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The TQM Journal

Determinants of company innovation and market performance

Journal:	*The TQM Journal*
Manuscript ID	Draft
Manuscript Type:	Research Paper
Keywords:	Quality practices, top management, process quality management, product and process innovation, market performance

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Abstract

Purpose: The present study focuses on two basic determinants of company innovation namely quality practices of top management and process quality management. The purpose of the study is to explore the impact of these determinants on product and process innovation. Determining the impact of these dimensions of innovation on the market performance of a company is also an aim of the present study.

Design/methodology/approach: A research study was carried out on a sample of 433 Greek manufacturing and service companies. Data was obtained through a structured questionnaire from the Chief Executive Officers of the companies. Exploratory and Confirmatory Factor Analysis is applied to extract and validate all the latent factors considered in the suggested model, while their relationships are determined through Structural Equation Modelling.

Findings: The analysis of the empirical data shows that both the dimensions of company innovation examined in the present study (product and process innovation) are positively influenced by the quality practices of top management and process quality management. Improving these two dimensions of company innovation, in turn, results in increased market performance.

Research limitations: First, the sample of the responding manufacturing and service Greek companies which include both small and medium-sized enterprises (SMEs) and large companies and operate in circumstances of financial crisis; second, the subjective data collected from only one company representative; and third, the examination of only two factors influencing company innovation, are the main limitations of the present study. Based on these limitations, future research studies are recommended.

Practical implications: The empirically validated theoretical model of the present study can guide the policy makers of a company to select a quality management and innovation strategy through which the company can lay the foundations to increase its market

performance, and thus, overcome the current economic downturn and financial crisis. Researchers can also use the suggested valid model as an assessment tool, a benchmarking tool and a tool for the design of their future research studies.

Originality/value: The present study contributes to the literature by determining a valid model that describes simultaneously the relationships between quality management factors, product and process innovation and market performance. This is also the first study reflecting Greek companies' efforts to withstand the current downturn and penetrate the market through innovation.

Keywords: Quality practices, top management, process quality management, product and process innovation, market performance.

Paper Type: Research paper

Introduction

Globalization influences the business environment by making it more competitive and boosting innovation (Gonzalez and Chacon, 2014). Dynamic environments are fertile fields for developing innovation (Zhang, 2013). So, in order to survive and compete in global and niche markets, companies should incorporate into their strategy the adoption of innovation (Humphreys *et al.,* 2005).

Usually innovation refers to the newness and novelty of products or processes (Prajogo, 2006). Innovation was mainly considered as product oriented (Pinho, 2008), but this has changed nowadays. Companies need to adopt a more process, organizational and technological approach to innovation in order to deal with external turbulence and worldwide competition (Pinho, 2008). Martinez-Costa and Martinez-Lorente (2008) argue that company innovation encompasses product and process innovation, while Evangelista and Vezzani (2010) and Crowley (2017) indicate that the differences between them cannot always be distinguished, since process innovation is supplemental to product innovation and this is strongly supported in the empirical literature.

A powerful factor promoting innovation is a company's culture (Devirtsiotis, 2011; Mahadevan, 2017). Prajogo and Ahmed (2006) state that the first step for the establishment of an effective innovation system is the change in company behavior and culture. The main responsibility for creating the appropriate environment/culture for innovation lies with the top management team and its quality practices (Ooi *et al.,* 2012). More specifically, the leadership team has to communicate the innovation ideology within the company (Ooi *et al.,* 2012), spread the innovation vision and goals to the company's workforce (Dervitsiotis, 2011; Ooi *et al.,* 2012) and clarify the fact that innovation can be achieved only if everybody commits to that goal (Garcia-Morales *et al.,* 2007; Martinez-Roman *et al.,* 2011).

The ability of introducing innovation to customers is improved when a company focuses on process quality management. In order to accomplish a successful innovation process, the right equipment and tools must be ensured (Ooi *et al.,* 2012). Moreover, repeating routines, which constitute a major factor of process management, need to be evaluated and improved in order to achieve superior innovation performance. This can also be achieved through business process re-engineering (Bhasin and Parrey, 2013).

Innovation is one of the core strategies companies choose for gaining a sustainable competitive advantage in the market (Hung *et al.,* 2010; Ooi *et al*., 2012; Ruiz-Moreno *et al.,* 2014). Market stagnation, unexplored emerging markets, reduced transaction costs and lower trade-barriers impel organizations to expand through innovation (in terms of new products/services, management, processes, technologies, etc.) in order to achieve a sustainable competitive edge (Volberda *et al.,* 2013).

While previous studies recognize the importance of dynamic determinants influencing innovation on a conceptual level, current research has still failed to empirically identify the role of these factors with regard to different types of innovation (Ellonen *et al.,* 2009). More specifically, there is a lack of research studies examining how specific quality management practices are related to innovation performance (Leavengood *et al.,* 2014). Kok and Biemans (2009) state that it is still not clear what managers must change in the innovation process and the underlying organizational structures and systems. Gunday *et al.* (2011) also note that analytical and empirical studies that examine the relationship between innovation performance and firm performance are limited. From the above it is apparent that there is a gap in the literature with regard to the innovation patterns of companies.

