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RESEARCH ARTICLE

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How do integrated quality and environmental management practices affect firm performance? Mediating roles of quality performance and environmental proactivity

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Abstract

Based on a sample of 208 Turkish firms, this paper investigates the integration of two management systems, quality management and environmental management, and explores the effect of this integration on firm performance. First, a conceptual framework was developed, relying on the premises of the resource-based view. Second, mediating roles of quality performance and environmental proactivity were examined on the association between integrated quality and environmental management systems and firm performance. Among the underlying trends, both quality performance and environmental proactivity were found to fully mediate the relationship between integrated quality and environmental management and firm performance.

KEYWORDS

environmental management, environmental proactivity, firm performance, quality management, quality performance, resource-based view

1 | INTRODUCTION

Various management systems (MSs) that represent the frameworks for policies, processes and procedures used by an organization have been employed widely over recent decades by many companies striving to increase their effectiveness in order to create competitive advantage in the market. While implementing MSs as stand-alone applications are common practice, there is a growing trend to implement several MSs jointly (Bernardo, Simon, Tarí, & Molina-Azorín, 2015; Simon, Bernardo, Karapetrovic, & Casadesús, 2011). Indeed, it turns to be an emerging need rather than a simple trend, due to the significant time lag between the implementation of the various MSs (Karapetrovic & Jonker, 2003; Kraus & Grosskopf, 2008).

The integration of two or more MSs means implementing multiple systems simultaneously into a single system (Beckmerhagen, Berg, Karapetrovic, & Willborn, 2003). It is critical that this system integration should contribute to organizational sustainability and the strategic decision-making capability of a firm so that it leads to the development of a competitive advantage. Although the strategic management perspective is rarely observed on the integration issues of MSs (Ahsen, 2014), the extant literature provides rich empirical and theoretical support for the integration of MSs (Karapetrovic & Casadesús, 2009; Salomone, 2008; Simon, Karapetrovic, & Casadesús, 2012; Zeng, Shi, & Lou, 2007; Zeng, Tam, & Tam, 2008; Zutshi & Sohal, 2005). Moreover, the integration of MSs is considered from a number of perspectives in the literature. Risk analysis of integration (Labodová, 2004), auditing (Kraus & Grosskopf, 2008), contribution to innovativeness of a firm (Bernardo et al., 2015; Simon, Yaya, Karapetrovic, & Casadesus, 2014), and sustainable development (Rocha, Searcy, & Karapetrovic, 2007; Searcy, Karapetrovic, & McCartney, 2009) are a few perspectives stated here. Furthermore, Simon et al. (2011) discuss the difficulties of the implementation of these MSs jointly. Despite these studies stressing the importance of integration, empirical evidence regarding to the results and effects of integration on a firm performance (PERF) is relatively rare.

Quality management (QM) and environmental management (EM) are mostly integrated and jointly implemented MSs, which also have standards to be certified worldwide. Although both QM and EM practices vary, with respect to their focus, they share similar objectives (Bernardo, Casadesus, Karapetrovic, & Heras, 2009). Firms struggle with many strong challenges in the implementation of QM practices (Ahire, Golhar, & Waller, 1996; Dow, Samson, & Ford, 1999). Similar types of challenges also exist for the execution of comprehensive EM systems to build up environmental proactivity (EP) in the generation of competitive advantage (Claver, Lopez, Molina, & Tarí, 2007; Hart, 1995; Steger, 2004). Aiming for sound and achievable PERF, through MSs, is even more important than their implementations, either individually or jointly. Therefore, the role of quality performance (QP) and EP are critical in the improvement of a firm's performance through an integrated quality and environmental management (IQEM) system.

The novelties of this study are two-fold. First, drawing on the premises of the resource-based view (RBV) of a firm (Aragón-Correa, 1998; Barney, 1991; Srivastava, Fahey, & Christensen, 2001), an attempt is made to integrate QM and EM practices as a single MS and identify underlying themes of IQEM practices. Although the areas of integration are widely studied in the extant literature (Ahsen, 2014; Karapetrovic & Casadesús, 2009; Karapetrovic & Jonker, 2003), their empirical investigation is rare. Second, the nature of the link between IQEM practices and PERF is clarified through the mediating role of QP and EP. Although there is a vast number of empirical studies that have investigated, separately, the association between QM and PERF, and between EM and PERF, their results remain inconclusive. Although it is believed that QM and EM pose advantages for firms, their impacts on financial performance and operational performance have not been clear enough to produce conclusions (Bernardo et al., 2009; Sampaio, Saraiva, & Guimarães Rodrigues, 2009). Thus, providing empirical evidence through IQEM systems may be useful in paving the ways for increasing PERF.

2 | THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

The integration of QM and EM can be facilitated in three ways: (i) building a QM system first and then an EM system later; (ii) building an EM system first and then a QM system later; and (iii) building QM and EM systems simultaneously (Karapetrovic & Willborn, 1998; Molina-Azorin, Tari, Claver-Cortes, & Lopez-Gamero, 2009). In the first composition, building QM first and then EM, a relevant EM system can be built up either by using the procedures originating from a QM system and then merging them into one, or by directly developing an EM system that is audit-based on quality standards. In the second composition, a firm tries to meet its quality objectives within EM assessments and successively establish an IQEM system. This second composition is suitable for a firm under high public pressure and investigation. The last composition requires documenting and implementing the environmental and quality characteristics jointly, which necessitates a high level of specialization and managerial skills. Thus, the QM and EM become interdependent within these compositions and a firm chooses the most desirable composition with the necessary level of integration for its IQEM systems (Molina-Azorin et al., 2009). However, structural and infrastructural works related to integration are as important as the rationale behind the integration strategies.

The structural work of integration of MSs begins with unification of documentation and processes. Subsequently, operations and tactics are integrated (Bernardo et al., 2009; Karapetrovic, 2003). The potential benefits of coordination are clarification in responsibilities, creating synergy among MSs, alignment in policy, objectives, and targets (Jørgensen, Remmen, & Mellado, 2006). This coordination is particularly for gaining insights regarding following up the strategic goals in an easier way, as well as integrating policies, objectives and manuals to systematize controlling, internal audits, and internal communications (Karapetrovic & Jonker, 2003). Specifically, the most important work procedures commonly integrated are planning, preventive and corrective actions, control of nonconformities, determination of stakeholder requirements and product realization (Simon et al., 2012). In order to develop a common understanding for the processes (e.g. policymaking, planning, controlling, implementing corrective actions and maintaining management reviews), coordination related to managing tasks across different units is essential for MS integration (Jørgensen et al., 2006).

Despite its difficulty, integration of MSs provides firms with many other opportunities, which tend to develop toward a state of complete integration (Bernardo et al., 2009; Karapetrovic & Casadesús, 2009; Karapetrovic, Casadesús, & Heras, 2006; Salomone, 2008; Zeng et al., 2007). In addition to time saving and efficient use of resources, bureaucracy through redundancy of similar tasks and confusion among different standards could also be reduced (Jørgensen et al., 2006). Therefore, a firm with multiple MSs needs less time to implement these MSs simultaneously than the sum of time needed for implementing them individually and separately (Karapetrovic & Casadesús, 2009). MSs such as quality and environmental management, occupational health and safety, as well as social accountability, help to improve the competitiveness of a firm not only by creating a positive image in the market (Jørgensen et al., 2006) but also by generating value across functions (Rebelo, Santos, & Silva, 2016). Increasing the competitiveness of a firm has well gone beyond focusing on short-term cost reduction actions. As Christmann (2000) asserted, turning practices into capabilities by focusing on processes can affect profits more positively than relying on short-term cost-cutting actions. Barney (1986) noted that it was promising to build a theory of an ongoing PERF, stemming from the resources controlled by the firm. Thus, the core argument, asserting the integration of MSs by emphasizing the role of QP and EP, promises broader organizational advantages in gaining sustainable competitive advantage. Consequently, this study emphasizes the role of QP and EP on the link between IQEM practices and PERF.

2.1 | Integrated quality and environmental management practices, quality performance, and environmental proactivity

Integrated MSs have been regarded as a useful tool for dealing with interdependencies between different MSs (Ahsen, 2014). Incorporation of objectives, resources, procedures, and strategic goals of a firm can be a good way to tackle problems, create competitive advantage and sustainable development (Bernardo, Casadesus, Karapetrovic, & Heras, 2012). Moreover, adoption of integrated MSs enables a firm to perform strategically by utilizing its resources optimally, managing their inventories effectively, and decreasing expenses (Molina-Azorin et al., 2009). In contrast, the extant literature has also asserted some problems related to integration processes. Especially, rising costs, differences between quality and environmental cultures, and problems associated with internal conflict management, are among some important disadvantages of integration (Zeng et al., 2007). Although integration has some problems in terms of generating extra expenses, one of the basic factors in forming a global strategy for a firm is to improve and evolve resources and capabilities to meet challenges related to changes in external content (Etemad, 2004). In other words, while firms are coping with the difficulties for integration, they tend to develop new capabilities or improve their existing abilities (Larsson & Finkelstein, 1999). Moreover, it is important to note that while successful integration partially depends on availability of resources, it is also contingent on the commitment of top management who consider integration as a strategic tool to gain competitive advantage (Bernardo, Gotzamani, Vouzas, & Casadesus, 2018). Thus, the idea of forming integrated MSs has become a strategic decision and has attracted the attention of both practitioners and scholars because of its relevance in achieving competitiveness and sustainability (Rebelo et al., 2016).

