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Review

Quality and Environmental Management Linkage: A Review of the Literature

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Abstract: This article presents a conceptual and empirical review of the literature related to the link between the different perspectives, models, and tools associated with Quality Management and Environmental Management. Several academic works identified in the literature that aimed to establish conceptual similarities between QM and EM are reviewed and discussed. In general, terms, the scholarly literature suggests that the main quality practices and programs associated with the Quality Management paradigm—such as ISO 9001 and Total Quality Management—facilitate the adoption of environmental practices associated with corporate Environmental Management. However, there is evidence of certain limitations driven by different biases, whether or not they are recognized in the reviewed publications. The concentration on some avenues of research focused on very detailed aspects of the linkage between QM and EM is discussed. Conversely, lines that have been overlooked and are in need for more research were also identified. The implications for scholars, such as suggestions for further research, are included as a contribution of the article.

Keywords: environmental management; quality management; ISO 9001; Business Excellence Models; EFQM; ISO 14001

1. Introduction

The mainstream scholarly and practitioner literature emphasizes that management principles, models, and practices contribute to the achievement of sustainable development. More specifically, the impact of the adoption of management practices associated with the Quality Management (QM) paradigm—such as Business Excellence Models (e.g., the EFQM self-assessment model or the Deming Prize Model) or meta-standards (e.g., ISO 9001)—and their potential positive impact on the improvement of corporate Environmental Management (EM) and on sustainability (e.g., the improvement of corporate environmental performance) have been identified in the literature.

Nevertheless, the positive win-win relationship between QM (approach and practices), EM, and sustainability is not automatic, and the scholarly findings related to this relationship need to be reviewed. As Zhu and Sarkis [1] argued in 2004, there has been very little systematic investigation of the linkage between QM and EM. More recently, Pereira-Moliner et al. [2] and Chugani et al. [3] have noted that little attention has been paid to the potential influence of QM on EM. As far as we know, no previous literature review of empirical works that have analyzed the impact of QM practices on EM has been carried out. Previous research has focused attention on the effect of QM practices on resource efficiency, in order to stress how the QM paradigm could generate benefits at the economic and environmental levels. However, research has not explored the complex linkage between QM and EM.

For instance, Chugani et al. [3] have recently reviewed 70 academic articles (of which 45 were based on empirical study) in order to analyze the environmental (green) impact of various QM practices such as Lean Manufacturing, Lean Six Sigma and Six Sigma. In their review, these authors evidenced that both Lean Manufacturing and Six Sigma can be considered effective methods to improve the eco-efficiency (e.g., support the conservation of resources, combat global warming, and save energy) of an organization (Chugani et al., 2017) [3]. Similarly, Garza-Reyes [4] reviewed 59 articles and conference presentations related to Lean and Green published between 1997 and 2015. This author found that the concepts of lean and green can effectively work together. In a similar vein, other literature reviews that have analyzed the linkage between ideas and/or tools related to QM and their impact on environmental aspects could be mentioned—some that cover environmental issues more broadly (e.g., sustainability or corporate greening) and others that are more specific (e.g., ISO 14001, life cycle assessment, or eco-design) (see below). Finally, Aquilani et al. [5] reviewed the sophisticated linkage between sustainability, value co-creation, TQM, EM, and Integrated Management Systems.

Considering this gap in the literature and the call for papers for the Special Issue '*Quality Management and Sustainable Development*' of *Sustainability*, this article reviews the conceptual and empirical literature related to the linkage between the different perspectives, models, and tools associated with QM and EM. The remainder of the paper is organized as follows. First, the review of the conceptual literature on the relationship between QM and EM is summarized. Second, the empirical literature review carried out is described, together with the methodology used for that purpose. Finally, the discussion and conclusion, which highlight the main contributions, practical implications, and avenues for future research, is presented.

2. Quality Management and Environmental Management: A Conceptual Review

There are several works in the academic literature that try to establish conceptual similarities between QM and EM. This brief section does not aim to conduct a systematic review of these works, but only to provide a general descriptive and exploratory introduction, due to the current scattered state of the literature.