Thus, many future research suggestions have been made by several authors. Matias and Coelho (2011) suggest looking at innovation management systems, to unveil how these are being implemented in practice, while Bigliardi and Dormio (2009), Valencia *et al.* (2010)

and Inauen and Schenker-Wicki (2011) suggest future research in innovation be supported by longitudinal studies. Dervitsiotis (2010) states that a periodic assessment is required not only of innovation outputs, i.e. new products, services or business models, but also of inputs that determine a company's innovation initiatives and the innovation process itself. Palm *et al.* (2014) note that more knowledge is needed about how quality management can be developed to stimulate and improve innovation. Moreover, Sadikoglu and Zehir (2010) and Waldner *et al.* (2015), mention that much more conceptual and empirical work is needed to examine the impact of several innovation dimensions on company performance. Evangelista and Vezzani (2010), Gunday *et al.* (2011) and Kafetzopoulos and Psomas (2015), also suggest future research studies empirically validate theoretical models that encompass and relate Total Quality Management (TQM), innovation capability and business performance. Finally, Baregheh *et al.* (2012) support that there is potential for considerably more research into innovation in small and medium sized enterprises (SMEs).

In order to fill the above mentioned literature gap, the present study follows the suggestions of several authors for future research studies with regard to innovation. So, the present study contributes to the existing body of literature by empirically validating a theoretical model incorporating determinants of company innovation, product and process innovation and market performance. It should be noted that the suggested model focuses on factors namely 'quality practices of top management' and 'process quality management' considering that they are significant determinants of company innovation.

The fact that the present study, firstly, provides up-to-date empirical evidence to validate a theoretical model not examined in previous research studies, secondly, focuses on the innovativeness of companies from the technical perspective (process and product innovation), thirdly, confirms the validity of latent factors by applying Exploratory and Confirmatory Factor Analysis (EFA and CFA), fourthly, tests the goodness of fit of the

theoretical model to the collected data through Structural Equation Modeling (SEM), and finally, uses a large sample of Greek companies operating under circumstances of economic downturn, makes the present study substantially different from those carried out so far. It is also worth noting that the present study is substantially different from the research studies of Kafetzopoulos and Psomas (2015) and Kafetzopoulos *et al.* (2015), carried out in the Greek business environment. More specifically, Kafetzopoulos and Psomas (2015) study only manufacturing companies without taking into consideration, firstly, quality management factors influencing company innovation, and secondly, the improvement of market performance due to the adoption of innovation. Kafetzopoulos *et al.* (2015) focus on the influence of a single latent factor namely "quality management" on innovation dimensions and not on the influence of individual dimensions of quality management. Moreover, they do not determine the effects of innovation on market performance but on a company's competitiveness. The above mentioned strongly support the originality and the contribution of the present study to the existing body of knowledge.

The rest of the paper is structured as follows: in the first part, reviewing the literature, the dimensions of company innovation with regard to its products and processes are conceptualized. In the next part, the research hypotheses of the study are formulated describing, firstly, the impact of quality practices of top management and process quality management on product and process innovation, and secondly, the impact of these innovation dimensions on market performance. The methodology of a research study carried out in Greek companies is then described. This is followed by the analysis and the respective results. In the next part, the results are discussed and the final conclusions and practical implications are presented. Finally, the limitations of the study and future research recommendations are presented.

Literature review and research hypotheses

Literature distinguishes different types of innovation and researchers have explored its classification in various ways (Jimenez-Jimenez and Sanz-Valle, 2011; Kim *et al.,* 2012). Some studies are based on a single type of innovation such as process innovation (Abrunhosa and Sa, 2008) or product innovation (Prajogo and Sohal, 2004), whereas other studies are based on both process and product innovation (Feng *et al.* 2008; Martinez-Costa and Martinez-Lorente, 2008). In this study innovation is described in terms of product and process innovation, considering them as the most common dimensions of company innovation (Martinez-Costa and Martinez-Lorente, 2008; Evangelista and Vezzani, 2010).

Product innovation

Product innovation is defined as 'new product or service introduced to meet an external user or market need' (Hung *et al.,* 2010; Li *et al.,* 2012). Companies change or create entirely new products or services according to the existing and potential customers' needs and requirements (Prajogo, 2006; Forsman, 2011). Thus, managers should always be aware of the opportunities that arise in order to meet consumers' expectations before their competitors do. For many scholars, in a highly competitive, global and rapidly changing environment, product innovation is a matter of viability, economic growth and competitive edge (Martinez-Costa and Martinez-Lorente, 2008; Pinho, 2008; Li *et al.,* 2012; Volberda *et al.,* 2013; Govindaraju *et al.*, 2013). Afthonidis and Tsiotras (2014) state that introducing an innovative product at times of recession is the right choice, even if available resources are scarce and the chance of increased sales is minimum.

Process innovation

Process innovation is defined as 'changes in the method of producing products or services' (Gunday *et al.,* 2011; Kim *et al.,* 2012). Optimizing the sequence of the production procedures is the core of process innovation and it can be associated with new resources,

tools, procedures (Kim *et al.,* 2012), techniques and software (Gunday *et al.,* 2011). Companies that implement process innovation aim to maximize the flexibility of the production processes (Forsman, 2011); improve the quality of products and minimize production cost (Gunday *et al.,* 2011; Forsman, 2011) and internal transaction cost (Gonzalez and Chacon, 2014).