The application of any practice drives the costs up for a firm; however, efforts in building MSs rest on the assumptions of improving efficiency and effectiveness for the entire firm (Merino-Diaz de Cerio, 2003). It has been asserted that integrating MSs ensures the flexibility of quality departments in order to adapt to changes in systems (Bernardo et al., 2018). Regardless of having a certificate, firms who integrate multiple MSs can gain a holistic understanding in management activities and business. Firms can establish an ability of adding considerable value to their operations while enhancing the sustainable development of their procedures and processes (Rebelo et al., 2016). Accordingly, QP depends mostly on intangible rather than tangible factors, like employee training, empowerment, and involvement (Ahire et al., 1996; Patyal & Koilakuntla, 2017; Powell, 1995;), which are essential in developing capabilities. Therefore, to cope with the challenges related to integration and turn them into a capability, firms need to reach certain performance levels both in terms of quality and environment.

Similarly, environmental commitment also entails companies to adopt a long-term stance to execute strategies and policies, and to assign the required resources properly (Menguc & Ozanne, 2005). Integrated MSs can be established with the focus of managing processes in a sustainable and eco-friendly way with environmental quality (Sanz-Calcedo et al., 2015). In line with this argument, Gonzalez-Benito and Gonzalez-Benito (2005) assert that the objectives of quality, reliability and flexibility could be met by improving ecological supply chain, recycling and reverse logistic systems. Adopting EM systems enhances organizational learning and improves employee awareness. Therefore, environmentally and friendly practices help firms to escalate EP (Bramoullé & Olson, 2005). The determination of employees to address environmental issues and their motivation to create ideas are essential, while this kind of spirit does not require any capital asset or additional cost (Remmen & Lorentzen, 2000). These viewpoints lead to the following two-part hypothesis:

> **Hypothesis 1a.** *Integration of quality and environmental management practices positively influences quality performance.*

> **Hypothesis 1b.** *Integration of quality and environmental management practices positively influences environmental proactivity.*

2.2 | Linking quality performance and environmental proactivity with firm performance

Explaining variation in performance or effectiveness is also one of the key themes in organization literature. Firms have multiple and conflicting organizational goals, which differ significantly from each other. The extant QM literature highlights the importance of adopting quality philosophy as a means to achieving competitive advantage because of its power in transforming the entire organization (Parvadavardini, Vivek, & Devadasan, 2016). Adopting QM is more than the formalization of processes. QM necessitates changes in management and culture where processes and procedures are engaged (Smith, 2004).

According to the RBV, the internal dynamics of a firm generally stem from its resources and capabilities, which are considered as a foundation of a firm's unique strategies, processes, and structural formation (Barney, 2001). In order to improve the competitive edge of a firm, these unique resources cannot be easily transferred or imitated, and they enhance the value of a firm. These resources also vary according to the firm's contingency factors, which, in turn, lead to differences in performance measures (Grant, 1991). The benefits of QM are mainly associated with value generation through better understanding of customer needs, enhanced communication, improved problem-solving and employee commitment (Powell, 1995). Moreover, integration enables firms to respond to changes in a timely manner while enhancing strategic focus by improving QP, which in turn affects the overall performance (Maiga, Nilsson, & Ax, 2015). Thus, QP is an essential indicator in converting QM into a capability to improve competitive edge (Flynn, Schroeder, & Sakakibara, 1994; Powell, 1995). Hence, this is stated more formally in the following hypothesis:

> **Hypothesis 2a.** *Quality performance positively influences firm performance.*

EP is the employment of practices by following strategies to advance environmental performance (González-Benito & González-Benito, 2006; Hart, 1995; Henriques & Sadorsky, 1999). A firm-level environmental performance, through the application of EM practices, produces overall beneficial results for a firm by increasing its competitive position (Klassen & McLaughlin, 1996). Environmental responses of firms can be categorized as EP, which is a tendency to do more than simply comply with regulations and standards (Garcés-Ayerbe, Rivera-Torres, & Murillo-Luna, 2012). As Hofmann, Theyel, and Wood (2012) claim, adopting advanced technology, cooperating with customers and suppliers, and having an innovative ability, in addition to their known strategic benefits, would provide companies with capabilities that help them deal with environmental challenges. Reaching financial performance requires an integration of EM and environmental performance goals into corporate level strategies which initially lead firms to gain operational performance and competitive advantage when compared to other firms (Christmann, 2000). Eventually the returns of these strategies will reveal themselves in financial outcomes (Banerjee, 2001). Firms in possession of EM perceive impacts well beyond environmental performance, for instance, pollution abatement, and enjoy a notably positive influence on various dimensions of operational performance (Melynk, Sroufe, & Calantone, 2003).

Once firms have passed the stage of introducing EM they begin to implement comprehensive EM systems to help them gain a competitive advantage (Claver et al., 2007; Hart, 1995; Steger, 2004). It is expected that increased competitiveness leads to higher market reputation and more sales opportunities for a firm. Since this is consistent with the philosophy of QM, a firm has a framework in integrating QM and EM to achieve excellent firm-level EP that goes beyond the expected standard of compliance (McGee & Bhushan, 1993). Moreover, the strategic inclination to reach a competitive advantage will be embedded in capabilities that enable the natural RBV, which focuses on the environmentally sustainable organizational performance (Hart, 1995). Therefore, these viewpoints lead to the following hypothesis:

> **Hypothesis 2b.** *Environmental proactivity positively influences firm performance.*

2.3 | The mediating effects of quality performance and environmental proactivity

QM is an integrative MS that primarily deals with the advancement and maintenance of all the tasks and processes within a firm, with the objective of serving customers' needs effectively (Flynn et al., 1994; Kaynak, 2003). Leadership, information and analysis (Sila & Ebrahimpour, 2005), benchmarking, advanced manufacturing technologies (Dow et al., 1999), employee training, involvement programmes (Powell, 1995), and supplier relations (Flynn et al., 1994), are found to have the strongest impact on shaping QM practices. Despite the results that guided firms to implement the most useful QM practices, firms tend to fail in applying QM practices unless they have very strong and well-defined strategies to achieve QP targets (Ahire et al., 1996). Firms have long been in need of creating a culture of interdependency and teamwork to maximize their organizational performance (Jyoti, Kour, & Sharma, 2017). Thus, it is vital for an organization to develop QM strategies that are aligned with other MSs in the entire organization. However, although many firms adopt integrated QM practices, they fail to reach favourable organizational performance. One of the main reasons for this failure is giving more importance to product quality while disregarding the importance of overall improvement efforts (Ahire et al., 1996).

In recent decades, firms have developed a more conventional wisdom regarding QM, and they tend to combine QM practices with other MSs to gain synergistic effects that produce favourable outcomes (Dow et al., 1999). It is vital for a firm to design its QM practices for substantial progress in QP, because different QM practices may serve different strategic objectives (Flynn et al., 1994). Thus, a vision related to adoption of QM practices is necessary to avoid fallacious decisions that lead a firm nowhere when adopting a QM system. Essential QM practices should be built to improve overall performance of the company. This can only be possible by adopting a holistic management wisdom that integrates all possible MSs (Dow et al., 1999). Moreover, to sustain the effectiveness of integrated MSs, attaching their synergistic effects to the overall strategies of a firm is essential (Dow et al., 1999). Similar to all MSs, QM is a philosophy that encompasses the entire firm instead of being a fragmented system that relies on some teams' or employees' responsibility (Flynn et al., 1994). Without a support from top management, a lack of involvement from other departments and isolation from other MSs may turn the whole system of QM ineffective.

The benefits related to QM should be dependent on strong foundations which support the functionality and transparency of systems, procedures, and processes (Chow-Chua & Goh, 2002). QP consists of the results that QM strives for (Curkovic, Vickery, & Droge, 2000), and the relationship between QM and QP is essential in implementing QM (Dow et al., 1999). When an effective QM that is designed for achieving QP is integrated with other MSs, the effect of QP on the PERF is expected to increase. Consequently, a well-performing firm becomes more flexible in adapting market changes (Patyal & Koilakuntla, 2017). Thus, attainment of strong and sustainable QP helps QM to be effective in improving overall PERF. These viewpoints and perspectives lead to the following hypothesis:

> **Hypothesis 3a.** *Quality performance mediates the link between integrated quality environmental management practices and firm performance.*

The challenge related to the natural environment and biophysical atmosphere is considered to be one of the key drivers of resources and abilities for a firm (Hart, 1995). More recently, EP has been identified as one of the EM capabilities that are simply the organizational abilities that help organizations to increase their performance on environmental problems (Dangelico, 2015; Lee & Klassen, 2008). Therefore, the process of developing an integrated MS will not be completed without considering EP, which is an important notion to develop firm resources, such as organizational learning and commitment, inter-departmental integration, and enhanced skills in employee involvement (Russo & Fouts, 1997). Thus, EP leads firms to develop managerial skills, coping with environmental issues. Eventually, effective management is expected to turn EM into a management capability.