Analyzing the theoretical and conceptual literature that focuses on the relationship between QM and EM, the influence of some of the contributions from quality experts must be noted (e.g., [6]). Reference is often made to Taguchi's definition of quality as minimal losses caused to society during the useful life of a product [7]. Heras-Saizarbitoria et al. [8] rely on this definition in the QM paradigm to coin novel concepts, such as social and environmental quality, by which they mean the incorporation in the field of business management of the trend to minimize the negative social and environmental impacts of the activities of organizations. In proposing this term, these authors also refer to Ishikawa's definition of optimum quality, understood as the intersection of the programmed or designed quality, the achieved quality, the quality required by the customers and by society as a whole (see Figure 1).

Although there are many definitions of QM, one of the most common defines it as a philosophy of principles, practices, and tools [9]. QM includes main principles such as continuous improvement and customer focus. In addition, the concern or consideration of sustainability can be seen as a requirement by customers in two different ways: first, as environmental sustainability is becoming an explicit need; second, as some academics in the field of QM, such as Garvare and Johansson [10], argue that society is an actor or client per se.

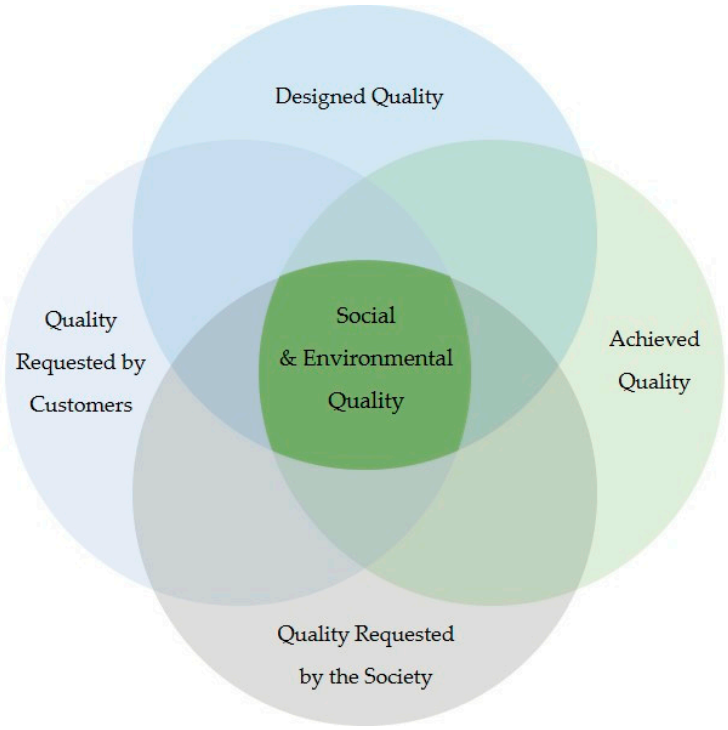

Figure 1. Social and environmental quality as the intersection between designed and achieved quality, and quality requested by the customers and society. Source: adapted from Heras-Saizarbitoria et al. [8].

As Pereira-Moliner et al. [2] and de Sousa Jabbour et al. [11] have argued, QM practices aim to improve the efficiency of organizational processes in order to eliminate defects. Specific practices such as 'zero defects' are very closely related to the 'no waste' goal of EM-based systems. Efforts to eliminate pollution and waste through EM can follow the same basic principles applied in QM, as both practices share a similar focus: using inputs more efficiently. Due to this and other similarities, organizations that have adopted QM practices might foster and develop a set of skills that facilitate the adoption of EM practices [2]. Nevertheless, as underlined by Molina-Azorín et al. [12], QM and EM perspectives also differ in a set of (substantive) respects. For example, despite both systems aiming to satisfy the needs of customers and other stakeholders such as shareholders, suppliers and employees, among many others, EM is a wider approach. The EM is also focused on other stakeholders beyond the conventional ones for QM such as the public administrations, NGOs, the local community and the general public, among many others [12].

Among the works that focus on specific perspectives, approaches, or tools related to the QM paradigm, there are many that discuss the possible theoretical contribution of TQM to sustainability (e.g., [13–16]). However, there is no paper studying the theoretical implications of the main frameworks for the development and adoption of the principles and practices related to TQM, with the notable exception of the work by Tarí and Molina-Azorín [17], which analyzes the implications of the EFQM self-assessment model for EM. As QM and EM systems have several similarities, these authors suggest that the EFQM self-assessment model could be a bridge toward the adoption of an integrated management system that considers both QM and EM issues and practices.