Quality practices of top management and innovation

Quality-oriented leaders confronting the recent turbulent economic environment need to foster communication, personal and professional development, risk taking and knowledge management (Garcia-Morales *et al.,* 2007). Conti (2013) states that the pursuit of quality may stand in the way of innovation, while Kumar and Sharma (2017) note that the leaders' quality personality ensures that a suitable innovation process is chosen. In the same line, Cole and Matsumiya (2008) mention that quality improvement activities, provided that they are properly managed, lead to successive over time innovations. Dervitsiotis (2011) points out that innovation oriented cultures depend on appropriate quality leadership from the top to the lower levels in the hierarchy. There are many studies which investigate the quality practices of top management and how they affect company performance through innovation (Sethi and Sethi, 2009; Phan *et al*., 2011; Kim *et al.,* 2012; Minonne and Turner, 2012; Ooi *et al.,* 2012). Most of these studies support the view that a quality-oriented leadership and the elements related to it, like mentoring, top management commitment and the encouragement of risk taking and quality problem solving are positively related to company innovation and performance. Based on the above literature review and the purpose of the present study the following research hypotheses are formulated:

RH_1: Quality practices of top management are positively related to product innovation.

RH_2: Quality practices of top management are positively related to process innovation.

Process quality management and innovation

Business process refers to a coordinated chain of activities intended to produce a business result or to a repeating cycle of activities that achieves a business goal (Glavan, 2011). A company's biggest hurdle in being process oriented is inadequate leader support and insufficient corporate strategy (Minonne and Turner, 2012). Psomas *et al.* (2011) point out the process orientation of the ISO 9001 standard, while similarly Chountalas *et al.* (2009) stress the system and process approach of the ISO 22000 standard and Silva and Medeiros (2004) highlight the importance of the productive processes for the implementation of the ISO 14001 standard. By applying business process quality management, companies control and evaluate their existing business processes and, when necessary, redesign them, aiming to improve metrics like cost, quality, customer service and productivity (Minonne and Turner, 2012) and to achieve operational efficiency, process enhancement and a competitive edge (Bhasin and Parrey, 2013). In this way, more reliable and effective processes can be developed, which may significantly enhance a company's ability to innovate in terms of its products and processes (Benner and Tushman, 2002). It is supported in literature that a positive relationship exists between process quality management and innovation (Kim *et al.,* 2012; Ooi *et al.,* 2012; Moreno-Luzo *et al.,* 2013). For example, Moreno-Luzo *et al.* (2013) state that process management affects positively incremental innovation. Based on the above literature review and the purpose of the present study the following research hypotheses are formulated:

RH_3: Process quality management is positively related to product innovation.

RH_4: Process quality management is positively related to process innovation.

Innovation and market performance

Liao *et al.* (2010) support the view that linking business strategy to quality processes and innovation improves business performance. Similarly, Kumar and Sharma (2017), state that the integration of TQM and innovation increases the profits and the market share of a

company. Zapata-Cantu *et al.* (2016) mention that innovation is a main factor of performance determinant in the long-term survival and sustainability of organizations. A large number of past empirical studies confirms that there is a positive relationship between innovation and company performance (Kafetzopoulos and Psomas, 2015; Medrano and Olarte-Pascual, 2016) including product/service quality, operational performance, market performance and financial performance (Psomas and Pantouvakis, 2015). However, the present study focuses only on one of the above mentioned dimensions of corporate performance and more specifically on market performance, which is conceptualized based on a company's market share, competitive position and penetration to the market (Dick, 2009; White *et al.,* 2009). Companies looking for better market position turn to innovation (Gonzalez and Chacon, 2014), meaning product and process innovation (Kafetzopoulos *et al.*, 2015). More specifically, product innovation is linked to gaining competitive advantage in the market by using new technologies and creating better products (Evangelista and Vezzani, 2010). Yam *et al*. (2004) also state that product innovation can lead to better market position and long term returns. Products that reach the market before those of their competitors achieve a better market share (Hoonsopon and Ruenrom, 2012). Furthermore, process innovation is also associated with competitive advantage in the market through the efficiency of better designed and implemented processes (Evangelista and Vezzani, 2010). Generally, innovation can increase customer satisfaction and loyalty and company performance with regard to economic terms and the market (Gunday *et al.,* 2011; Dervitsiotis, 2012). Conti (2013), also supports the increase of customer value through continuous improvement and innovation. Based on the above literature review and the purpose of the present study the following research hypotheses are formulated:

RH_5: Product innovation is positively related to market performance.

RH_6: Process innovation is positively related to market performance.