EP should be assessed based on the environmental impacts of a firm, involving its products, processes, waste generation, packaging operations, suppliers, distribution channels, raw materials, and energy usage (Banerjee, 2001). Attaining EP contributes to the effective running of a firm with respect to preparation of more planned documents, intensified safety measures (Morrow & Rondinelli, 2002), improved employee awareness of environmental issues, reduced waste, and increased recycling efforts by employees (Rondinelli & Vastag, 2000). According to Henri and Journeault (2008), an EM system that implements EM practices should be able to supply the information concerning environmental risks, which necessitates the usage of EP indicators.

The relationship between EM practices and EP may not be formed without considering the roles of existing resources and capabilities of a firm (Hart, 1995). In line with this reasoning, the current literature on business considers the research topic of how environmental capabilities may impact strategic decisions (Banerjee, 2001; Berchicci, Dowell, & King, 2012), resources, and the tangible and intangible assets that a firm acquires. In line with Banerjee (2001), if EM practices, which are turned into a capability for a firm, are managed effectively, then they may become a critical part of the strategic decision-making process; thus, PERF is influenced by EP.

Consistent with the above arguments, EP is an important contributor to the firm's performance. For instance, reducing the carbon emission per unit production indicates the use of less energy, better energy efficiency, and reduced production costs. In addition, reduction in total carbon emissions affects stakeholder relations in a positive manner (Lannelongue, Gonzalez-Benito, Gonzalez-Benito, & Gonzalez-Zapatero, 2015). Production of sustainable products may assist in reducing material costs, and increasing the volume of total sales as well as the profitability of a firm. Therefore, EP through an IQEM system may necessitate a firm to tailor its strategy to be consistent with environmental concerns, and this may be a step forward towards generating a competitive advantage (Buysse & Verbeke, 2003; Hart, 1995; Lannelongue, Gonzalez-Benito, & Gonzalez-Benito, 2015; Sharma & Vredenburg, 1998). As a result, EP is crucial in paving the way for organizational performance. Considering the fact that integrated QM and EM practices initiate greater efficiency for a firm, through using the same documentation and management methods (Karapetrovic & Casadesús, 2009), these viewpoints and perspectives lead to the following hypothesis:

> **Hypothesis 3b.** *Environmental proactivity mediates the link between integrated quality environmental management practices and firm performance.*

The research framework along with its hypothesized paths are displayed in Figure 1.

3 | RESEARCH METHODS

3.1 | Sample and data collection

This survey was designed to examine the mediating roles of QP and EP on the relationship between IQEM practices and PERF, relying on a dataset of firms from a key emerging country, Turkey. The data were assembled via postal survey using a questionnaire. The questionnaire was initially designed in English, and then it was translated into Turkish. The Turkish version was translated bank into English until a group of three specialists decided that the two versions were alike. The questionnaire was subjected to piloting several times to verify that the format, wording and ordering of questions were suitable, and also to improve its content validity. The new version of the questionnaire was then reviewed by four different professionals from companies operating in durable goods, electrical equipment, energy and clean system services. Each of the managers interviewed possessed detailed knowledge of the QM, EM and the integration process that their firms had established. Each of the interviews lasted 1–1.5 hours. Following the interviews, the questionnaire was remodified. The last version of the questionnaire was again pre-tested with 10 different professionals from different companies. Although there were modifications that were relevant to each of the respondent firms, the final version of the questionnaire broadly covered the same range of questions. The pilot studies aimed to investigate the multiple perspectives of the parties involved. This form of triangulation is increasingly seen as necessary in studies of this kind.

The sampling frame for Turkish firms was selected from the database of Istanbul Chamber of Industry (ICI); this industrial database contains nearly 18 000 manufacturing firms from several different industries. Using a random sampling method, a total of 1000 firms were selected, and the sampling frame for the survey was established. A questionnaire with a covering letter was posted to the managing director of each firm, asking them (or a senior manager with knowledge of quality and environmental issues as well as firm performance) to complete it. Following two sets of reminders, 230 completed questionnaires were returned, of which 208 were usable. The remaining 22 questionnaires were dropped due to incomplete data. This represented an effective response rate of 20.8%, which was deemed reasonable, given the confidential nature of the questionnaire. Following the procedure recommended by Armstrong and Overton (1977), non-response bias was checked by comparing the first wave of survey responses to the last wave of survey responses. No significant variations were detected in the responses between early and late respondents ($p > 0.1$), attesting the non-existence of response bias. The respondents were also compared with regard to the key features of the sample (i.e. geographical location and industry sector), which indicated no systematic differences either.

The main characteristics of the sample are summarized in Table 1. The sample consists of small and medium-sized enterprises (SMEs), as well as firms classified as large-sized enterprises (40%). The mean age of the sampled firms is 25 years, while the average number of employees per sampled firm is 950. The breakdown of the sample, with respect to the industry sector, is as follows: (i) metal, iron, steel and machinery (17%); (ii) consumer durables, electronics and electrical (12%); (iii) automotive and related industries (11%); (iv) textile and clothing apparel (11%); (v) cement, glass ceramics and plastics (10%); (vi) construction, forestry and wood products (10%); (vii) medicine, chemicals and pharmaceuticals (8%); (viii) food, beverages and paper (8%); and (ix) other services (13%).

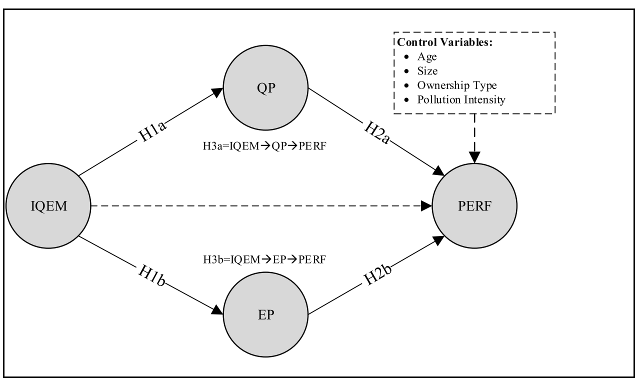

FIGURE 1 Research framework

3.2 | Operationalization of variables

The following subsections provide brief descriptions of the endogenous and exogenous variables, along with the control variables used

TABLE 1 Characteristics of sample firms*

Characteristic		Number	%
Industry sector	Consumer durables, electronics and electrical	25	12
	Cement, glass, ceramics and plastics	20	10
	Food, beverage and paper	17	8
	Construction, forestry and wood products	21	10
	Medicine, chemical and pharmaceuticals	17	8
	Textile, clothing and apparel	23	11
	Metal, iron, steel and machinery	36	17
	Automotive and related	22	11
	Other	27	13
Number of employees	< 250	125	60
	251–500	18	9
	501–1000	23	11
	1001–5000	24	11
	> 5000	18	9
Years of operation	< 5	12	6
	5–10	29	14
	11–20	48	23
	21–40	77	37
	> 40	42	20
Type of ownership	Locally owned	167	80
	Foreign-owned	41	20
N=208			

in this study. All the items were measured through five-point Likert-type scale items ranging from 1 (strongly disagree) to 5 (strongly agree).

3.2.1 | Dependent variable

Firm performance

Measures of PERF were based on items derived from the literature (Boyd, 1991; Demirbag, Collings, Tatoglu, Mellahi, & Wood, 2014; Li, Huang, & Tsai, 2009; Pearce, Freeman, & Robinson, 1987; Rao, 2006; Venkatraman & Ramanujam, 1986) by considering financial and non-financial indicators of performance together. Respondents were requested to indicate how their companies had performed during the last three years compared to their key rivals, on each of the following performance indicators: (i) sales growth; (ii) increase in market share; (iii) increase in operational profit; (iv) decrease in general costs; (v) improvement in overall competitive position; (vi) improvement in the performance of supply chain; (vii) decrease in employee turnover; (viii) improvement in capacity for developing new products and services; and (ix) improvement in new product and service development processes.

3.2.2 | Independent variable

Integrated quality and environmental management practices

The construct of integrated IQEM practices is designated as the independent variable, and consists of 11 items adapted from earlier studies (Karapetrovic & Jonker, 2003; Simon et al., 2012). These items aim to measure the integration level of QM and EM practices simultaneously. The following items are aimed at investigating joining areas of the IQEM practices that work on (i) supporting the overall objectives of the firm, (ii) the planning process, (iii) goals and targets, (iv) a single system, (v) auditing, (vi) management reviews, (vii) nonconformities, (viii) preventive and corrective actions, (ix) resource management, (x) data collection, and (xi) internal communication.

3.2.3 | Mediator variables

Quality performance

This construct was drawn from previous research about the expected outcomes of QM (Curkovic et al., 2000; Garvin, 1987; Powell, 1995). This scale captures the organization's QP on each of the following indicators for the last three years, relative to their rivals, and consists of six items, namely, improvement of product quality, increase in profitability, superiority to competing products, improvement in after-sales services, decline in cost of quality, and increase in customer satisfaction.

Environmental proactivity

This construct is composed of six items drawn from earlier studies (Dai, Cantor, & Montabon, 2017; Gonzalez-Benito & Gonzalez-Benito, 2005; Liu, Zhu, & Seuring, 2017; Melynk et al., 2003; Nehrt, 1996; Sarkis, 1998; Shrivastava, 1995). The following items capture the extent of EP in responding firms during the last three years in comparison to their main rivals: using recycled components, producing easily recycled products, using clean technologies and equipment, performing better than competitors in EM, reducing toxic waste, and reducing emission rates.

