2000; Zollo and Winter, 2002; Winter, 2003; Teece, 2012). Organizations that expect to enhance their organizational knowledge need to develop an appropriate orientation (cultural values, principles, and so on) for this purpose. Thus being a learning-orientated organization plays a fundamental role in effective DC development (Nielsen, 2006). Organizations with outstanding DCs usually develop them through trial and error as well as through improvisation and imitation (Zahra et al., 2006), and these firms must be able to learn from past mistakes and experience (Eisenhardt and Martin, 2000; Nielsen, 2006). Furthermore, DCs update and refine the knowledge embedded in organizational routines, and they require a balanced set of activities for this purpose related to knowledge management and organizational learning (e.g., Nielsen, 2006; Easterby-Smith and Prieto, 2008). For this reason, learning orientation alone is not sufficient for effective DCs development. Organizations may be clearly learning oriented, but it is also necessary to complete this orientation with such necessary practices for knowledge integration as decision-making groups or behavior patterns for knowledge sharing. The role played by knowledge integration is also noteworthy because it is the bridge between the creation of new knowledge and the use of existing knowledge (Zollo and

Winter, 2002; Nielsen, 2006). In summary, the *learning orientation* will guide learning processes inside an organization that will result in the *integration* of new and heterogeneous *knowledge.* This internal context, if it is based on learning orientation and knowledge integration, strengthens the organizational ability to sense and respond regularly to a wide range of environmental changes, which could suggest the connection between such antecedents and strategic flexibility (Volberda, 1996; Chiang et al., 2012; Barrales-Molina et al., 2013). Learning orientation, knowledge integration and strategic flexibility shape the organizational ecosystems where DCs such as NPD are generated in response to environmental changes (Schilke, 2013; Singh et al., 2013). The definition of each variable is provided in Table 1.

Insert Table 1 about here

QM can be defined as "a holistic management philosophy that strives for continuous improvement in all functions of an organization" (Kaynak, 2003, p. 406). It relies on a series of practices that vary from those oriented toward customers, suppliers, employees, and managers to those oriented toward technical aspects. Effective implementation of these practices requires an integrative approach (e.g., Flynn et al., 1995; Ho et al., 2001; Kaynak and Hartley, 2008; Kim et al., 2012). Although HR-related QM practices are not directly related to increased performance (e.g., Flynn et al, 1995; Kaynak and Hartley, 2008), they do play a significant role. They enable wider dissemination of the vision that the organization aims to achieve, and they foster the involvement and identification of employees (Finley, 1996; Bayo-Moriones et al., 2011), which in turn increases employees' commitment to QM and facilitates the implementation of technical QM practices. That may be the reason that the published research on QM identifies HR management as one of the most important factors for successful implementation of QM (Kaynak and Hartley, 2008; Nair, 2006; Sila and Ebrahimpour, 2005). Consistent with the current

research, this study focuses on three HR-related QM practices: training, employee empowerment, and teamwork. These three practices have been extensively documented in QM literature (Saraph et al., 1989; Anderson et al., 1995; Flynn et al., 1995; Powell, 1995; Ahire et al., 1996; Kaynak, 2003; Sila and Ebrahimpour, 2005; Kaynak and Hartley, 2008; Kim et al., 2012). Their definitions are included in Table 2.

Insert Table 2 about here

HR practices are strategically valuable for a firm because they are firm-specific, meaning they are difficult to imitate or replace (Barney 1991; Lepak and Snell, 2002; Longoni and Cagliano, 2016). A strategic HR management system, which consists of those unique and valuable HR practices that enhance organizational performance (Delery and Doty, 1996; Lepak and Snell, 2002; Chuang and Liao, 2010), includes HR-related QM practices such as "high performance work practices" (Osterman, 1994; Chuang and Liao, 2010). HR management literature proposes that these practices significantly contribute to organizational innovation (Lau and Ngo, 2004; Shipton et al., 2006; Lopez-Cabrales et al., 2009; Chen and Huang, 2010; Ceylan, 2013; Zhou et al., 2013; Fay et al., 2015). Training develops employees' abilities, knowledge, and skills, which can provide a source of new ideas, processes, and practices. Empowerment motivates employees and facilitates decentralization, both of which generate new ideas and opportunities for innovation. Teamwork develops individual initial ideas, encourages employees to exchange knowledge, and produces a divergence of orientation, thereby creating a wider range of options. Moreover, teamwork breaks down barriers so that communication and information exchange are improved, both of which contribute to innovation.

Drawing on the literature and the theoretical foundation it provides, we propose a research model (Figure 1) that includes the relationships among HR-related QM practices: learning orientation, knowledge integration, strategic flexibility, and NPD. In the remainder of this section, we present the discussions leading to the research hypotheses.

Insert Figure 1 about here

HR-related QM practices

HR-related QM practices can play a fundamental role in the learning orientation of an organization. First, training employees in ways that facilitate their problem-solving abilities will contribute to learning-oriented organizations (Yang and Chen, 2005; Flores et al., 2012). Training fostered by QM managers facilitates intellectual stimulation, experimentation, dialogue, and motivation, all of which strengthen learning orientation in firms (Lloréns et al., 2005; Ruiz et al., 2005). Second, empowerment fosters employees' interaction and enhancement (Silos, 1999; Baird and Wang, 2010; Zeng et al., 2017). All these abilities enhance communication and the exchange of ideas among an organization's members, activity that facilitates learning (Ahire et al., 1996). In addition, team mechanisms such as quality circles or suggestions systems for knowledge codification and transfer are also conducive to creating an environment that fosters learning (Arthur and Huntley, 2005). Linderman et al. (2004) propose that the use of teams promotes socialization, which enables knowledge-sharing, aids in the generation of new ideas for improvement, and facilitates the use of existing knowledge in the workforce. Under QM, teamwork facilitates communication and evaluates alternatives according to their benefits and disadvantages, thereby promoting a learning-oriented organization (Ruiz et al., 2005; Caemmerer and Wilson, 2010). The implementation of these HR-related QM practices will contribute to the creation of a work environment that leads to stronger learning-oriented organizations. For