Research methodology

Questionnaire development

In order to test the above formulated research hypotheses, a research study was carried out in Greek companies using a structured questionnaire as the data collection method. The design of the questionnaire was based on a comprehensive literature review (Sadikoglu and Zehir, 2010). The quality practices of top management used in the present study, have been adapted from the studies of Zu (2009), Rhee *et al.* (2010) and Fotopoulos and Psomas (2010), while the measured variables of process quality management have been adapted from the studies of Kaynak (2003), Zu (2009) and Psomas *et al.* (2011). The innovation practices reflecting the dimensions of 'product innovation' and 'process innovation' are drawn from the studies of Jimenez-Jimenez *et al.* (2008), Martinez-Costa and Martinez-Lorente (2008), Tomlinson (2010) and Jimenez-Jimenez and Sanz-Valle (2011). Finally, the studies of Yam *et al.* (2004), Evangelista and Vezzani (2010) and Gunday *et al*. (2011), are used for drawing the items describing market performance. The questionnaire was evaluated through structured interviews with professionals and academics and furthermore it was pilot tested on 20 companies in Greece, proving its appropriateness (Stouthuysen *et al.,* 2012). From the above, it is concluded that the questionnaire constructs and their associated items possess sufficient content validity. Respondents were asked to indicate the degree of their agreement or disagreement with the statements of the final version of the questionnaire, using a seven-point Likert scale, where 1 represented “strongly disagree” and 7 represented “strongly agree”. It is worth noting that the respondents were asked to indicate the market performance of their company as a result of the level of adoption of product and process innovation.

Sample

A sample of 2000 companies was randomly selected from the list of companies that were recorded in the data base of ICAP (the largest business information and consulting firm

in Greece). The questionnaire was sent to the Chief Executive Officer (CEO) of the sample companies through e-mails (Garcia-Morales *et al.,* 2007; Jimenez-Jimenez *et al.,* 2008). Two follow-up reminder e-mails were sent two and four weeks after the initial e-mailing (Singh, 2008). In total, 433 valid questionnaires were collected, yielding a response rate of 21.65% which is acceptable compared to the response rate of similar research studies.

The responding companies belong to the manufacturing (49%) and services (51%) sectors. The majority of these companies are SMEs, given that 62% employ less than 50 employees, 15% more than 50 and less than 100 employees, 9% more than 100 and less than 250 employees and 14% employ more than 250 employees. It is worth noting that half of the sample companies implement a Quality Management System (QMS) and have been certified according to the ISO 9001 standard, 20% implement a Food Safety Management System (FSMS) and have been certified according to the ISO 22000 standard, while 4% implement an Environmental Management System (EMS) and have been certified according to the ISO 14001 standard. From the above, it is apparent that the majority of the companies participating in the present study have been certified according to an international standard. However, the vast majority of the non-certified sample companies, according to the statement of the CEOs, have already taken the initial steps to develop a QMS, based on which they will be certified according to the ISO 9001 standard soon.

The certified and non-certified companies were compared in terms of the number of their employees (Mann Whitney Test) and no statistically significant differences were found. This means that both the sub-samples of the certified and non-certified companies have almost the same structure with regard to the company size. Comparing the certified and non-certified companies in terms of the questionnaire items (T-test), no statistically significant differences were found either. In other words, the two sub-samples of the participating companies take into similar consideration all the theoretical factors considered in the present

study (with regard to quality management, innovation and market performance). Moreover, the companies certified according to ISO 9001, ISO 22000 and ISO 14001 were compared in terms of the questionnaire items (one-way ANOVA), and no statistically significant differences were found among the three sub-samples of companies. So, it is apparent that irrespective of which international standard the companies have been certified to, the quality management, innovation management and market performance are not substantially different among the three sub-samples of the certified companies.

In addition to the above mentioned comparisons, the early and late responding companies were also compared in terms of the number of their employees (Mann Whitney Test) and the questionnaire items (T-test) (Singh, 2008; Kim *et al.,* 2012) and no statistically significant differences were found. Furthermore, several non-responding companies stated, when contacted, that the major reason for them not participating in the research study was 'lack of time', 'company policy of not disclosing information' and the fact that they were 'not interested' (Singh *et al.,* 2011). So, from the above it is apparent that non-response bias is not a cause for concern in this study.

Since the questionnaire was completed by a single respondent from each participating company, the common method variance had to be checked (Martinez-Costa and Martinez-Lorente, 2008). So, the single-factor test was applied (Martinez-Costa and Martinez-Lorente, 2008), loading all the questionnaire items into a principal component analysis and forcing them into one latent factor. This method produced poor results as indicated by the 22 percent of the variance extracted, while many items suffered from poor factor loadings, which fell below 0.5. Thus, the common method variance is not a substantive problem in this study.

Data analysis

Given that the number of the responding companies (433) is deemed large enough for multivariate data analysis (Hair *et al.,* 2005), EFA is applied to reduce the initial set of the

variables to a more manageable set of scales (Gunday *et al*., 2011) and to extract the latent factors. Moreover, CFA is applied to refine the resulting scales in EFA (Sadikoglu and Zehir, 2010). A series of tests are also performed through EFA and CFA to determine whether the latent factors developed in this study have sound psychometric properties (Singh, 2008). These tests concern unidimensionality, multicollinearity, reliability, convergent validity, discriminant validity and nomological validity. The relationships between the latent factors are determined through Structural Equation Modeling (SEM).