3.2.4 | Control variables

Four control variables were used to consider for possible extraneous effects on the dependent variable.

Firm size (SIZE)

In terms of size, the sample firms were subsumed under two categories: SMEs versus large-sized firms. This study espouses the number of employees as the key measure for defining SMEs. Consistent with small business research, an SME is defined as a firm that employs <250 employees. This is also in line with the definition of an SME acknowledged by the Turkish Statistical Institute and the European Union (SME User Guide, 2016).

Firm age (AGE)

Firm age was measured by an ordinal variable including five categories based on the total number of years elapsed since the formation of firm (Table 1). AGE is a common control variable to test whether older and more established firms differ from newer ones, in terms of the key constructs of the study.

Type of ownership (OWN)

A firm's ownership structure is denoted by a dichotomous measure, and is given the value of 1 if the firm has a minimum of a 10% foreign equity stake, and is given a value of zero if the firm is 100% locally owned.

Pollution intensity (PI)

To control for industry variations, a categorical variable was created for the industry sector. The entire sample of firms were broadly split into two sets: high pollution and low pollution industries. The approach of Berrone and Gomez-Mejia (2009) was followed and adopted in defining high- and low-polluting sectors. High pollution industries include mining, metals, petroleum, gas, leather, textiles, apparel, chemicals, automotive, transport and related equipment, durables, electrical and electronics, while low pollution industries comprise food and beverages, tourism, retail, export–import trading, construction and logistics. It was tested whether the inclusion of high pollution versus low pollution firms might weaken or cancel out the relationships of focal interest.

4 | ANALYSIS AND FINDINGS

The data analysis was carried out in two stages. Using a confirmatory factor analysis (CFA), the measurement model for each construct was

TABLE 2 First order confirmatory factor analysis results[a]

Construct	Items	Standardized loadings[b]	AVE[c]	CA[d]	CR[e]
Firm performance	**PERF**		**0.50**	**0.50**	**0.90**
Our sales have increased.	PERF1	0.62			
Our market share has increased.	PERF2	0.70			
Our operational profit has increased.	PERF3	0.66			
Our general costs have decreased.	PERF4	0.64			
Our overall competitive position in the industry has increased.	PERF5	0.75			
The overall performance of our supply-chain has improved.	PERF6	0.85			
Our employee turnover has decreased.	PERF7	0.68			
Our capacity on new product and service development has improved.	PERF8	0.69			
New product/service development processes have accelerated.	PERF9	0.74			
Integrated quality and environmental management practices	**IQEM**		**0.77**	**0.97**	**0.97**
The QM and EM systems work coherently to support the overall objectives of our firm.	IQEM1	0.66			
The QM and EM systems are undertaken simultaneously in the planning process.	IQEM2	0.87			
The QM and EM systems are undertaken simultaneously while the goals and targets have been defined.	IQEM3	0.85			
The practices related to QM and EM systems are fully integrated into a single system in our firm.	IQEM4	0.88			
The audit processes of QM and EM systems are undertaken simultaneously.	IQEM5	0.81			
Management reviews related to QM and EM systems are fulfilled simultaneously.	IQEM6	0.92			
The control of nonconformities related to QM and EM systems are undertaken simultaneously.	IQEM7	0.92			
Preventive and corrective actions related to QM and EM systems are taken simultaneously.	IQEM8	0.93			
Resource management related to QM and EM systems are undertaken simultaneously.	IQEM9	0.94			
Evaluation of data collected from QM and EM systems are undertaken simultaneously.	IQEM10	0.91			
Internal communication related to QM and EM systems are established simultaneously in order to reach every employee in our firm.	IQEM11	0.91			
Quality performance	**QP**		**0.65**	**0.92**	**0.92**
The adoption of QM has dramatically improved our overall productivity.	QP1	0.83			
The adoption of QM has dramatically improved our overall profitability.	QP2	0.73			
The adoption of QM has dramatically improved our ability to provide products/services with capabilities that are superior to competing products.	QP3	0.85			
The adoption of QM has dramatically improved our ability to provide after-sale services.	QP4	0.85			
The adoption of QM has dramatically decreased the total cost of quality of products/services.	QP5	0.77			
By the adoption of QM, our customers have become more satisfied with the quality of our products/services.	QP6	0.82			
Environmental proactivity	**EP**		**0.53**	**0.87**	**0.87**
Our firm uses recycled components and inputs as much as possible.	EP1	0.61			
Our firm strives to make products that are easily recycled.	EP2	0.60			
Our firm utilizes clean technologies and equipment in all required areas and equipment.	EP3	0.71			
Our firm performs better in environmental studies when compared to our competitors in the industry.	EP4	0.85			
The adoption of environmental management has significantly reduced toxic waste.	EP5	0.82			
The adoption of environmental management has significantly reduced emission rates.	EP6	0.75			

[a]chi square/df = 1.50, CFI = 0.96, AGFI = 0.81, IFI = 0.96, TLI = 0.96, RMR = 0.054, RMSEA = 0.049.

[b]all loadings are significant at $p < 0.001$.

[c]AVE, average variance extracted.

[d]CA, Cronbach's Alpha.

[e]CR, Composite reliability.

tested first to determine if the study's constructs provided a satisfactory fit to the data. Second, the relationships among the study's constructs, as hypothesized in the conceptual framework in Figure 1, were examined through a structural equation modelling (SEM) procedure.

4.1 | Measurement model validation

In line with the recommendations of Hair, Black, Babin, and Anderson (2010), one item was eliminated from EP and four items from PERF constructs, due to low-factor loadings and high-collinearity problems. The exact wording of the items, excluding the deleted ones, are reproduced in Table 2 along with the first-order CFA results. Table 2 shows that the model fit indices are within generally acknowledged ranges, exhibiting an excellent fit to the data (χ^2/d.f. = 1.50; AGFI = 0.81; CFI = 0.96; TLI = 0.96; IFI = 0.97; RMSEA = 0.05) (Janssens, Wijnen, De Pelsmacker, & Van Kenhove, 2008). The value of χ^2/d.f. is within the range of 0–5, where lower scores indicate a better fit. Moreover, the CFI, TLI and IFI are all highly adequate, as they are very close to a value of 1.0. Similarly, the acceptable level of the AGFI index remains between 0.80 and 0.90. A value of ~0.05 for the RMSEA also shows a close fit of the model. Table 2 also reveals that all items are significantly linked to their underlying majority of the constructs by having standardized loadings >0.60 ($p < 0.001$).

4.2 | Reliability and validity of measures

Internal consistency of the study's constructs are measured by both Cronbach's Alpha (CA) and composite reliability (CR). Table 2 shows that all constructs have CA and CR values which exceed the threshold value of 0.70, exhibiting adequate levels of *construct reliability* (Bagozzi & Yi, 1988; Nunnally, 1978).

Table 2 also shows *convergent validity* measures of the model by examining the average variance extracted (AVE) values of the constructs. The AVE values are higher than the threshold rate of 0.50, attesting the convergent validity of the constructs (Fornell & Larcker, 1981; Malhotra & Dash, 2011, p. 702). Additionally, highly significant standardized regression weights of the variables ($p < 0.01$) are accepted as the indicators of convergent validity (Anderson & Gerbing, 1988). The *discriminant validity* of the constructs is identified by measuring each construct's convergence on the corresponding values, and it can be examined by detecting the covariance between pairs of constructs that must be significantly different from unity. Table 3 presents the test results associated with the discriminant validity of the measurement model. The pairwise tests show strong support for the discriminant validity criterion, specifying that the conceptual domains of these constructs do not overlap (Venkatraman, 1989). Descriptive statistics including correlations among the variables are presented in Table 4.

4.3 | Common method bias

The common method bias (CMB) indicates the extent of erroneous covariance among variables due to the common method in data collection (Buckley, Cote, & Comstock, 1990). The CMB is critical to examine, because its existence indicates the corruption of measures in the same direction that would consequently contaminate the outcomes of a study (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Social

TABLE 3 Discriminant validity

Test number	Description	χ^2 model	χ^2 unconstrained model	Difference[a]
1	IQEM → QP	83.2	117.4	34.2
2	IQEM → EP	98.7	122.0	23.3
3	IQEM → PERF	174.2	201.4	27.2
4	QP → EP	56.0	98.2	42.2
5	QP → PERF	175.8	206.9	31.1
6	EP → PERF	154.8	185.2	30.4

[a]all values are significant at $p < 0.001$.

TABLE 4 Descriptive statistics and inter-correlationships

Variable name	Definition	Mean	SD	1	2	3	4	5	6	7	8
1. PERF	Firm performance	3.70	0.80	1							
2. IQEM	Integrated quality and environmental management practices	3.68	1.02	0.45**	1						
3. QP	Quality performance	3.94	0.74	0.77**	0.53**	1					
4. EP	Environmental proactivity	3.71	0.79	0.67**	0.61**	0.72**	1				
5. AGE	Firm age	0.57	0.49	0.09	0.02	0.09	0.06	1			
6. SIZE	Firm size	0.39	0.49	0.19*	0.04	0.08	0.13	0.21*	1		
7. OWN	Type of ownership	0.20	0.40	0.08	0.09	0.04	0.19**	0.09	0.30**	1	
8. PI	Pollution intensity	0.53	0.50	0.04	−0.01	0.04	−0.03	0.14**	0.02	0.03	1

SD, standard deviation.