instance, Amancio Ortega, founder and president of Zara until 2011, developed a learning-oriented organization through the implementation of horizontal communication systems, teamwork, and the delegation of decision-making, all of which empower employees. Designers and manufacturers at Zara set up teams for a continuous learning-orientation process and analyzed customers' preferences, including their tendencies and consumption behaviors (Martínez, 2012). Consequently, the following hypothesis is proposed:

H1a: HR-related QM practices are positively related to learning orientation.

QM teams are comprised of cross-functional members who share their knowledge and propose new improvement possibilities (Silos, 1999; Chiles and Choi, 2000; Zeng et al., 2017). This teamwork contributes to the exchange of individual knowledge and experience, thus generating the knowledge integration process. Furthermore, QM encourages employees to work according to common methodologies such as plan, do, check, and act (PDCA) as well as prompts them to establish common goals for all teams. The use of a common language among team members leads to similar behavior that contributes to knowledge integration (Edwards et al., 2011). To run all these processes, management must provide the resources needed to carry out proper and complete training of employees in the principles, procedures, and tools that QM uses (Flynn et al., 1995; Kaynak, 2003; Kaynak and Hartley, 2008; Kim et al., 2012). Further, Huang et al. (2001) argue that the knowledge integration process is conducted through social interaction, which is fostered by employees' empowerment (Silos, 1999; Baird and Wang, 2010). To improve its knowledge integration capability, Fiat, for instance, created a new team-based structure that incorporated a division for the development of platforms and components (Becker and Zirpoli, 2003). Therefore, we suggest the following hypothesis:

H1b: HR-related QM practices are positively related to knowledge integration.

The implementation of QM is a positive context for NPD because, among other factors, good alignment exists between the market and the technological state of the firm (Perdomo-Ortiz et al., 2006). Empowering employees encourages them to participate actively in the improvement of process efficiency and product quality, and empowerment provides them with the structure needed to make these improvements (Ahire et al., 1996; Silos, 1999). All these improvements may result in developing new products and services that generally satisfy customers. Furthermore, when teamwork is initiated in such cross-functional teams as NPD teams, experts from different fields are able to combine their specialized knowledge to generate new ideas (Madjar et al., 2002; Chiang and Hung, 2014). Teamwork is considered a crucial factor in enhancing the individual creativity that is important to the success of NPD projects (Dayan and Benedetto, 2009). At the same time, a team problem-solving approach leads employees to improve existing products or services (Kim et al., 2012). Additionally, empowerment and teamwork strengthen communication channels, promote autonomy and self-evaluation, reduce restrictions caused by technical aspects, and foster the capacity for innovation (Perdomo-Ortiz et al., 2006; Prajogo and Sohal, 2001). Toyota Prius and Toyota Lexus represent two examples of successful NPD that utilize a team-based structure (Liker, 2004). For this purpose, an organization must create a work environment characterized by trust, open communication, and participation, and it must provide the resources needed to carry out proper, complete training. QM-related HR practices, then, play a crucial role in creating such an environment and providing necessary resources (Flynn et al., 1995; Ahire et al., 1996; Kaynak, 2003; Sila and Ebrahimpour, 2005). According to the arguments offered above, we propose the following hypothesis:

H1c: HR-related QM practices are positively related to NPD.

Learning orientation

Learning orientation involves a climate of cooperation and open communication whose key features include shared vision, commitment, open-mindedness, and intra-organizational knowledge sharing (Calantone et al., 2002). This ideal climate, in turn, influences what kind of information is gathered and how it is interpreted, evaluated, and shared (Sinkula et al., 1997; Moorman and Miner, 1998; Hult et al., 2004). As a result, frequent and regular knowledge-flows occur in organizations with effective learning orientation (Huang and Wang, 2013; Tamayo-Torres et al., 2016), and these flows promote the sharing of individual specialist knowledge related to customer needs, technical systems, and organizational assets. A good example is Pixar, which created a professional-development program called Pixar University with the intent of building common values, spirit, and communication among employees. Although employee training was the primary goal of Pixar University, this program enabled specialized employees (cartoonists, computer programmers, designers, artists, and administration staff) to understand and respect the tasks that each performed (Catmull, 2014).

Nowadays, the level of complexity of organizational knowledge is so high that all relevant knowledge cannot be contained within a specific department or organizational community (Grant, 1996). Consequently, knowledge integration is fundamental for the advancement of new organizational projects. In this context, learning orientation can be considered one of the structural variables that defines the level of knowledge integration potential. Consistently, previous research (e.g., Kogut and Zander, 1992; Szulanski, 1996; Kenney and Gudergan, 2006) has defined learning orientation as a requisite inseparable from the structure and context in which the integration process occurs. Based on the foregoing explanation, becoming a learning-oriented organization can be seen as a necessary step toward

developing knowledge integration. In order to achieve shared beliefs, employees must be willing to work in a context of regular social interaction that is based on trust and open-mindedness. Such an environment promotes intra-organizational knowledge sharing. Thus, we formulate the next hypothesis:

H2: Learning orientation is positively related to knowledge integration.