With the generation and dissemination of the meta-standards for EM [18], the QM paradigm and its related conceptualization have influenced the way organizations approach sustainability in many ways, which has also been reflected in the relationship between QM and EM (see Table 1). The foundational and crucial idea that underlies the meta-standards for EM and other sustainability issues on which new standards have been generated in recent years—e.g., biodiversity management [19]—is based on fundamental ideas and concepts associated with QM, such as the PDCA (Plan-Do-Check-Act) cycle of continuous improvement. As Zeng et al. [20] and

Zhu et al. [21] emphasized, the models for continual improvement are very similar for both QM and EM systems, especially if the ISO 9001:2015 and the ISO 14001:2015 versions of the meta-standards are considered [22–24]. Indeed, as has been highlighted in several works that analyze the symbolic and substantive impact of meta-standards such as ISO 14001 (e.g., [6,25,26]), there is some discussion of whether these meta-standards actually contribute to the substantive improvement of environmental performance, other than being able to systematize activities, due to the procedural rather than performance orientation of this type of standard.

Table 1. Review of studies (selection) that analyzed the impact of QM on EM.

Study	#	Main Conclusions
Siva et al., 2016	[27]	QM practices, principles & tools may be used to try to support EM.
Borri and Boccaletti, 1995	[28]	Existence of a correlation between QM and EM systems.
Curkovic et al., 2000	[29]	Strong relationship between TQM and environmentally responsible manufacturing (ERM) systems.
Giancarlo, 2005	[30]	The link between QM and EM is relevant. Environmental factors might play a relevant role among many aspects related to QM.
Klassen and McLaughlin, 1993	[31]	Relation between the concept, approach, methodology, and benefits of TQM and EM in the field of operations management.
Heras-Saizarbitoria and Boiral, 2013	[18]	Companies with a QM system in accordance with IS0 9001 linked with an EM system in accordance with IS0 14001 obtain greater benefits than others.
Beckmerhagen et al., 2003; Beechner and Koch, 1997; Poksinska et al., 2003; Rodríguez and Ricart, 2000; Wilkinson and Dale, 1999; Zeng et al., 2005; Zutshi and Sohal, 2005	[20,32–37]	Companies with a QM system in accordance with IS0 9001 linked with an EM system in accordance with IS0 14001 are: • Improving the effectiveness and efficiency of the companies; • Avoiding unnecessary efforts; • Reducing bureaucracy by eliminating duplication of policies, procedures, and records; • Aligning resources, processes, and goals; • Reducing the costs of external and internal audits; • Improving communication among all organizational levels.
Molina-Azorín et al., 2009	[38]	Relevant benefits are obtained for EM when applying principles and practices related to QM.
Pereira-Moliner et al., 2012	[2]	QM and EM practices share a similar focus, namely using inputs more efficiently. Previous implementation of QM practices can facilitate the adoption of EM.
Rusinko, 2005	[39]	QM can be used as a bridge between QM theory and environmental sustainability.

Source: summary compiled by the authors.

Angell and Klassen [40] stressed that the QM toolbox may be suitable for incorporating sustainability considerations because it focuses on meeting customer expectations [9]. In addition, in some QM (e.g., [41–44]) and EM (e.g., [31,45,46]) studies, it has been shown that the meta-standards used in the two fields have common implementation practices (e.g., leadership, training, self-assessment, and continuous improvement). Therefore, for many authors, it seems logical to use QM-related tools, methods, and practices while implementing an EM system. Similarly, Luttropp and Lagerstedt [47] and Maxwell and Van der Vorst [48] argue that sustainability considerations are more likely to be taken into account in a company's day-to-day business if they are integrated into existing work procedures rather than requiring the development of new ones.

Other scholars have highlighted more similarities between QM and underlying corporate EM practices and initiatives [29,31,39,49]. As with QM, it is argued that one of the long-term objectives of EM is to take a proactive stance, considering environmental aspects in an integrated manner in product design, throughout the manufacturing process, marketing, product delivery, and customer service [50–52]. Rusinko [39], for example, points to several QM principles that can be used to support initiatives to implement sustainability practices.