*$p < 0.01$;

**$p < 0.001$.

desirability, vague wording, and the length of the scale may cause the common method bias (Harrison, McLaughlin, & Coalter, 1996; Malhotra, Kim, & Patil, 2006).

Three separate statistical analyses were performed for the CMB. First, Harman's single-factor test was used to check whether the majority of the variance could be identified by a single factor (Andersson & Bateman, 1997; Organ & Greene, 1981; Podsakoff et al., 2003). To do this, the number of factors was constrained in an exploratory factor analysis (EFA) to be one rather than vary through eigenvalues. If there is a considerable amount of common variance, this single factor is expected to generate the majority of the covariance among items. Since the resultant single factor does not account for the majority of the variance among the variables of the study, the CMB does not appear to be an issue for the current study. The CFA method is also used in applying Harman's single-factor test as an alternative to the EFA. Principally, in this method, all the items in the model are assigned to a single factor, which denotes the method effects (Malhotra et al., 2006). The logic behind the single-factor procedure is that the CMB does not control the data substantially if the CFA results under a single factor are significantly distorted in terms of fit statistics. In this case, the fit indices (χ^2 (393) = 1926.1; χ^2/d.f. = 4.4; RMR = 0.16; AGFI = 0.32) indicate that the CMB is not the key source of the variations.

As a second analysis, the common latent factor (CLF) test was also applied (Williams, Edwards, & Vandenberg, 2003). In this test, a latent factor, connected to all observed variables in the model, is used to identify the common variance among all the variables. Shared variance between this latent variable and the items in the study is assumed to be a function of the CMB (Richardson, Simmering, & Sturman, 2009). The analyses revealed that this shared variance was limited to 38%, and did not constitute the majority of the variance among the variables of the study.

The third analysis, which is the most current approach in testing, is the zero-constrained test. It is the difference between the chi-squared values of the constrained and unconstrained models. In the constrained model, all paths of the CLF are constrained to zero. The analysis is conducted to compare the models by the amount of shared variance across them and assess whether the difference in chi-squared values is significantly different from zero. Thus, when the analysis shows that the groups are not significantly different, it is concluded that the CMB does not exist in the model. Analysis shows that no significant CMB exists in this data, as the statistical test between the unconstrained CLF model (χ^2 = 655.9; d.f. = 436) and the constrained CLF model (χ^2 = 627.2; d.f. = 406) reveals that there is no significant variation (p = 0.52). All of these results indicate that the CMB does not involve a significant matter for this survey (Podsakoff, MacKenzie, & Podsakoff, 2012).

4.4 | Hypotheses testing

The structural paths in the hypothesized framework (Figure 1) are tested using AMOS. Figure 2 presents the parameter estimates for the hypothesized paths and provides the outcomes of the path analysis for the sample. The goodness of fit indices for this model show an adequate level of fit (χ^2/d.f. = 1.73; CFI = 0.95; IFI = 0.95; RMSEA = 0.06; TLI = 0.94).

The direct relationships in the model underlying H1a, H1b, H2a and H2b are all statistically significant (p < 0.001), providing support for all four hypotheses. The links between IQEM → QP (H1a) and IQEM → EP (H1b) have standardized regression weights of 0.66 (p < 0.001) and 0.55 (p < 0.001), respectively. Similarly, the links between QP → PERF (H2a) and EP → PERF (H2b) have standardized regression weights of 0.45 (p < 0.001) and 0.66 (p < 0.001), respectively.

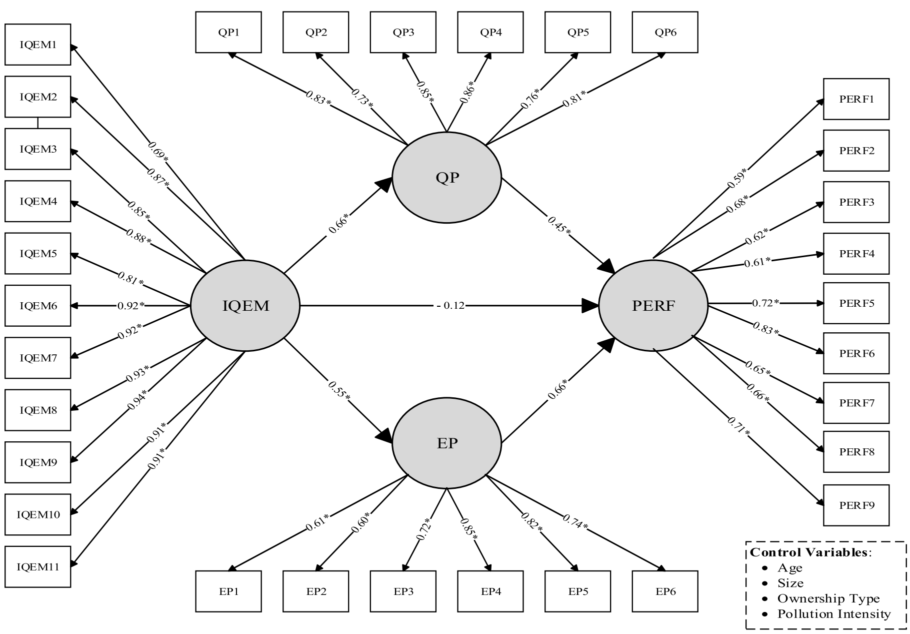

FIGURE 2 Path model

A mediation analysis is mainly used for providing a more precise explanation for the chain of causation, by clarifying how or why an independent variable influences the dependent variable (Hair et al., 2010). In general, a mediator variable establishes a link between an independent and a dependent variable. There are some vital conditions for a variable to be concluded as a mediator (Baron & Kenny, 1986). Primarily, the path between the independent variable and the mediator variable, as well as the path between the mediator variable and the dependent variable, should be significant. Accordingly, when these paths are found to be significant, the link between the dependent and independent variables should be insignificant. However, a vital part of this analysis depends on the assumption that the direct relationship between the dependent and independent variable should be significant. Thus, when there is a mediating effect in a model, a previously significant link between the independent and dependent variable should no longer be significant. In this model, when there is no mediator or other interactions, the direct links between IQEM–PERF, QP–PERF, and EP–PERF are all significant ($p < 0.001$), with standardized regression weights of 0.48, 0.84, and 0.80, respectively.

There are various statistical approaches to quantify and test hypotheses about direct and indirect effects of an independent variable on a dependent variable (Baron & Kenny, 1986; Preacher & Hayes, 2008). In order to check the significance of mediation effects of QP and EP between IQEM and PERF, the traditional Sobel test approach was first applied, which refers to "an approximate significance test for the indirect effect of the independent variable on the dependent variable via the mediator" (Baron & Kenny, 1986, p. 1177). Hence, two mediation effects are examined. First, QP fully mediates the link between IQEM and PERF (Sobel test statistics = 5.45; $p < 0.001$). Second, EP has a full mediating role in the relationship between IQEM and PERF (Sobel test statistics = 4.14; $p < 0.001$). Thus, both H3a and H3b are supported. These results validate the full mediation effects of QP and EP, and indicate that the effect of IQEM on PERF is fully contingent upon the mediation effects of QP and EP. Therefore, IQEM only becomes effective on PERF through indirect effects of QP and EP.

The existence of mediation effects were also checked using the bias-corrected bootstrap confidence interval method in line with Preacher and Hayes (2008). The use of this method has been recommended over the traditional Sobel test or the causal steps approach, since the bootstrapping method has higher power in controlling type I error (MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2008). To run the bias-corrected bootstrapping method, as recommended by Hayes and Preacher (2014), 5000 resamples were generated to check whether the indirect effects differ significantly from zero. The indirect effects of IQEM on PERF, through QP and EP, are calculated as 0.66 ($p < 0.001$) and 0.45 ($p < 0.001$), respectively, and were all found to be significantly different from zero. Both of the hypotheses, H3a and H3b, regarding the mediating effects of QP and EP, are fully supported.

In order to examine the pure connections among the IQEM, QP, EP, and PERF constructs, the endogenous variables are controlled for contingency specific factors including firm size, age, ownership type of the firm, and the degree of pollution intensity of the sector. Of the control variables, none of them are found to be significant on the dependent variable, PERF.

4.5 | Potential for endogeneity bias

In the research model, QP was assumed exogenous to PERF. However, this assumption is likely to be verified as such that PERF could also be exogenous to QP. For instance, "improvement in new product and service development processes" (viz. PERF) may easily drive "customer satisfaction regarding the quality of products/services" (viz. QP), making the variance of QP indeed endogenous to the model. If QP is endogenously affected by PERF, the results of the study may be inconsistent and biased (Greene, 2003; Guide & Ketokivi, 2015; Liu, Wei, Ke, Wei, & Hua, 2016). In order to address possible endogeneity bias, the two stage least squares (2SLS) regression method is applied with instrumental variables (Bellamy, Ghosh, & Hora, 2014; Liu et al., 2016; Steven, Dong, & Corsi, 2014). First, instrumental variables for QP were identified to conduct the 2SLS regression. Both AGE and OWN are employed as instrumental variables for QP, as these two variables are not significantly related to PERF (Table 4). PI and degree of competition (DOC) were also identified as instrumental variables as they are suggested to not be significantly linked to PERF, and significantly linked to QP (Table 5). DOC refers to the competition level of the firm's industry and is measured by an ordinal variable ranging from low to high.