Knowledge integration

Initially, Grant (1996) suggested that knowledge integration can be considered the origin of fast response capability and, subsequently, empirical studies have contributed to explaining that knowledge integration helps to renew regularly the knowledge basis of the firm and incorporate new external knowledge (Okhuysen and Eisenhardt, 2002; Kenney and Gudergan, 2006; Alegre et al., 2011; Majchrzak et al., 2012; Eriksson, 2014). In this way, recent studies point out that knowledge integration is seen as a valuable mechanism to sense and understand changes in such highly dynamic environments as the biotechnology sector (Alegre et al., 2011; Kamuriwo and Baden-Fuller, 2016) and other high-tech industries (Caridi-Zahavi et al., 2016) because the integration of knowledge facilitates sharing of valuable knowledge among members of the firm when facing these changes. For these reasons, knowledge integration can be used to promote sensing continual environment demands and adjust organizational responses to them. In essence, knowledge integration can strengthen the strategic flexibility of the organization, understood as its ability to sense and respond to major external changes by identifying new opportunities and threats, and then implementing regular strategic changes that can exploit the new conditions (Volberda, 1996; Adner and Helfat, 2003; Shimizu and Hitt, 2004). We would expect, then, that a firm with knowledge integration capability should develop strategic flexibility. Thus, we formulate the next hypothesis:

H3: Knowledge integration is positively related to strategic flexibility.

Strategic flexibility

In turbulent environments, strategic flexibility becomes a fundamental capability for responding to diverse environmental demands. In fact, firms can realize their strategic flexibility through NPD and offer new products or services that respond to the sensed opportunities and threats. Previous empirical studies (Kandemir and Acur, 2012; Thomas, 2014) suggest this connection between strategic flexibility and NPD when the environment is perceived as turbulent, and in these conditions, strategic decision-making processes must be able to better fit market demands through NPD. NPD can be seen consistently as the result derived from strategic and tactical decisions that respond to the environment. Strategically flexible firms are able to detect and understand the opportunities and threats from the environment and at the same time, they are able to make a set of tactical decisions to coordinate investments and the cross functional teams that launch the new products and services exploiting the new conditions sensed (Dess and Lumpkin, 2005; Barrales-Molina et al., 2015; Tamayo-Torres et al., 2016). The smartphone industry offers an outstanding example of turbulent environments in which firms demonstrate their strategic flexibility through remarkable efforts on NPD to offer new versions of smartphones twice a year (Suarez and Grodal, 2015). The resulting NPD shows that the ability to be strategically flexible so that it can sense new market demands and exploit them by adding new product features that respond to competitor actions, customer demands, and national regulations. Thus, we can formulate the next hypothesis:

H4: Strategic flexibility is positively related to NPD.

Research methodology

The data for this research were drawn from a study that focused on QM implementation, its structural components, and its relationships to DCs in several European countries. Data obtained through cross-sectional email surveys, which is useful for reaching a large number of subjects, are appropriate for this study because our research questions require studying the relationships between multiple variables (Kaynak, 2003).

Construction of the instrument and content validity

To identify the different items and scales included in this research, we performed an in-depth literature review. All scales of HR-related QM practices and strategic flexibility were composed of original items in the literature. Individual relationships between QM practices have already been tested in various studies, which suggest their interdependent nature (e.g., Kaynak, 2003; Kim et al., 2012). For this reason, considering the similarity and interrelationships between HR-related QM practices and following previous research (e.g., Ho et al., 2001; Lau and Ngo, 2004; Rahman and Bullok, 2005; Naor et al., 2008; Lopez-Cabrales et al., 2009), we group all HR-related QM practices into a second order factor. Scales for learning orientation, knowledge integration, and NPD were created after reviewing the related literature. NPD capability is reflected by organizational routines supporting innovation processes aimed at introducing new product innovations (Lawson and Samson, 2001; Schilke, 2014). Following recommendations from previous research on NPD (e.g., Kandemir and Acur, 2012; Laaksonen and Peltoniemi, 2016; Schilke, 2014), we used performance scores on NPD to avoid slant derived from managerial responses. In other words, we used four items of NPD performance as a proxy for NPD measurement. These items measure how an organization introduces new processes,

services or products, and enters new markets. The list of scales, items, and their sources are presented in Appendix A. For all the scales, we used a Likert-type scale of seven points.

Once designed, the questionnaire was pre-tested by five quality managers from firms in different sectors. We tested the study using these responses because the test sample was similar to our actual sample. This pilot test enabled the clarification of possible ambiguities, correction of errors, and the solution of formatting problems. After a thorough analysis of the questionnaire, the quality managers recommended some modifications that would facilitate comprehension of the questions and a few minor changes in wording. These changes were incorporated into the questionnaire.

Target population and survey procedure

The target sample for the study was composed of 3,024 European firms. The firms contacted were chosen randomly from the Amadeus database and *Actualidad Económica* (2004). The procedure for data collection consisted of emailing a letter explaining the research project to the CEO or the quality manager of each firm. This letter included a direct link to a questionnaire available online. By clicking on the link, respondents could access the questionnaire, complete it online, and then send it automatically to a central computer where all responses were saved. To mitigate sampling error, this research offered the possibility of sending a summary of the survey results to respondents, and multiple mailings were sent to increase the response rate (Ravichandran, 2000). Ultimately, we received 254 replies. Eighteen answers were unusable because they contained an error or were duplicated. The online questionnaire does not allow its submission if it was incomplete, thereby removing the possibility of missing values. Consequently, we had 236 usable questionnaires, a 7.8% final response rate. Some non-respondents explained that they did not want to participate in this research because (1) they had

already responded to some survey studies; (2) they did not have time to fill out the questionnaire; and/or (3) their companies did not permit them to respond to surveys. While the response rate for this study is relatively low, which may limit the study's generalizability, such a response rate is common for this type of study. Successful management studies such as Wu et al. (2012) or Shah and Ward (2003) had similar response rates—6.15% and 6.7%, respectively. The sampling frame, identified through Amadeus database and *Actualidad Económica* (2004), covers a wide variety of industries and countries, thus the concern of generalizability was largely mitigated.