In addition, in their seminal works in the field, Blake [53] and Welford [54] argue for the use of TQM for environmental applications by identifying common principles with strategic EM and establishing thematic bridges to TQM philosophies. Thus, in the conventional scholarly literature, a set of concepts and terms has been coined, such as Green Quality or Green Quality Practices [55], and Total Environmental Management or Total Quality Environmental Management (TQEM) [49,56–60], the latter potentially being the most successful. Similarly, Angell and Klassen [40] have pointed out that the philosophy underlying TQEM is that the principles of TQM are also applicable to environmental improvement. Borri and Boccaletti [28] have also suggested that TQEM clearly reflects the existing parallelism between quality and environmental problems. Indeed, the TQEM principles are analogous to many of the proposed models and principles of corporate sustainability and EM (e.g., the 16 principles of the ICC Business Charter for Sustainable Development). These authors also refer to the parallels between QM and EM in specific perspectives and practices such as zero defects, conformity to customer requirements, and quality reporting and audits. Harrington et al. [61] have also used the concept of TQEM to refer to the need to integrate the fairly widespread application of TQM principles to environmental management. These authors base their concept on a proposal of the Global Environmental Management Initiative (GEMI), a coalition of firms established in 1990. For Khadour [62], TQEM emerged in the manufacturing sector from the integration of strategic EM into the holistic approach of TQM. Based on this corporate initiative, TQEM embodies four key principles: customer identification, continuous improvement, doing the job right the first time and a systemic approach [61]. For Miles and Covin [63], the TQEM approach is simply TQM augmented by a stakeholder theory approach in a way that internalizes environmental costs and benefits when assessing the organization's level of quality.

Finally, it should be noted that no new conceptual proposals have been made in recent years in relation to the analyzed issue. This may be due either to saturation of the QM paradigm or to the general reduction in the number of conceptual models that have been investigated, as noted by Heras-Saizarbitoria in his analysis of the diffusion of theories [64].

3. Method

The empirical literature review followed the approach used in most systematic reviews (e.g., [65]). The literature search was limited to empirical studies published in international journals between 1987 and 2018. The year 1987 was chosen because it corresponds to the launch of ISO 9000, an important date in the evolution of the QM paradigm [4]. Only papers written in English and Spanish were considered for the literature review, because of the dominance of these languages in the scholarly literature. Due to the previously mentioned reviews carried out by Chugani et al. [3] and Garza-Reyes [4] on the impact of Six Sigma and lean management, respectively, on EM; those two topics, and other topics directly or indirectly connected to them were not considered. The empirical review focused on analyzing the linkage between the main practices and programs associated with the QM paradigm, such as ISO 9001 and the international reference models for TQM, and EM. Keywords associated with QM—such as 'Total Quality Management', 'quality management', 'management systems', 'ISO 9000', 'ISO 9001', 'TQM', 'Business Excellence', 'Business Excellence Models', and 'EFQM'—combined with keywords related to EM—such as 'environmental management', 'sustainability,' and 'corporate greening', among many others—were used to find relevant papers.

The most relevant electronic databases (e.g., Science Direct, ABI/INFORM, and ProQuest) as well as Google Scholar were used for these searches. Practical and methodological screening was used for inclusion and exclusion of items, and to focus on the articles that fit with the objectives of the search, considering the very scattered nature of the literature. Given the vast amount of research on QM and MS, based on a wide diversity of objectives and methods, a review protocol using inclusion and exclusion criteria was used, as suggested in Boiral et al. [61]. This screening (see Table 2) was achieved through the analysis of the title, the abstract and the keywords of the reviewed works. In line with the aim of the systematic review and the focus on empirical works, theoretical articles and those

that did not clearly deal with the impact of specific models and tools related to QM (e.g., the EFQM self-assessment model, ISO 9001 standards) on EM were excluded. Works analyzing how EM combined with QM can have a significant impact on performance or work related to organizational innovations (that could be related to the QM paradigm) and its potential impact on EM were not included—for example, works by Ostrom et al. [66], Nyangon et al. [67], and Taminiau et al. [68]. This process led to the final selection of 65 papers that met the requirements of the review (e.g., relevance and focus), although, as described below, a set of papers was not scrutinized in more depth after the initial analysis.

Table 2. The criteria for inclusion and exclusion of articles.