Results

Exploratory Factor Analysis (EFA)

Items identified in the literature describing quality practices of top management, process quality management, company innovation with regard to products and processes and finally market performance are used as measured variables of an EFA. The result is the establishment of five latent factors (Kaiser-Meyer-Olkin = 0.917, Bartlett's test of Sphericity = 4995.923, p = 0.00, eigenvalue > 1, Measures of Sampling Adequacy > 0.80, factor loadings > 0.632, Cumulative Variance = 70.5%). The extracted latent factors are explained using the measured variable loadings and can be labeled in accordance with the respective theoretical factors considered in the present study, as follows: 'quality practices of top management', 'process quality management', 'product innovation', 'process innovation' and 'market performance'.

Confirmatory Factor Analysis (CFA)

CFA is performed to further validate the measures for all the factors considered in this study (Prajogo *et al.,* 2012). In doing so, the goodness of fit of the model to the measured data is established. More specifically, the Basics of Goodness of Fit, the Absolute Fit Indices, the Incremental Fit Indices and the Parsimony Fit Indices indicate an acceptable fit of the proposed model (Table I). From the above, it is apparent that the results consistently support

the structure of the latent factors revealed as discussed earlier in the EFA stage (Bayraktar *et al.*, 2009).

Take in Table I

Take in Table II

It is shown in Table II that all the standardized regression weights are above 0.68. Thus, the respective squared multiple correlations are satisfactorily high. This means that a high amount of measured variable's variance is explained by a latent factor. The item loadings (from both EFA and CFA) that exceed the 0.50 threshold and the goodness of fit of the model to the measured data, show that all indicators are well loaded onto the factor they are intended to measure. Thus, similar to the studies of Sadikoglu and Zehir (2010) and Prajogo *et al.* (2012), the unidimensionality of the factors is ensured.

Given that none of the inter-item Pearson correlation coefficients in this study is greater than 0.9, the possibility of multicollinearity in the data is very low (Singh, 2008; Singh *et al.*, 2011). Two measures of multicollinearity are also calculated (based on EFA or CFA) as suggested by Hair *et al.* (2005): the tolerance value of each item ($1-R^2$, where R^2 represents the squared multiple correlation) and the variance inflation factor (VIF) which is calculated as the inverse of the tolerance value. All the tolerance values are well above the minimum acceptable cut-off value of 0.1, while all the VIFs are well below the maximum acceptable cut-off value of 10 (Hair *et al.,* 2005). The above indicate absence of multicollinearity type problems in the data.

Reliability analysis is also applied by the internal consistency method calculating the Cronbach's alpha coefficient (Sadikoglu and Zehir, 2010; Prajogo *et al.*, 2012) and the Composite/Construct Reliability index (Avella and Vazquez-Bustelo, 2010). Table III shows that all the Cronbach's alpha coefficients and the Construct Reliability indexes are above 0.69 indicating that the selected items reliably estimate the latent factors (Sadikoglu and Zehir,

2010). Table III also supports the construct validity of the latent factors. According to Hair *et al.* (2005), construct validity is confirmed by evaluating convergent validity (AVE > 0.520) (Kim, 2009; Sadeh *et al.*, 2013); discriminant validity (AVE > $Corr^2$) (Kim *et al.*, 2012; Sadeh *et al.*, 2013); and nomological validity (significant correlations among the extracted latent factors) (Singh *et al.*, 2011).

Take in Table III

Structural Equation Modeling (SEM)

The SEM procedure is applied (maximum likelihood method) to estimate the causal relations between the latent factors (Fotopoulos and Psomas, 2010) and to confirm or refute the hypotheses presented earlier (H_1-H_6). Figure 1 presents the estimated standardized parameters for the causal paths and the results of the squared multiple correlations for the endogenous factors. Based on Figure 1, it is apparent that product innovation is positively and significantly affected primarily by the quality practices of top management and secondarily by process quality management, while process innovation is positively and significantly affected primarily by process quality management and secondarily by the quality practices of top management. It is also obvious that the quality practices of top management and process quality management as two determinants of company innovation are highly correlated. According to the findings, it is also apparent that both product and process innovation are significant positive contributors to company market performance. However, market performance is primarily affected by process innovation and secondarily by product innovation.

Take in Figure 1

Discussion

The majority of the Greek manufacturing and service companies participating in the present study are SMEs since Greece is a European country with a high density of SMEs (Fotopoulos and Psomas, 2009; Fotopoulos and Psomas, 2010; Rubio-Andrada *et al*., 2011).

The present study focuses on a theoretical model which places 'product innovation' and 'process innovation' in the center. The 'quality practices of top management' and 'process quality management' are considered in literature as core influencing factors of the above mentioned innovation dimensions. Thus, these two factors are positioned on the left side of the suggested model. Finally, a company's market performance is supposed to be directly affected by the innovation dimensions. Thus, 'market performance' is positioned on the right side of the suggested model. The present study provides empirical evidence not only to support the theoretical relationships identified in the literature but also to determine the strength of these relationships.