Prior to running 2SLS regression, QP is regressed on all the variables of the model subject to endogeneity analysis. Model 1 in Table 5 with one stage ordinary least squares (OLS) demonstrates that the R^2 of this regression is 0.30, significantly higher than the R^2 of the regression model with only the control variables (ΔR^2 = 0.28, ΔF-value = 13.04, $p < 0.01$). This result shows that AGE, OWN, PI and DOC can be treated as effective instrumental variables for QP in this study.

Based on the results of Model 1 in Table 5, the predicted value of the assumed endogenous variable of QP was calculated (Bellamy et al., 2014) to test the relationship between QP and PERF at the second stage. As seen in Model 2 in Table 5, the link between QP and PERF is positive and significant (β = 0.64, $p < 0.01$).

TABLE 5 2SLS model for endogeneity

	Model 1 (OLS)	Model 2 (2SLS)
Variable	QP	PERF
IQEM	0.37*	0.11
AGE	0.08	
OWN	−0.06	
SIZE	0.08	0.21*
PI	0.08	
DOC	0.16*	
QP		0.64*
R^2	0.30	0.60
	F-value: 14.20*	Wald χ^2: 122.84*

*$p < 0.01$.

variables used as instruments for the assumed endogenous variable.

After performing the 2SLS by using STATA, the Durbin–Wu–Hausman post-estimation test of endogeneity (Liu et al., 2016) was performed. The test results indicate that the endogeneity related to QP is insignificant, and hence the null hypothesis that QP is exogenous cannot be rejected (the Durbin score with $\chi^2(1) = 0.167$, $p = 0.68$; and the Wu–Hausman score with $F(1203) = 0.163$, $p = 0.69$). Thus, it is demonstrated that the results and conclusions are unlikely to be affected by endogeneity.

5 | DISCUSSION AND CONCLUSION

This study has made an important attempt to improve understanding of the factors influencing the rationale behind the integration of different MSs. To do this, a conceptual model has been developed essentially based on the premises of RBV. This integrated management system is vital for developing capabilities to attain a competitive advantage. Thus, the logic behind establishing integrated management relies heavily on gaining capabilities towards developing strategic orientation. Therefore, this paper has investigated the impact of integrated management practices, specifically QM and EM, on firm performance by relying on the arguments of RBV.

The advantages related to the integration of quality and environmental systems were studied widely in the literature. According to Jayathirtha (2001), the objectives of IQEM were identified as reducing waste and resource depletion, eliminating environmental pollution, designing products that will give minimal environmental impact, controlling environmental impact of raw materials, and encouraging awareness among employees and within the community. The integration of two or more separate management systems with different objectives helps a firm produce a single, more efficient system that benefits from existing synergies (Bernardo et al., 2015). Improvement in the efficiency and the effectiveness of organizations, alignment of goals, processes and resources, and improvement in communication in the entire organization are among the other benefits of integrating QM and EM practices (Beckmerhagen et al., 2003; Beechner & Koch, 1997; Molina-Azorin et al., 2009; Wilkinson & Dale, 1999; Zeng, Tian, & Shi, 2005). Besides the benefits of integrated systems, it should be highlighted that the sustainability of an integrated management system depends on joint auditing and performance-oriented management (Gianni & Gotzamani, 2015). Therefore, developing capabilities by implementing IQEM is expected to leverage firm performance across functions. This study's findings empirically prove that, without any mediation effect, the linkage between IQEM and PERF is positive and significant.

The findings also show that the linkage between IQEM and PERF is fully mediated by QP and EP. Although this finding seems straightforward and simple at first glance, it actually has some important insights to share with both practitioners and managers. Applying an integrated management system like IQEM is not sufficient to attain higher performance. Instead, a firm needs to transform this integration into a capability by attaining high levels of QP and EP. This is a critical factor that shows a firm's ability to create a distinctive competence, which can be achieved by considering firm specific factors. Thus, pursuing QP and EP will not only pave the way for the connection between IQEM and PERF, but also help a firm sustain its competitive advantage by transferring these practices into a capability.

In line with these arguments, considering integration of management systems, it would be expected that when QM and EM were established concurrently, both QP and the degree of EP of a firm were considered equally important for the firm's legitimacy of business activities. When an integration of management systems is not only an incorporation of joint activities but also a mechanism to achieve QP, then PERF may gain momentum from a stronger market position and reputation leading to financial success. Similarly, raising EP would enable a firm to create synergy to achieve a superior performance. In testing the effects of the RBV, Ray, Barney, and Muhanna (2004) state that it is more appropriate to form causality relationships with effective processes rather than to form relationships with overall firm performance. They claim that a firm needs to gain competitive advantage through market processes creating value. Thus, the mediation effects of QP and EP, to attain superior PERF through IQEM, can be deemed as essential.

5.1 | Managerial and policy implications

Some useful managerial implications arise from this study. First, by emphasizing the best use of specific organizational capabilities to succeed in the integration of QM and EM, firms can get favourable results by attaining high levels of QP and EP simultaneously. Second, when considering the impacts of QP and EP on the PERF, it is readily apparent from the results that different capabilities can be engaged for different purposes. As proposed by Hofmann et al. (2012), adopting advanced technology, having an innovative ability, and engaging in alliances with customers and suppliers – in addition to their well-known strategic benefits – may provide firms with capabilities that help them cope with environmental challenges. These capabilities are also applicable to form strong QM practices, which go beyond a management system. To some degree, the relationships among IQEM, QP, EP and PERF are apparently more ambiguous and multifaceted than first envisaged.

The capabilities originating from the internal and external processes and stakeholders of a firm may not always complement each other. This may be one of the reasons to prevent practitioners from further association, and also integration between different parts. It is essential to acknowledge that much of the literature on management and organizations assumes that performance means economic performance. Nonetheless, some management practices (i.e. EM systems) may not be aimed primarily at improving financial performance at first glance, at least not directly. Rather, they are born out of a public good rationale such as environmental protection, which eventually results in increases in a firm's outcomes. The core managerial implication of this study is the inevitability of considering complicated connections and relationships (i.e. combined effects, synergies, complementarities and incompatibilities) among the capabilities of management, in terms of EM functions and the demands of external stakeholders. Thus, in view of the findings, it is recommended that executives pursue possible ways to develop and improve their QP and EP to nurture their firm performance.

As for the control variables, none of them were found have a significant impact on firm performance. Firms in Turkey are well aware that the benefits of adopting EM cancel out its implementation cost (Tatoglu, Bayraktar, & Arda, 2015; Yüksel, 2008). Thus, the action of adopting EM makes a firm more proactive in order to integrate EM with other systems, regardless of age, size, ownership status and industry sector. Consequently, this finding may be generalized in a way that the adoption of IQEM in many different firm settings may help improve performance, so long as the firms embrace IQEM to achieve QP and increase EP.

5.2 | Limitations and future research

This study provides some novel empirical findings and some useful insights; however, some limitations should also be acknowledged when interpreting the results. First, the study has examined the links between IQEM and PERF within a single emerging country setting; hence, the findings cannot be generalized and should be considered exploratory in nature. Therefore, it would be extremely worthwhile to study other emerging and industrialized countries to get a more complete picture in future studies. Second, depending on perceptual data gathered from managers may result in biases such as measurement error. Collecting data from multiple respondents may be useful in eliminating those biases. Despite the possibility of having objective measures of IQEM, QP, EP and PERF, collecting data for such measures may be problematic due to the unavailability of data at individual firm level. For a more holistic view, future research could also be carried out by adding other management systems like health and safety and supplier systems into the integration. Moderator variables such as internationalization, global strategic intentions, innovation performance and market orientation, may be incorporated into the model.

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REFERENCES

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

Ahsen, A. (2014). The integration of quality, environmental and health and safety management by car manufacturers–a long-term empirical study. *Business Strategy and the Environment*, *23*(6), 395–416.

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

Andersson, L. M., & Bateman, T. S. (1997). Cynicism in the workplace: Some causes and effects. *Journal of Organizational Behavior*, *18*, 449–469.

Aragón-Correa, J. A. (1998). Strategic proactivity and firm approach to the natural environment. *Academy of Management Journal*, *41*(5), 556–567.

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, *14*, 396–402.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, *16*, 74–94.

Banerjee, S. B. (2001). Managerial perceptions of corporate environmentalism: Interpretations from industry and strategic implications for organizations. *Journal of Management Studies*, *38*(4), 489–513.

Barney, J. B. (1986). Strategic factor markets: Expectations, luck, and the theory of business strategy. *Management Science*, *32*(10), 1512–1514.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99–120.

Barney, J. B. (2001). Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of Management*, *27*(6), 643–650.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182.

Beckmerhagen, I. A., Berg, H. P., Karapetrovic, S. V., & Willborn, W. O. (2003). Integration of management systems: Focus on safety in the nuclear industry. *International Journal of Quality & Reliability Management*, *20*(2), 210–228.

Beechner, A. B., & Koch, J. E. (1997). Integrating ISO 9001 and ISO 14001. *Quality Progress*, *30*(2), 33–36.

Bellamy, M. A., Ghosh, S., & Hora, M. (2014). The influence of supply network structure on firm innovation. *Journal of Operations Management*, *32*(6), 357–373.