Inclusion Criteria	Exclusion Criteria
Paper published in the 1987–2018 period; Paper published in peer-reviewed journals; Paper addressing the impact of the adoption of specific models and tools related to QM (e.g., the EFQM self-assessment model, ISO 9001 standards) on EM; Paper with rigorous methods (quantitative, qualitative or mixed methods) and clearly explained.	Theoretical and/or conceptual papers with no empirical content; Books, book chapters, PhD Theses, reports, conference proceedings and similar works; Empirical scholarly papers which analyze the linkage of tools or techniques that could be associated very loosely to the QM paradigm on EM; Empirical scholarly papers which analyze the linkage of models and tools associated with the QM paradigm on EM bur indirectly (i.e., not as the aim of the work); Success stories about the linkage of QM on EM not based on a scholarly analysis; Papers published in other languages than English and Spanish.

Source: compiled by the authors.

4. Results

The review showed that the more recent empirical academic literature has not focused on analyzing the effect that QM has on corporate sustainability in general and on EM practices in particular. Two types of studies were identified, according to their main outcomes: those establishing a negative relationship between QM and EM (see Table 3), which are in the minority (e.g., [69–72]), and those reporting positive results (see Table 4), stating that QM is closely related to the promotion of EM, and innovation in EM in particular (e.g., [24–28,35,36,42,73–80]). Other authors, such as Steiber and Alänge [73], point out that while some aspects of QM could actually bring benefits to EM (e.g., environmental innovation), the question of whether QM as a whole does so is not very clear.

Table 3. Review of empirical studies showing a negative relationship between QM and EM.

Study	#	Sample (Number of Companies)	Country	Main Findings
Castillo-Rojas et al., 2012	[63]	249	Spain	Tools and methodologies of QM are based on excessive formalization and systematization, which hinder EM (e.g., green innovation) as they increase bureaucracy.
Zeng et al., 2017	[64]	238	USA, Italy, Japan, Germany, Sweden Korea, Austria, and Finland	Excessive formalization hinders the creativity of companies. It is necessary to align the practices and tools of QM with issues related to EM.
Li et al., 2018	[66]	407	China	Report a negative correlation between QM and innovation in EM.
Manders et al., 2016	[65]	100	China	QM is negatively correlated with innovation in EM, although the environmental regulation itself significantly mitigates this impact.

Source: summary compiled by the authors.

The majority of the papers establishing a negative relationship between QM and EM have suggested that QM tools and methodologies—especially those of ISO 9001—tend to increase the formalization and systematization of processes in organizations, hindering a set of aspects related to EM, such as green innovation, as they increase bureaucracy [63]. Other authors, such as Prajogo and Sohal [74], and Zeng et al. [64], refer to the hindering of companies' creativity by the application of excessive formalization. In the same vein, Li et al. [66] carried out an empirical analysis of the impact of QM on aspects related to the innovation of EM. Based on a sample of 407 companies from China for the 2008–2014 time period, these authors found that QM correlated negatively with innovation in the field of EM, although the environmental regulation itself significantly mitigated this impact.

Table 4. Review of empirical studies showing a positive relationship between QM and EM.

Study	#	Sample (Number of Companies)	Country	Main Findings
Corbett and Cutler, 2000	[42]	7	New Zealand	Having a QM system in place facilitates the development of an EM system.
Craig and Lemon, 2008	[75]	12	China and Poland	QM as a support to the implementation of EM systems and sustainability management.
de Sousa Jabbour et al., 2014	[11]	95	Brazil	QM practices are linked with the improvement of EM and the environmental performance of firms.
Fok et al., 2009	[81]	323	USA	Companies with better QM are perceived by employees with a higher concern for EM.
King and Lenox, 2001	[6]	17,499	USA	Initiatives related to QM such as Lean production are linked with an improvement of EM (e.g., better prevention of pollution).
Llach et al., 2013	[82]	374	Spain	There are synergies between QM and EM practices. QM provides a valuable learning for EM.
Molina-Azorín et al., 2015	[12]	368	Spain	Firms with QM practices have fewer obstacles to adopt EM.
Nguyen et al., 2018	[73]	144	Vietnam	Proposal and validation of an instrument to measure QM practices and sustainable development. Identification of four QM practices with significant positive impact on sustainable development: the support of top management, the design process, the quality of data and the generation of reports, and continuous improvement.
Pereira-Moliner et al., 2012	[2]	259	Spain	QM practices facilitate the adoption of practices related to EM.
Pipatprapa et al., 2017	[83]	178	Thailand	QM and innovativeness positively and significantly affect EM and green performance, both directly and indirectly.
Poksinska et al., 2003	[31]	142	Sweden	The presence of a QM system made it easier to adopt an EM system, as the principles to adopt management systems in both are similar.
Roy et al., 2001	[84]	250	Canada	EM and environmental commitment is often linked to sound management practices such as TQM.
Saraph et al., 1989	[41]	162	USA	Very common self-reinforcing practices between QM systems and EM systems: leadership, training, self-assessment, and continuous improvement.
Teixeira et al., 2017	[85]	104	Brazil	Positive and significant linkage between QM & EM.
Wiengarten and Pagell, 2012	[77]	1142	16 countries	QM is positively linked to EM. In addition, both are positively connected to operational performance.
Yang et al., 2010	[74]	107	Taiwan	Organizations with relevant QM practices are more likely to develop relevant proactive EM practices.
Yang et al., 2011	[78]	309	22 countries	Prior lean manufacturing experiences, associated with QM, are positively related to EM practices.
Zhu and Sarkis, 2004	[1]	27	China	QM has a relevant impact on the management support for EM in SMEs.
Zhu et al., 2013	[21]	377	China	The adoption of ISO 9001 is helpful for the adoption of ISO 14001 and more generalized TQEM.