According to the present study findings, both the dimensions of company innovation examined are significantly influenced by 'quality practices of top management' and 'process quality management'. These quality management factors represent respectively the 'soft' and the 'hard' aspects of a management system, which has been certified according to an international standard (either ISO 9001 or ISO 22000 or ISO 14001) by the majority of the sample companies. It seems that the 'process orientation' principle of management systems such as the ISO 9001 QMS (Psomas *et al.,* 2011), the ISO 22000 FSMS (Chountalas *et al.,* 2009; Kafetzopoulos *et al.,* 2013) and the ISO 14001 EMS (Silva and Medeiros, 2004; Marimon *et al.,* 2009), provided that these systems have been fully adopted by the top management team, has pointed the certified sample companies in the direction of re-organizing their operations and re-designing their processes. This direction is also followed by the vast majority of the non-certified sample companies, given that they have already

begun their journey to quality management. In doing so, new, innovative and advanced quality methods are applied by almost all the sample companies leading to innovative products (Psomas and Kafetzopoulos, 2014).

However, the 'quality practices of top management' and 'process quality management' do not have the same influence on product and process innovation. The study proves that product innovation is primarily influenced by the 'soft' aspect (quality practices of top management) and secondarily by the 'hard' aspect (process quality management) of a company's management system. This means that a company's ability and success in incorporating innovative characteristics into its final product is mostly influenced by top management support to quality, strategic selections, attitudes and interaction with employees. In other words, generating new innovative product characteristics and incorporating them into the product design is positively affected by the quality practices adopted by the leaders of a company. However, the impact of technologically advanced, up to date and quality oriented processes on product innovation should not be underestimated. From the above it is apparent that the first and third research hypotheses are accepted.

By contrast, process innovation seems to be primarily influenced by the 'hard' aspect (process quality management) and secondarily by the 'soft' aspect (quality practices of top management) of a company's management system. This shows that the development of innovative processes is mostly influenced by the degree to which a company has already been implementing effective process quality management by incorporating automation and quality-statistical tools into its daily processes. However, the impact of top management involvement, attitudes and interaction with employees, as expressed by the 'quality practices of top management' factor, on the development of process innovation should also be seriously considered. From the above it is apparent that the second and the fourth research hypotheses are also accepted.

The impact of the two innovation dimensions on a company's the market performance is also worth discussing. The findings of the present study reveal that both product and process innovation significantly affect market performance. However, process innovation contributes more to market performance than product innovation. This finding may be partly explained by the fact that half of the sample companies belong to the services sector and thus, the innovation processes can be visible to customers and motivate their active involvement, which in turn is positively acknowledged by them. Baglieri and Consoli (2009) support the view that the innovation process which is based on the consideration and participation of clients is more successful in terms of the uniqueness of the value offered to them. Also, the fact that the majority of the sample companies have been implementing either the ISO 9001 QMS, or the ISO 22000 FSMS, or the ISO 14001 EMS may be indicative of a more process and customer oriented population of companies (Silva and Medeiros, 2004; Fotopoulos *et al.,* 2009; Psomas, 2013), which results in better market performance. In other words, the process and customer orientated ISO 9001, ISO 22000 and ISO 14001 certified companies approach the market and the customers based on their requirements, voice and feedback; establish innovative processes (Psomas and Kafetzopoulos, 2014); and consequently satisfy their customers and enhance their market performance. Bhatnagar and Gopalaswamy (2017) also state that customer's intention to buy, trial and repeat purchase are higher in cases where the service innovation configuration is more customer oriented. Similarly, Psomas and Pantouvakis (2015) state that research studies have advocated for non-financial benefits from ISO 9001 implementation such as operational process improvement, adoption of process innovation and increased added value as perceived by the customers. However, apart from a company's process innovation initiatives, its innovative products-services result in higher customer satisfaction and higher evaluation of the company as a whole, which in turn results

in improved market performance. From the above it is apparent that the fifth and sixth research hypotheses are accepted.

The findings of the present study with regard to the significant impact of quality practices of top management on company innovation are in accordance with the studies of Prajogo and Ahmed (2006), Perdomo-Ortiz *et al.* (2009), Sethi and Sethi (2009), and Martinez-Roman *et al.* (2011). Contrary to the above mentioned studies as well as the present study, Ooi *et al.* (2012) found that leadership is not positively related to company innovation performance. The studies of Ooi *et al.* (2012), Kim *et al.* (2012), Moreno-Luzo *et al.* (2013) in accordance to the present study, reveal that process quality management is positively and significantly related to a company's innovation performance. The findings of the present study are also in line with the findings of the study of Kafetzopoulos *et al.* (2015) in Greek companies, according to which top management support and process management (as components of a wide factor namely "quality management") have a positive impact on product and process innovation. Market performance improvement as a result of better innovation performance, supported in this study, is also supported by the study of Gunday *et al.* (2011). In line with the present study findings, the study of Kafetzopoulos and Psomas (2015) in Greek manufacturing companies, reveals a positive impact of innovation (as expressed by four distinct dimensions namely product, process, marketing and organizational innovation) on company performance, even though market performance is not included in the performance dimensions examined by Kafetzopoulos and Psomas (2015).

Conclusions

The gap in literature and the future research suggestions made by previous researchers in the field of innovation have motivated the authors of this study to empirically validate a theoretical model with the company innovation dimensions in its center. A research sample of both manufacturing and service companies operating in Greece was used for this purpose. The

originality of this study in relation to similar previous studies is that is offers a reliable and valid model which presents simultaneously the relationships between determinants of company innovation, product and process innovation and market performance. This is also the first study reflecting Greek companies' efforts to withstand the current downturn and penetrate the market through innovation and quality management.