We also estimated non-response bias. This test determines whether there is any significant difference between early and late respondents (Amstrong and Overton, 1977). To test for this bias, an independent sample *t*-test was run for the HR-related QM practices and the other variables related to DCs. The results obtained did not show any significant difference between the two groups. Additionally, some χ^2 tests were run to test whether there was any significant difference in three demographic variables (number of employees, total sales, and activity sector) between the two waves of responses. Once again, the results showed no significant differences.

Finally, we investigated the possibility that common method variance might be present. First, the questionnaire was pre-tested to eliminate ambiguities. This is one of the procedural remedies utilized to avoid this problem (Podsakoff et al., 2012). Second, if common method bias is a serious threat to the research results, a single factor would account for most of the variance (Podsakoff et al., 2012). Thus, following Schilke (2014), we performed Harman's one-factor test. According to the literature, common method variance is not a serious threat if the one-factor model has a poor fit with the data (Schilke, 2014). Final results show that the one-factor model did not fit the data ($\chi 2$/df = 9.65; CFI = 0.467; RMSEA = 0.249; NFI = 0.443; and NNFI = 0.411), thus common method variance seems not to be a problem for this study. Nevertheless, as

Harman's one-factor test has several limitations (Podsakoff et al., 2012), we also studied the fit of the measurement model, greater than 0.90, and the correlations between variables, neither of which suggests a problem with common method variance (Volberda et al., 2012).

Sample demographics

Replies came from the eleven European countries selected: Spain, Italy, the United Kingdom, Switzerland, Romania, the Czech Republic, Denmark, Austria, Belgium, Sweden, and Germany. Spain (62.71%) and Italy (17.8%) were the countries from which the most responses were received. The rest of the sample (19.49%) was distributed in similar proportions between the other countries.

The original sample was composed of manufacturing and service firms. By activity sector, the 236 firms used in this research are distributed as follows: 49 belong to different activities in the service sector (20.76%), 43 to machinery and components (17.80%), 31 to construction (13.14%), 28 to the food industry (11.86%), 22 to the metal industry (9.32%), 20 to the chemistry sector (8.47%), 18 to electricity and electronics (7.63%), and the remaining 26 to miscellaneous sectors (11.02%). Our cross-industry sample is appropriate, as Pannirselvan and Ferguson (2001) suggest, because distinctions between manufacturing and services have become blurred, as manufacturers have become more responsive to customers, and service organizations have become more concerned about quality process and output.

Approximately 12.29% of the firms had 50 or fewer employees, 46.19% employed 51–250 employees, 27.12% employed 251–1,000 employees, and 12.29% employed over 1,000 employees. Among the firms, 2.12% of the firms reported annual sales of 1 million Euros or less, and 7.63% of the firms had annual sales of 1–7 million Euros. Firms with annual sales of 7–40

million Euros comprised about 51.27% of the final sample, and approximately 38.98% of the firms had annual sales of more than 40 million Euros.

Validity and reliability of scales

All the assumptions of multivariate analysis—normality, linearity, homoscedasticity, and multicollinearity—were tested for all the variables. The data have high kurtosis statistics and normal scores of variables were calculated and used in the analyses. We also looked for outliers. There was one item for one company identified as such. Hair et al. (1995) advise that if the outlier is a valid observation in the population, it should be retained in the analysis to warrant generalizability for the entire population. In the light of their recommendation, the observation has been retained in the analysis.

To assess construct validity, and following the procedure of Kaynak and Hartley (2006), all scales were analyzed using an extensive validation process. We first established the content validity of the scales by performing an extensive literature review. Second, we obtained the reliability values of the scales by calculating Cronbach's α (Appendix A). After reliability was confirmed, unidimensionality was tested. For this purpose, we ran exploratory factor analyses using principal component extraction and varimax rotation techniques[1]. Next, as a final refinement for unidimensionality, the scales were evaluated utilizing Lisrel 8.53 software and confirmatory factor analysis (CFA). In particular, we analyzed three measurement models: two for HR-related QM practices (first-order and second-order models) and another for DC variables. As presented in Table 3, goodness-of-fit statistics related to all measurement models indicate a satisfactory fit of the measurement models to the data. The results of the second order model for HR-related QM practices show that the standardized factor loadings on each HR-related QM

[1] All the scales exceed the required 50% cumulative percentage of extraction sums of squared loadings (Training=80.10; Empowerment=68.10; Teamwork=84.75; Learning Orientation=78.29; Knowledge Integration=82.02; NPD=78.22; Strategic Flexibility=86.02).

practice and their corresponding *t*-values are all significant (Training λ=0.62; *t*-value=9.10; Empowerment λ=0.56; *t*-value=9.06; Teamwork λ=0.74; *t*-value=11.70). Composite reliabilities for the refined scales are included in Table 4.

Third, the CFA allowed us to analyze the scales' convergent validity. According to Hulland (1999), the items must have significant factor loadings (*t*-value>1.96, *p*-value<0.05) and an individual reliability (R^2) greater than 0.5. Some items were removed from the scales to fulfill this requirement. All of the purified scales satisfied the requirements for convergent validity (Appendix A).