Berchicci, L., Dowell, G., & King, A. A. (2012). Environmental capabilities and corporate strategy: Exploring acquisitions among US manufacturing firms. *Strategic Management Journal*, *33*(9), 1053–1071.

Bernardo, M., Casadesus, M., Karapetrovic, S., & Heras, I. (2009). How integrated are environmental, quality and other standardized management systems? An empirical study. *Journal of Cleaner Production*, *17*(8), 742–750.

Bernardo, M., Casadesus, M., Karapetrovic, S., & Heras, I. (2012). Integration of standardized management systems: Does the implementation order matter? *International Journal of Operations & Production Management*, *32*(3), 291–307.

Bernardo, M., Gotzamani, K., Vouzas, F., & Casadesus, M. (2018). A qualitative study on integrated management systems in a non-leading country in certifications. *Total Quality Management and Business Excellence*, *29*(3–4), 453–480.

Bernardo, M., Simon, A., Tarí, J. J., & Molina-Azorín, J. F. (2015). Benefits of management systems integration: A literature review. *Journal of Cleaner Production*, *94*, 260–267.

Berrone, P., & Gomez-Mejia, L. R. (2009). Environmental performance and executive compensation: An integrated agency-institutional perspective. *Academy of Management Journal*, *52*(1), 103–126.

Boyd, B. K. (1991). Strategic planning and financial performance: A meta-analytic review. *Journal of Management Studies*, *28*(4), 353–374.

Bramoullé, Y., & Olson, L. J. (2005). Allocation of pollution abatement under learning by doing. *Journal of Public Economics*, *89*(9), 1935–1960.

Buckley, M. R., Cote, J. A., & Comstock, S. M. (1990). Measurement errors in behavioral sciences: The case of personality/attitude research. *Educational and Psychological Measurement*, *50*(3), 447–474.

Buysse, K., & Verbeke, A. (2003). Proactive environmental strategies: A stakeholder management perspective. *Strategic Management Journal*, *24*(5), 453–470.

Chow-Chua, C., & Goh, M. (2002). Framework for evaluating performance and quality improvement in hospitals. *Managing Service Quality: An International Journal*, *12*(1), 54–66.

Christmann, P. (2000). Effects of "best practices" of environmental management on cost advantage: The role of complementary assets. *Academy of Management Journal*, *43*(4), 663–680.

Claver, E., Lopez, M. D., Molina, J. F., & Tarí, J. J. (2007). Environmental management and firm performance: A case study. *Journal of Environmental Management*, *84*(4), 606–619.

Curkovic, S., Vickery, S., & Droge, C. (2000). Quality-related action programs: Their impact on quality performance and firm performance. *Decision Sciences*, *31*, 885–905.

Dai, J., Cantor, D. E., & Montabon, F. L. (2017). Examining corporate environmental proactivity and operational performance: A strategy-structure-capabilities-performance perspective within a green context. *International Journal of Production Economics*, *193*, 272–280.

Dangelico, R. M. (2015). Improving firm environmental performance and reputation: The role of employee green teams. *Business Strategy and the Environment*, *24*(8), 735–749.

Demirbag, M., Collings, D. G., Tatoglu, E., Mellahi, K., & Wood, G. (2014). High-performance work systems and organizational performance in emerging economies: Evidence from MNEs in Turkey. *Management International Review*, *54*(3), 325–359.

Dow, D., Samson, D., & Ford, S. (1999). Exploding the myth: Do all quality management practices contribute to superior quality performance? *Production and Operations Management*, *8*(1), 1–27.

Etemad, H. (2004). Internationalization of small and medium-sized enterprises: A grounded theoretical framework and an overview. *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*, *21*(1), 1–21.

Flynn, B. B., Schroeder, R. G., & Sakakibara, S. (1994). A framework for quality management research and associated measurement instrument. *Journal of Operations Management*, *11*, 339–366.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50.

Garcés-Ayerbe, C., Rivera-Torres, P., & Murillo-Luna, J. L. (2012). Stakeholder pressure and environmental proactivity: Moderating effect of competitive advantage expectations. *Management Decision*, *50*(2), 189–206.

Garvin, D. A. (1987). Competing on the 8 dimensions of quality. *Harvard Business Review*, *65*(6), 101–109.

Gianni, M., & Gotzamani, K. (2015). Management systems integration: Lessons from an abandonment case. *Journal of Cleaner Production*, *86*, 265–276.

Gonzalez-Benito, J., & Gonzalez-Benito, Ó. (2005). Environmental proactivity and business performance: An empirical analysis. *Omega*, *33*, 1–15.

González-Benito, J., & González-Benito, Ó. (2006). A review of determinant factors of environmental proactivity. *Business Strategy and the Environment*, *15*(2), 87–102.

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

Greene, W. (2003). Econometric Analysis. *New Jersey*. USA: Prentice Hall.

Guide, V. D. R., & Ketokivi, M. (2015). Notes from the editors: Redefining some methodological criteria for the journal. *Journal of Operations Management*, *37*, v–viii.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis – A Global Perspective* (7th ed.). New Jersey, USA: Pearson Prentice Hall.

Harrison, D. A., McLaughlin, M. E., & Coalter, T. M. (1996). Context, cognition, and common method variance: Psychometric and verbal protocol evidence. *Organizational Behavior and Human Decision Processes*, *68*(3), 246–261.

Hart, S. L. (1995). A natural-resource-based view of the firm. *Academy of Management Review*, *20*(4), 986–1014.

Hayes, A. F., & Preacher, K. J. (2014). Statistical mediation analysis with a multicategorical independent variable. *British Journal of Mathematical and Statistical Psychology*, *67*(3), 451–470.

Henri, J. F., & Journeault, M. (2008). Environmental performance indicators: An empirical study of Canadian manufacturing firms. *Journal of Environmental Management*, *87*(1), 165–176.

Henriques, I., & Sadorsky, P. (1999). The relationship between environmental commitment and managerial perceptions of stakeholder importance. *Academy of Management Journal*, *42*(1), 87–99.

Hofmann, K. H., Theyel, G., & Wood, C. H. (2012). Identifying firm capabilities as drivers of environmental management and sustainability practices–evidence from small and medium-sized manufacturers. *Business Strategy and the Environment*, *21*(8), 530–545.

Janssens, W., Wijnen, K., De Pelsmacker, P., & Van Kenhove, P. (2008). *Marketing Research with SPSS*. UK: Pearson Education Limited.

Jayathirtha, R. (2001). Combating environmental repercussions through 'TQEM' and 'ISO 14000. *Business Strategy and the Environment*, *10*(4), 245–250.

Jørgensen, T. H., Remmen, A., & Mellado, M. D. (2006). Integrated management systems–three different levels of integration. *Journal of Cleaner Production*, *14*(8), 713–722.

Jyoti, J., Kour, S., & Sharma, J. (2017). Impact of total quality services on financial performance: Role of service profit chain. *Total Quality Management and Business Excellence*, *28*(7–8), 897–929.

Karapetrovic, S. (2003). Musings on integrated management systems. *Measuring Business Excellence*, *7*(1), 4–13.

Karapetrovic, S., & Casadesús, M. (2009). Implementing environmental with other standardized management systems: Scope, sequence, time and integration. *Journal of Cleaner Production*, *17*(5), 533–540.

Karapetrovic, S., Casadesús, M., & Heras, I. (2006). *Dynamics (Pembroke, Ont.) and Integration of Standardized Management Systems*. Girona, Spain: Documenta Universitaria.

Karapetrovic, S., & Jonker, J. (2003). Integration of standardized management systems: Searching for a recipe and ingredients. *Total Quality Management and Business Excellence*, *14*(4), 451–459.

Karapetrovic, S., & Willborn, W. (1998). Integration of quality and environmental management systems. *The TQM Magazine*, *10*(3), 204–213.

Kaynak, H. (2003). The relationship between total quality management practices and their effects on firm performance. *Journal of Operations Management*, *21*, 405–435.

Klassen, R. D., & McLaughlin, C. P. (1996). The impact of environmental management on firm performance. *Management Science*, *42*(8), 1199–1214.

Kraus, J. L., & Grosskopf, J. (2008). Auditing integrated management systems: Considerations and practice tips. *Environmental Quality Management*, *18*(2), 7–16.

Labodová, A. (2004). Implementing integrated management systems using a risk analysis based approach. *Journal of Cleaner Production*, *12*(6), 571–580.

Lannelongue, G., Gonzalez-Benito, J., & Gonzalez-Benito, O. (2015). Input, output, and environmental management productivity: Effects on firm performance. *Business Strategy and the Environment*, *24*(3), 145–158.

Lannelongue, G., Gonzalez-Benito, J., Gonzalez-Benito, O., & Gonzalez-Zapatero, C. (2015). Time compression diseconomies in environmental management: The effect of assimilation on environmental performance. *Journal of Environmental Management*, *147*, 203–212.

Larsson, R., & Finkelstein, S. (1999). Integrating strategic, organizational, and human resource perspectives on mergers and acquisitions: A case survey of synergy realization. *Organization Science*, *10*(1), 1–26.

Lee, S. Y., & Klassen, R. D. (2008). Drivers and enablers that foster environmental management capabilities in small-and medium-sized suppliers in supply chains. *Production and Operations Management*, *17*(6), 573–586.

Li, Y. H., Huang, J. W., & Tsai, M. T. (2009). Entrepreneurial orientation and firm performance: The role of knowledge creation process. *Industrial Marketing Management*, *38*(4), 440–449.