The model examined in the present study supports the significant contribution of both 'quality practices of top management' and 'process quality management' to company innovation dimensions, namely 'product and process innovation'. It is worth noting that 'product innovation' is primarily influenced by 'quality practices of top management', while 'process innovation' is primarily influenced by 'process quality management'. According to the suggested model, company innovation dimensions, and especially the adoption of 'process innovation', significantly influence a company's overall 'market performance'.

Practical implications

Based on the present study, useful practical implications arise for both policy makers and researchers. The current deep economic crisis have led many enterprises to concentrate their energy simply on surviving; as a result, they are not focusing on innovation (Medrano and Olarte-Pascual, 2016). The empirically validated theoretical model of the present study can guide company policy makers to select the appropriate strategy through which a company can lay the foundations to increase its market performance, and thus, overcome the current economic downturn and financial crisis. This strategy should be considered from both the innovation and quality management perspective. More specifically, policy makers should give priority to process innovation initiatives, without however ignoring product innovation, given that both innovation dimensions enhance a company's market performance. From the quality management perspective, policy makers can make a company place more emphasis on its process orientation in order to successfully develop innovative processes, while

simultaneously motivating top managers to inherently adopt quality practices as a means to generate innovative ideas for new product development. In order for the policy makers to formulate such a robust strategy, to ensure that it permeates through the company and make it sustainable, they can base their efforts on organizing internal educational seminars, consulting experts in the field of quality and innovation management, stimulating company managers to attend international conferences and finally benchmarking "excellent" companies. In doing so, the main concepts of the model suggested in the present study can be widely and strongly adopted by the company managers and employees. Researchers can also benefit from the present study findings. They can use the suggested valid model as an assessment tool (for quality, innovation and market performance), a benchmarking tool and a tool for the design of their future research studies.

Limitations and future research recommendations

The study presented in this paper suffers from some limitations. For example, the sample of the responding companies is limited to Greek small, medium and large companies which belong to both the manufacturing and services sectors. Moreover, in the business environment in which the sample companies operate, a financial crisis dominates which influences a company's efforts to innovate and penetrate a wider market. These circumstances should be carefully taken into consideration while generalizing the present study findings. The subjective character of the data collected through the CEOs involves also the risk of receiving biased responses. Finally, the suggested model examines only 'quality practices of top management' and 'process quality management' as influencing factors of company innovation.

The above mentioned limitations give rise to suggestions for future research. It is worth testing the validity of the model suggested in the present study, in samples of SMEs and large companies operating under similar economic conditions in Europe or worldwide.

Testing this model for its validity in specific subsectors of the manufacturing industry (e.g. the food industry) or the services sector could also be a future research direction. Given that the data collected constitutes subjective estimations, it is recommended that objective business evidence be used, drawn from the companies' official documents and other data. Finally, it is strongly suggested that more influencing factors of company innovation be incorporated into the model.

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Table I: Goodness of fit measures

Goodness of fit measures	**CFA model**
The Basics of Goodness of Fit	
Chi-square	404.681
Probability level	0.000
Absolute Fit Indices	
Chi-square/ degrees of freedom (χ^2/df)	2.529
Root Mean Square of Approximation (RMSEA)	0.059
Root mean square residual (RMR)	0.040
Goodness of Fit Index (GFI)	0.914
Incremental Fit Indices	
Normed Fit Index (NFI)	0.920
Incremental Fit Index (IFI)	0.950
Tucker-Lewis coefficient (TLI)	0.941
Comparative Fit Index (CFI)	0.950
Parsimony Fit Indices	
Parsimony Comparative Fit Index (PCFI)	0.800[1]
Parsimony Normed Fit Index (PNFI)	0.775[1]

1: relatively high values represent better fit of the model – given that the respective values for the saturated model is 0.0.

Table II: Confirmatory Factor Analysis

Latent factors	Measured variables	Standardized Regression Weights	Squared Multiple Correlations
Quality practices of top management	Top management frequently communicates company quality goals and vision to employees (var1)	0.771	0.594
	Top management emphasizes pursuing knowledge which fits the new business environment (var2)	0.786	0.618
	Top management considers that employees' ability to learn is the key to company competitive advantage (var3)	0.819	0.671
	Quality issues are reviewed in the plant's management meetings (var4)	0.691	0.477
Process quality management	Inspection, review, or checking of work is automatically implemented (var5)	0.704	0.496
	The work processes are automatically implemented (var6)	0.712	0.507
	Quality tools and techniques are used to reduce process variation (var7)	0.737	0.543
	Statistical techniques are applied to reduce process variation (var8)	0.757	0.573
Product innovation	The level of newness (novelty) of the company's products is increased (var9)	0.751	0.564
	The latest technological innovations are incorporated in the new products (var10)	0.865	0.748
	The frequency of developing new products is high (var11)	0.755	0.570
	The number of the new products introduced to the market is high (var12)	0.669	0.448
Process innovation	The competitiveness of the company from the technology point of view is high (var13)	0.801	0.642
	The latest technological innovations are frequently adopted in our processes (var14)	0.887	0.787
	The technology used in our processes is characterized by novelty (var15)	0.922	0.850
	The rate of changes in the processes and techniques is high (var16)	0.847	0.717
Market performance	The company's market share is high (var17)	0.688	0.473
	The company's penetration of the market is high (var18)	0.686	0.471
	The company's image within the market is high (var19)	0.725	0.526
	The company's position in the market considering the competitiveness is high (var20)	0.783	0.613