Next, we analyzed the discriminant validity of the scales. Following Anderson and Gerbing (1998), we constructed confidence intervals (±2 standard errors) around the estimated correlation between two factors. If this interval does not include 1.0, discriminant validity is achieved. Results confirmed that none of the confidence intervals include 1.0. As an additional test for discriminant validity, we compared the squared correlation of each pair of factors to average variance extracted (AVE) for each factor. To achieve discriminant validity, squared correlation of two factors must be less than the variance extracted for each factor (Fornell and Larcker, 1981), which the results confirm. Table 4 also includes the descriptive statistics, correlations and AVE of the variables studied.

Insert Table 3 about here

Insert Table 4 about here

Results

To test all hypotheses established in this paper, we used Structural Equation Modeling (SEM) with robust method estimation. To conduct this analysis, we utilized Lisrel 8.53. Figure 2

depicts all results of the structural model. Each path includes the path coefficients and *t*-values. *t*-values greater than 1.96 are significant at $p<0.05$ and *t*-values greater than 2.58 are significant at $p<0.01$). Table 3 presents all of the goodness-of-fit indices of the structural model. All values are acceptable, meaning that the model shows satisfactory fit (Mulaik et al., 1989; Byrne, 1998). The results also show that all of the hypotheses included in the model are supported.

Insert Figure 2

Discussion

The main goal of this study is to analyze the relationships between HR-related QM practices, learning orientation, knowledge integration, strategic flexibility and NPD, making it possible to identify the relationships that emerge among these variables.[1] In this section, we discuss the main implications of this study for research and practice.

Research implications

Hypotheses 1a, 1b, and 1c propose a positive relationship between HR-related QM practices and learning orientation, knowledge integration, and NPD. We wish to point out that the results obtained underscore the importance of HR-related QM practices for organizations. The results of our study link HR-related QM practices to a DC such as NPD, thereby supporting the findings of studies specifically arguing that HR-related QM practices can contribute to performance through other variables (Sousa and Voss, 2002; Nair, 2006; Kaynak and Hartley, 2008). Our study indicates that there is a positive relationship between QM and innovation, and it offers empirical evidence supporting the line of research that affirms the existence of this positive relationship.

[1] Taking into account the data and methodology employed in this research, this study confirms only significant relationships among variables; there is no evidence on causality.

Our results are also consistent with previous research affirming that HR-related QM practices such as training to enhance knowledge and empowerment to experiment for improvement can lead to a learning-oriented environment (Sitkin et al., 1994; Zhang et al., 2012) that supports the integration of knowledge throughout an organization (Chiang and Shih, 2011). For instance, Linderman et al. (2004) found a positive relationship between the use of teams and knowledge creation. Our study advances knowledge by supporting the relationship between the teamwork and learning orientation that precedes knowledge creation and subsequent knowledge integration (Zollo and Winter, 2002; Winter, 2003; Nielsen, 2006; Barrales-Molina et al., 2013). Our findings corroborate the theoretical contributions (e.g., Zollo and Winter, 2002; Teece, 2007) that highlight the value of such organizational mechanisms as cross-functional teams and the knowledge articulation that initiates the teamwork that promotes knowledge integration and the development of new organizational routines for NPD. To sum up, our results empirically confirm that HR-related QM practices contribute to (1) creating a learning-oriented company, (2) integrating knowledge, and (3) supporting a successful NPD. Finally, we have to note that HR-related QM practices are indirectly and positively related to strategic flexibility through knowledge integration. This conclusion agrees with the proposal of Gómez-Gras and Verdú-Jover (2005) that QM organizations develop better strategic flexibility than non-QM organizations because organizations that rely on QM practices are oriented from control to learning and from processes to customers. These movements and the integrated knowledge increase firms' options for formulating environmental adaption strategies and supporting the specific orientation of HR-related QM practices versus traditional HR practices.

Next, we focus on the relationships between learning orientation, knowledge integration, strategic flexibility, and NPD. As asserted by hypotheses 2 and 3, the positive relationship

between learning orientation, knowledge integration, and strategic flexibility are supported. In this sense, our study adds empirical evidence to the theoretical connection between learning orientation, knowledge management, and strategic flexibility. Our results highlight the importance of organizational context to the effective integration of specific knowledge from different functional areas that can promote the open feedback, collaboration, and brainstorming that may be desirable when it comes to sharing and assimilating specialized knowledge. Although some theoretical contributions argue the value of knowledge management to strategic flexibility (e.g., Grant, 1996; Nielsen, 2006), our results emphasize that knowledge integration can be considered a necessary step to respond successfully to environmental demands. In other words, strategic flexibility is promoted by the combination of ideas and expertise contributed by different functional areas or departments. Once again, our results highlight the value of enhancing learning orientation in firms with mechanisms like cross-functional teams that integrate specialized knowledge and then disperse it throughout an organization, which strengthens strategic flexibility.

Finally, our results also support hypothesis 4, which asserts a positive relationship between strategic flexibility and NPD. These findings suggest that strategic flexibility can be seen as one of the developed abilities that underlies a specific DC such as NPD. This result is consistent with other empirical studies that shed light on how firms employ NPD to respond regularly to environmental opportunities and threats (e.g., Pavlou and El Sawy, 2011; Kandemir and Acur, 2012). In other words, our findings show that the ability of a firm to be strategically flexible is demonstrated through NPD.

These results generate solid empirical support for the literature on DCs that confronts the challenge of explaining the nature of DCs through NPD. First, as we mentioned earlier, our study

responds to some recent calls for connecting a DCs view with other related fields such as HR management and QM (e.g., Vogel and Güttel, 2013). Our findings highlight the need to pay more attention to HR-related QM in organizations that wish to develop DCs successfully. Second, these findings shed light on the micro-foundation of DCs, explaining and testing the antecedents of NPD in a context related to QM. In conclusion, this study contributes to the research on operations because our results show that variables such as QM, HR management, and NPD can be linked to the achievement of adaptive capabilities in organizations that are able to survive in hypercompetitive environments. In this sense, QM can play a significant role not only in daily activities of the organization but also in its strategic orientation for long run success.