Liu, H., Wei, S., Ke, W., Wei, K. K., & Hua, Z. (2016). The configuration between supply chain integration and information technology competency: A resource orchestration perspective. *Journal of Operations Management*, *44*, 13–29.

Liu, Y., Zhu, Q., & Seuring, S. (2017). Linking capabilities to green operations strategies: The moderating role of corporate environmental proactivity. *International Journal of Production Economics*, *187*, 182–195.

MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behavioral Research*, *39*, 99–128.

Maiga, A. S., Nilsson, A., & Ax, C. (2015). Relationships between internal and external information systems integration, cost and quality performance, and firm profitability. *International Journal of Production Economics*, *169*, 422–434.

Malhotra, N. K., & Dash, S. (2011). *Marketing Research: An Applied Orientation* (6th ed.). New York: Pearson.

Malhotra, N. K., Kim, S. S., & Patil, A. (2006). Common method variance in IS research: A comparison of alternative approaches and a reanalysis of past research. *Management Science*, *52*(12), 1865–1883.

McGee, E. C., & Bhushan, A. K. (1993). Applying the Baldrige quality criteria to environmental performance: Lessons from leading organizations. *Total Quality Environmental Management*, *3*(1), 1–18.

Melynk, S. A., Sroufe, R., & Calantone, R. (2003). Assessing the impact of environmental management systems on corporate and environmental performance. *Journal of Operations Management*, *21*(3), 329–351.

Menguc, B., & Ozanne, L. K. (2005). Challenges of the "green imperative": A natural resource-based approach to the environmental orientation–business performance relationship. *Journal of Business Research*, *58*(4), 430–438.

Merino-Diaz de Cerio, J. (2003). Quality management practices and operational performance: Empirical evidence for Spanish industry. *International Journal of Production Research*, *41*, 2763–2786.

Molina-Azorin, J. F., Tari, J. J., Claver-Cortes, E., & Lopez-Gamero, M. D. (2009). Quality management, environmental management and firm performance: A review of empirical studies and issues of integration. *International Journal of Management Reviews*, *11*(2), 197–222.

Morrow, D., & Rondinelli, D. (2002). Adopting corporate environmental management systems: Motivations and results of ISO 14001 and EMAS certification. *European Management Journal*, *20*(2), 159–171.

Nehrt, C. (1996). Timing and intensity effects of environmental investments. *Strategic Management Journal*, *17*(7), 535–547.

Nunnally, J. C. (1978). *Psychometric Theory* (2nd ed.). New York, NY: McGraw-Hill.

Organ, D. W., & Greene, C. N. (1981). The effects of formalization on professional involvement: A compensatory process approach. *Administrative Science Quarterly*, *26*, 237–252.

Parvadavardini, S., Vivek, N., & Devadasan, S. R. (2016). Impact of quality management practices on quality performance and financial performance: Evidence from Indian manufacturing companies. *Total Quality Management and Business Excellence*, *27*(5–6), 507–530.

Patyal, V. S., & Koilakuntla, M. (2017). The impact of quality management practices on performance: An empirical study. *Benchmarking: An International Journal*, *24*(2), 511–535.

Pearce, J. A., Freeman, E. B., & Robinson, R. B. (1987). The tenuous link between formal strategic planning and financial performance. *Academy of Management Review*, *12*(4), 658–675.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Applied Psychology*, *88*(5), 879–903.

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, *63*, 539–569.

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

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891.

Rao, M. P. (2006). A performance measurement system using a profit-linked multi-factor measurement model. *Industrial Management & Data Systems*, *106*(3), 362–379.

Ray, G., Barney, J., & Muhanna, M. (2004). Capabilities, business processes, and competitive advantage: Choosing the dependent variable in empirical tests of the resource-based view. *Strategic Management Journal*, *25*, 23–38.

Rebelo, M. F., Santos, G., & Silva, R. (2016). Integration of management systems: Towards a sustained success and development of organizations. *Journal of Cleaner Production*, *127*, 96–111.

Remmen, A., & Lorentzen, B. (2000). Employee participation and cleaner technology: Learning processes in environmental teams. *Journal of Cleaner Production*, *8*(5), 365–373.

Richardson, H. A., Simmering, M. J., & Sturman, M. C. (2009). A tale of three perspectives examining post hoc statistical techniques for detection and correction of common method variance. *Organizational Research Methods*, *12*(4), 762–800.

Rocha, M., Searcy, C., & Karapetrovic, S. (2007). Integrating sustainable development into existing management systems. *Total Quality Management and Business Excellence*, *18*(1–2), 83–92.

Rondinelli, D., & Vastag, G. (2000). Panacea, common sense, or just a label? The value of ISO 14001 environmental management systems. *European Management Journal*, *18*(5), 499–510.

Russo, M. V., & Fouts, P. A. (1997). A resource-based perspective on corporate environmental performance and profitability. *Academy of Management Journal*, *40*(3), 534–559.

Salomone, R. (2008). Integrated management systems: Experiences in Italian organizations. *Journal of Cleaner Production*, *16*(16), 1786–1806.

Sampaio, P., Saraiva, P., & Guimarães Rodrigues, A. (2009). ISO 9001 certification research: Questions, answers and approaches. *International Journal of Quality & Reliability Management*, *26*(1), 38–58.

Sanz-Calcedo, J. G., González, A. G., López, O., Salgado, D. R., Cambero, I., & Herrera, J. M. (2015). Analysis on integrated management of the quality, environment and safety on the industrial projects. *Procedia Engineering*, *132*, 140–145.

Sarkis, J. (1998). Evaluating environmentally conscious business practices. *European Journal of Operational Research*, *107*, 159–174.

Searcy, C., Karapetrovic, S., & McCartney, D. (2009). Designing corporate sustainable development indicators: Reflections on a process. *Environmental Quality Management*, *19*(1), 31–42.

Sharma, S., & Vredenburg, H. (1998). Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities. *Strategic Management Journal*, *19*(8), 729–753.

Shrivastava, P. (1995). Environmental technologies and competitive advantage. *Strategic Management Journal*, *16*, 183–200.

Sila, I., & Ebrahimpour, M. (2005). Critical linkages among TQM factors and business results. *International Journal of Operations & Production Management*, *25*(11), 1123–1155.

Simon, A., Bernardo, M., Karapetrovic, S., & Casadesús, M. (2011). Integration of standardized environmental and quality management systems audits. *Journal of Cleaner Production*, *19*(17), 2057–2065.

Simon, A., Karapetrovic, S., & Casadesús, M. (2012). Evolution of integrated management systems in Spanish firms. *Journal of Cleaner Production*, *23*(1), 8–19.

Simon, A., Yaya, L. H. P., Karapetrovic, S., & Casadesus, M. (2014). Can integration difficulties affect innovation and satisfaction? *Industrial Management & Data Systems*, *114*(2), 183–202.

SME User Guide (2016). *User Guide to the SME Definition*. European Commission, Brussels: Enterprise and Industry Publications.

Smith, G. (2004). An evaluation of the corporate culture of South West airlines. *Measuring Business Excellence*, *8*(4), 26–33.

Srivastava, R. K., Fahey, L., & Christensen, H. K. (2001). The resource-based view and marketing: The role of market-based assets in gaining competitive advantage. *Journal of Management*, *27*(6), 777–802.

Steger, U. (2004). *The Business of Sustainability*. *Basingstoke*. UK: Palgrave Macmillan.

Steven, A. B., Dong, Y., & Corsi, T. (2014). Global sourcing and quality recalls: An empirical study of outsourcing-supplier concentration-product recalls linkages. *Journal of Operations Management*, *32*(5), 241–253.

Tatoglu, E., Bayraktar, E., & Arda, O. A. (2015). Adoption of corporate environmental policies in Turkey. *Journal of Cleaner Production*, *91*, 313–326.

Venkatraman, N. (1989). The concept of fit in strategy research: Toward verbal and statistical correspondence. *Academy of Management Review*, *14*, 423–444.

Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. *Academy of Management Review*, *11*(4), 801–814.

Wilkinson, G., & Dale, B. (1999). Integrated management systems: An examination of the concept and theory. *The TQM Magazine*, *11*, 95–104.

Williams, L. J., Edwards, J. R., & Vandenberg, R. J. (2003). Recent advances in causal modeling methods for organizational and management research. *Journal of Management*, *29*, 903–936.

Yüksel, H. (2008). An empirical evaluation of cleaner production practices in Turkey. *Journal of Cleaner Production*, *16*(1), S50–S57.

Zeng, S., Tian, P., & Shi, J. (2005). Implementing integration of ISO 9001 and ISO 14001. *Managerial Auditing Journal*, *20*, 394–407.

Zeng, S. X., Shi, J. J., & Lou, G. X. (2007). A synergetic model for implementing an integrated management system: an empirical study in China. *Journal of Cleaner Production*, *15*(18), 1760–1767.

Zeng, S. X., Tam, V. W., & Tam, C. M. (2008). Towards occupational health and safety systems in the construction industry of China. *Safety Science*, *46*(8), 1155–1168.

Zutshi, A., & Sohal, A. S. (2005). A framework for environmental management system adoption and maintenance: An Australian perspective. *Management of Environmental Quality: An International Journal*, *16*(5), 464–475.

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