Table III: Model reliability and validity

Latent factors	Reliability Cronbach's alpha	Average Variance Extracted[a]	Construct Reliability[b]	(Corr)^{2c}
Quality practices of top management	0.851	0.590	0.852	0.376
Process quality management	0.820	0.530	0.818	0.453
Product innovation	0.858	0.583	0.847	0.471
Process innovation	0.921	0.750	0.926	0.471
Market performance	0.781	0.520	0.697	0.291

[a]: AVE = $\Sigma\lambda_i^2$ / n, (number of items i = 1…..n, λi = standardized factor loading);
[b]: CR = $(\Sigma\lambda_i)^2$ / $[(\Sigma\lambda_i)^2 + (\Sigma\delta_i)]$, (number of items i = 1….n, λi = standardized factor loading, δ_i = error term);
[c]: the highest squared correlation between the factor of interest and the remaining factors.

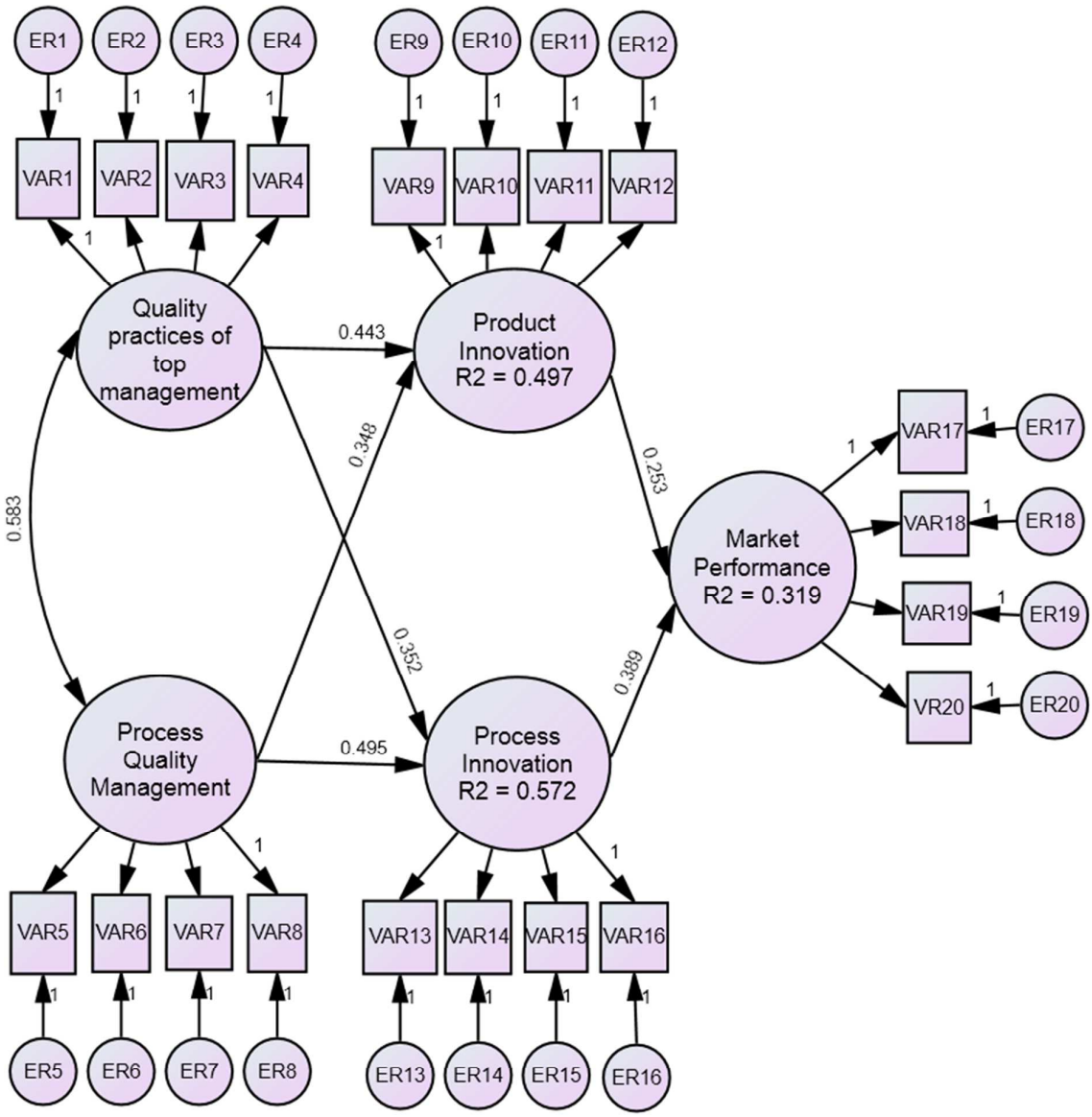

Figure 1. The structural relationships between the latent factors