Managerial implications

This study offers valuable contributions for managers because it recommends ways to foster and identify key points in QM implementation that enable firms to be more strategically flexible and better able to develop regularly new products. First, the results obtained generate a solid justification for implementing QM in an organization, as observed positive relationships with DC development support the QM implementation decision. In making this idea specific, we derive two new conclusions. One, our conclusions argue for the value of dedicated efforts and attention by managers to the HR-related practices proposed by QM, as we have empirically justified the positive relationships of these practices to NPD. We have also justified the notion that integrating two constructs—HR-related QM practices and NPD—can, given their importance in responding quickly to hypercompetitive environments, contribute significantly to the survival of an organization. As we have emphasized, QM is a multidimensional construct, and our results demonstrate the interdependence of HR-related QM practices.

As to specific practices, managers should create a culture that trains, develops, and empowers all employees, as they can play an increasingly active role in an organization. Our results also underline the importance of teamwork, which managers should promote. To achieve a high level of teamwork, managers should be cognizant of such issues as trust, techniques, tools for teamwork, problem solving, and the creation of spaces and times dedicated to teams, all of which are necessary for creating an environment that guarantees obtaining all possible benefits from the teams created.

Next, the analysis of three variables—learning orientation, knowledge integration, and strategic flexibility — emphasizes the attention that managers must pay to knowledge management if HR-related QM practices are to be beneficial. Thus organizations in which knowledge management plays a highly relevant role—or simply organizations that aim to stimulate this variable—can do so by focusing on the practices and structure that we have studied in our research.

Finally, managers should be cognizant of the value of building DCs when implementing QM. Our results suggest that investments in developing DCs such as NPD will ensure a better and regular response to turbulent environments. Beyond those traditional variables related to DCs (sustainable competitive advantage and performance), our study serves to highlight the point that strategic flexibility leads to the creation of specific DCs a such as NPD, which facilitates continuous environmental adaptation, thus becoming one of the pillars that sustains competitive advantages and achieves regular levels of performance. All these results, derived from European organizations with different sizes and activities that range from services to manufacturing, offer a roadmap for increasing competitive level and strengthening positions for survival in current turbulent markets facing international threats from Asian and

American competitors. In particular, most of the analyzed companies are in Spain and Italy, two countries whose services and manufacturing industries are under strong pressure from international competition and must continue strengthening their competitive abilities.

Limitations

The present study is as rigorous as possible so that it provides reliable and conclusive results. Nevertheless, the study has some limitations that must be noted. First, our study has a significant strategic focus. Because variables such as strategic flexibility, NPD, and learning orientation can be considered strategic variables, a cross-sectional study limits interpretation of them. As strategic variables show a long-term orientation, some of their effects may appear only in the future. Further, other HR-related QM practices such as performance appraisal or retribution are not included in this study. Moreover, the cross-sectional character of the study does not allow observation of the relationships between variables over time, thus further limiting interpretation of the results. Second, the low response rate could possibly limit the study's generalizability. Our literature review did not reveal any significant control variables that theoretically change the relationships between variables. Thus, we opted for a parsimonious model to provide clear and understandable results. Finally, the data were obtained from a single respondent in each organization and are self-reported. One consequence of this procedure is that the data may be less objective than data in studies that use multiple respondents or that analyze objective databases. The results must, therefore, be interpreted carefully.

Conclusion and further research

This study aimed to empirically analyze the relationships between HR-related QM practices and NPD through strategic flexibility development. The results obtained identify a series of relationships affirming that HR-related QM practices are positively related to DC

development, and, consequently, to organizational adaptation. Even so, it would be interesting for future studies to test our model with objective measures of organizational performance or competitive advantage.

This study also demonstrates the importance of the role HR-related QM practices play in organizations. We observed that these practices possess some characteristics that make it difficult for competitors to imitate them. However, the development of HR-related QM practices is not uniform among all initiatives for QM implementation (e.g., ISO standards, Malcolm Baldridge, or the EFQM model) (Gutierrez-Gutierrez et al., 2010). Thus, a future line of research could analyze the behavior of these HR-related QM practices, based on the initiatives implemented by the organization, in greater depth.

Drnevich and Kriauciunas (2011) assert that the greater the dynamism, the greater the contribution dynamic capabilities may make. It would thus be interesting for future research to introduce dynamism of the environment as a moderating factor in the relationships analyzed. Including dynamism or other factors such as turbulence or hostility would produce a more precise image and enable us to draw new conclusions about the potential of QM to stimulate DCs and thus guarantee organizational success.