Source: summary compiled by the authors.

The second group of research papers suggested a positive relationship between QM and EM (see Table 4). For example, in their study carried out in Brazil, de Sousa Jabbour et al. [11] found that QM is a relevant antecedent for the EM maturity of an organization. Similarly, based on a sample of 144 responses from Vietnamese companies, Nguyen et al. [73] found that QM practices have various positive impacts on EM (e.g., environmental performance). These authors identified four QM practices that have a significant positive impact on EM and sustainable development: senior management support, design process, data and reporting quality, and continuous improvement. Another recent study carried out by Teixeira et al. [85] with firms from Brazil evidenced a positive and relevant linkage between QM practices and EM. They suggested that firm size and ISO certification also have a significant and positive effect on EM practices, as reported in the previous literature (e.g., [11,85–89]).

Following this line of argumentation, Wiengarten and Pagell [78] analyzed the interaction between QM and EM practices in relation to operational performance. These authors concluded that QM practices such as ISO 9001, SPC, and TQM could improve the outcomes of EM practices such as the adoption of ISO 14001, pollution prevention, material recycling, and waste reduction. They suggested that the ISO 9001 standard could also be of interest for the improvement of EM as this standard can be associated with better process control and this could in turn be associated with a better EM. Some authors (e.g., [36,46]) have suggested that a well-functioning QM system may be a prerequisite for the successful implementation of EM practices. As shown in Table 4, another type of study found evidence of how QM contributes to environmental performance [77,78,90].

Finally, there are many works—around 60% of all the identified papers—that focused on the QM and EM linkage, but whose analysis has not been considered. These were excluded in the post-screening phase, taking into account the inclusion and exclusion criteria. These represent a prolific line of research in the literature related to the integration of meta-standards (e.g., [91–97]). This rather 'technical' perspective of analysis has underlined that the integration of systems for QM and EM brings a series of benefits in addition to those already obtained individually with each of the systems (e.g., [41,98]). The following benefits, among others, have been highlighted in the literature [20,29–34]: the improvement of the efficiency of the firms, the alignment of goals and the reduction of the costs of external and internal audits, among many others. These works share an orientation towards the study of the linkage between QM and EM, as the 'technical' aspects of the integration of meta-standards are crucial. Aspects such as the way the documentation base of the QM and EM systems are integrated, and the very specific procedures aimed to carry out internal audits in organizations. As those specific aspects might not be considered as relevant for the study of the QM/EM linkage in general (see the exclusion criteria) we decided to exclude them. In our opinion, these works should be reviewed separately, given their homogeneous characteristics.

5. Discussion and Conclusions

The conventional scholarly literature—which is strongly influenced by practitioners in this field—suggests that QM can be particularly suitable as a perspective to help company managers to adopt corporate EM and other related environmentally sustainable practices [36]. QM and environmental sustainability share common aspects that have been analyzed by many works in the field of management, some of which are considered classics in the field (e.g., [99,100]). Similarly, as has been shown in the conceptual and empirical review, several authors indicate that the adoption of QM practices results in significantly greater organizational support for the adoption of EM principles. This background has facilitated the proposal of new terms and concepts such as the TQEM, which have not had much success, even in geographical areas where the QM paradigm has been particularly successful.