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Table 1. Definitions of DC variables included

New Product Development	DC	The ability to regularly develop new products by identifying customer needs and understanding new technologies and processes (Lloréns, Ruiz and García-Morales, 2005)
Learning Orientation	DC antecedent	Organization-wide activity of creating and using knowledge to enhance competitive advantage (Calantone, Cavusgil and Zhao, 2002, p. 516)
Knowledge integration	DC antecedent	An ongoing collective process of constructing, articulating, and redefining shared beliefs through the social interaction of organizational members (Huang; Newell and Pan, 2001, p. 161)
Strategic Flexibility	DC expected ability	An organization's capability to identify major changes in the external environment, to quickly commit resources to new courses of action in response to change, and to recognize and act promptly when it is time to halt or reverse such resource commitments (Shimizu and Hitt, 2004, p. 45)

Table 2. QM Human Resource Management-related practices

Training	Resources for training employees, including technical issues and multitasks (Adapted from Flynn *et al.*, 1995)
Employee empowerment	Allowing employees to inspect their own work and to stop the production if the process is out of control. Providing supporting framework, such as the necessary resources and technical support, to assist them in such decision making (Ahire *et al.*, 1996, p. 31)
Teamwork	Emphasizing the importance of employees' ideas and their continuous growth and development. Supervisors willing to let employees make their own mistakes so they learn how to be empowered and manage their own work (Adapted from Flynn *et al.*, 1995, p. 664)

Table 3. Fit indexes for measurement models and structural model

Goodness-of-Fit Statistics	Measurement model for QM (First-order model)*	Measurement model for QM (Second order model)*	Measurement model for NPD antecedents and strategic flexibility*	Structural Model	Recommended values for satisfactory fit of a model to data
χ^2/df	1.571	1.561	2.053	2.003	< 3.0 [a]
Root Mean Square Error of Approximation (RMSEA)	0.049	0.046	0.067	0.0634	< 0.08 [b]
Akaike's Information Critetion (CAIC)	198.94	201.31	292.50	731.274	< saturated model and independence model [c]
CAIC for Saturated Model	355.51	355.51	504.18	1,635.349	
CAIC for Independent Model	3,526.73	2,827.18	4,673.89	7,547.717	
Parsimony Goodness-of Fit-Index (PGFI)	0.58	0.54	0.61	0.687	> 0.50 [d]
Parsimony Normed Fit Index (PNFI)	0.70	0.68	0.71	0.819	> 0.50 [d]
Comparative Fit Index (CFI)	0.99	0.99	0.99	0.972	> 0.90 [b]

[a] Bollen (1989), Hair *et al.*, (1995)
[b] Byrne (1998), Jöreskog and Sörbom (1993)
[c] Byrne (1998), Jöreskog and Sörbom (1993)
[d] Byrne (1998), Mulaik *et al.*, (1989)
* Additional fit indexes: QM First-order model (GFI=0.99; AGFI=0.99; NFI=0.99; NNFI=0.99); QM Second-order model (GFI=0.96; AGFI=0.93; NFI=0.98; NNFI=0.99); NPD model (GFI=0.99; AGFI=0.98; NFI=0.98; NNFI=0.98).

Table 4. Descriptive statistics, bivariate correlations, composite reliabilities, AVE

Variables	Mean	SD	1	2	3	4	5	6	7	CR[1]	AVE[2]
1. Training	5.366	1.254	1							0.79	0.65
2. Empowerment	4.986	1.369	0.534**	1						0.95	0.87
3. Teamwork	4.735	1.572	0.553**	0.546**	1					0.96	0.89
4. Learning Orientation	5.570	1.343	0.309**	0.180**	0.370**	1				0.98	0.87
5. Knowledge integration	4.711	1.508	0.330**	0.254**	0.476**	0.405**	1			0.86	0.77
6. Strategic flexibility	4.678	1.480	0.188**	0.150*	0.330**	0.404**	0.544**			0.91	0.83
7. NPD	4.721	1.448	0.284**	0.136*	0.319**	0.336**	0.457**	0.472**	1	0.92	0.79

** Correlation signification at level 0.01

* Correlation signification at level 0.05

[1] Composite reliability (recommended value >0.7; Fornell and Larcker, 1981; Zhou and Li, 2012).

[2] Average variance extracted (recommended value >0.5; Fornell and Larcker, 1981; Zhou and Li, 2012).

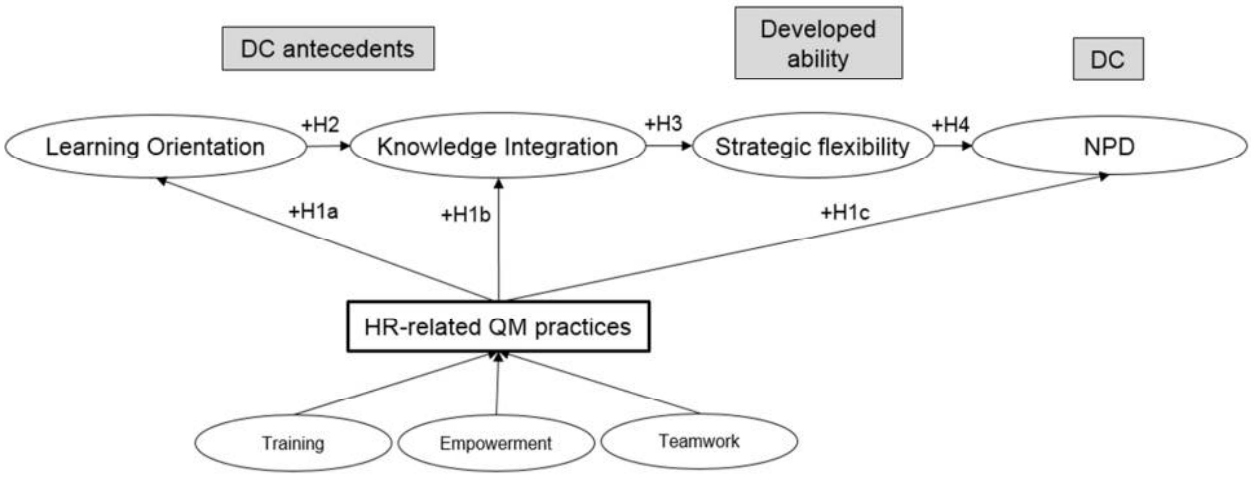

Figure 1. Proposed model

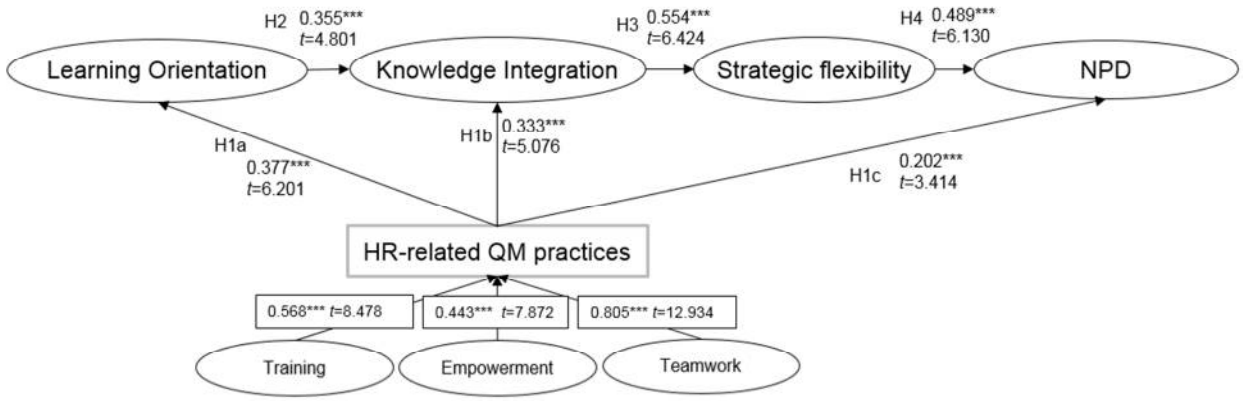

Figure 2. Final model

*** *p*-value<0.01
** *p*-value< 0.05
* *p*-value< 0.1

Appendix A. Measurement scales

Variable	Sources	Cronbach's α	Items	Factor loadings and *t*-values
Training	Original from Flynn *et al.* (1995)	0.780	1. Direct labour undergoes training to perform multiple tasks in the production process.	λ =0.75, *t*-value=16.75
			2. Plant employees are rewarded for learning new skills.	Removed
			3. Our plant has a low skill level, compared with our industry (reverse coded).	Removed
			4. Direct labour technical competence is high in this plant.	λ=0.86, *t*-value=23.04
Empowerment	Original from Ahire *et al.* (1996)	0.872	1. Our line workers inspect the quality of their own work; inspection is not the responsibility of an inspector.	λ=0.80, *t*-value=23.78
			2. Line workers are encouraged to fix problems they find.	λ =0.94, *t*-value=42.54
			3. Line workers are given the resources necessary to correct quality problems they find.	λ =0.92, *t*-value=41.33
			4. Line workers have technical assistance available to them to help them solve quality problems.	λ =0.83, *t*-value=17.29
			5. A problem solving network is available to line workers in solving quality related problems.	λ =0.84, *t*-value=32.93
Teamwork	Original from Flynn *et al.* (1995)	0.907	1. Our plant is organized into permanent production teams.	Removed
			2. Our plant forms teams to solve problems.	Removed
			3. In the past three years, many problems have been solved through small group sessions.	Removed
			4. Supervisors encourage the persons who work for them to exchange opinions and ideas.	λ=0.96, *t*-value=57.47
			5. Supervisors encourage the people who work for them to work as a team.	λ=0.96, *t*-value=63.92
			6. Supervisors frequently hold groups meetings where the people who work for them can really discuss things together.	λ=0.87, *t*-value=38.71
Learning Orientation	Elaborated from Baker and Sinkula (1999) and Sinkula *et al.* (1997)	0.929	1. Our organisation is a learning organisation.	λ=0.95, *t*-value=54.89
			2. The sense around here is that employee learning is an investment not an expense.	λ=0.95, *t*-value=57.46
			3. Once we quit learning we endanger our future.	λ=0.90, *t*-value=27.99
			4. The basic values of this organization include learning as a key to improvement.	λ=0.97, *t*-value=81.19
			5. Our ability to learn is the key to improvement.	λ=0.93, *t*-value=53.93

Variable	Sources	Cronbach's α	Items	Factor loadings and *t*-values

Knowledge integration	Elaborated from Grant (1996)	0.778	1. The rules and/or policies in the firm enable the co-ordination of activities and information flows.	Removed
			2. Our firm has production activities divided into independent phases and organised sequentially.	Removed
			3. There are generally accepted behaviour patterns that govern actions when rules and procedures do not.	Removed
			4. To resolve complex situations and uncertainty, we organise conflict resolution and decision-making groups.	λ=0.97, *t*-value=23.02
			5. The rules, sequences, behaviour patterns and groups enable sharing of useful knowledge among members of the firm and avoid unnecessary transfers.	λ=0.77, *t*-value=21.23
Strategic flexibility	Adapted from Volberda (1999)	0.837	1. In our firm we re-formulate dismantle current strategies quickly when market conditions or competence require it.	λ=0.89, *t*-value=30.82
			2. In our firm we have a variety of alternative strategies that let us to change easily when environmental conditions vary.	λ=0.93, *t*-value=35.39
			3. In our firm we use production machinery or providing of services technologies that allow a large amount of operations quickly and without large costs of task change.	Removed
NPD performance	Elaborated from Kusunoki, Nonaka and Nagata (1998)	0.869	1. The firm has introduced a very high number of new products and services.	λ=0.89, *t*-value=29.65
			2. The firm has entered a very high number of new markets.	λ=0.83, *t*-value=24.16
			3. We have initiated a very high number of new production processes or services offered.	λ=0.94, *t*-value=49.13