Other works about the specific practices related to QM—such as the impact of the most well-known standards for QM (e.g., ISO 9001)—are not as positive or optimistic about their results. Therefore, more empirical research is needed with regard to specific QM practices and their real contribution to the EM practices.

As underlined in the conceptual review, QM and EM practices seem to share a similar focus, namely using inputs more efficiently. Due to this and other similarities, as underlined by several authors, organizations that have adopted QM practices might foster and develop a set of skills that help the adoption of EM practices. The positive relationship between QM and EM can be explained by the resource-based view of the firm, which focuses on the development of specific capabilities and key competencies that improve the effectiveness and competitive advantage of organizations (e.g., [99,101,102]). The adoption of QM practices develops internal skills, competences, and capabilities that facilitate the effective implementation of EM initiatives. Nevertheless, the development of internal capabilities underlying such a win-win relationship presupposes that the adoption of QM and EM practices is internalized in the daily activities of organizations. Many studies based on the neo-institutional theory have shown the disconnect between statements and official practices on QM and EM, and how these practices are internalized in practical terms (e.g., [25,103,104]). According to this approach, the adoption of QM and EM systems in organizations is motivated by external pressures rather than by the search for improvement of internal practices and performance. As a result, the implementation of those practices is often superficial and mostly intended to improve corporate image. Whether the relationship between QM and EM is positive or negative may depend on the internalization of both quality and environmental practices. When those practices are superficial, they tend to increase bureaucracy, excessive formalization, and disconnection with daily activities, as hypothesized by the neo-institutional approach. Conversely, when those practices are internalized in the organization, QM and EM initiatives tend to reinforce each other, to encourage organizational learning, the development of internal competences, and the improvement of organizational effectiveness, as hypothesized by the resource-based view. Researchers interested in the analysis of the linkage between QM and EM should keep this type of issue very much in mind, and further explore the conditions that could encourage a win-win relationship.

The impact of various QM practices also needs to be further investigated. One of the most surprising results of the empirical literature review is that most of the works that analyze the main pillars of the QM paradigm focus on the impact of the ISO 9001 meta-standard on EM. This phenomenon may reflect the greater attractiveness of certifiable schemes for researchers. These schemes are dichotomous for the variable under focus: you either have the certificate, or you do not. For example, in many countries, there are public registries of certified companies. As Häversjö [105] noted in 2000, the research of many aspects related to certifiable voluntary standards, such as ISO 9001 and ISO 14001, has been a veritable Klondike for researchers from all types of field, due to the availability of data. This is not the case for other practices associated with QM, such as TQM.

On the other hand, the impact of Business Excellence Models on EM does not feature in the literature. Many works that discuss the possible theoretical contribution of TQM to sustainability were found, but there is a lack of applied works (e.g., empirical works) that shed light on the real effects of the adoption of Business Excellence Models such as the EFQM self-assessment model on the sustainability of organizations. Surprisingly, although 'technical' lines of research have focused on very specific aspects of the linkage between QM and EM, other lines of research have not been followed at all. Therefore, one recommendation from the literature review is the need to study the impact of these models—rather widely disseminated in some geographical areas and in certain sectors of activity—on EM and the sustainability of organizations in general.

Many limitations (e.g. distorsions) were found in the reviewed works, although in most cases, those limitations were not recognized in the reviewed works themselves. For example, with few exceptions, when studying the process of adopting practices, tools and systems related to QM and EM, only the managers—and especially the managers in charge of the systems themselves—are surveyed or interviewed. This way of proceeding leads to the suspicion that research results may be limited by biases of various kinds. For example, as has been stressed in several works that study the implications of the adoption of QM and EM practices (e.g., [18,25,106,107]), managers generally tend to answer in the tone of the 'rhetoric of success' [108]. It is also possible that social desirability and organizational

biases, two biases that could limit the quality and reliability of the findings and conclusions of the reviewed works, have an impact, as noted in a set of works (e.g., [19,109–112]). To reduce this type of bias and limitation, it is important to consider the complexity of the adoption process related to both QM and EM. Among many other issues, there is a need to give voice to some of the main internal stakeholders of the companies, such as middle managers, possibly not related to the QM and EM areas and—perhaps especially—non-management employees. The perspective of these very important internal stakeholders in the analysis of the potential of QM practices for EM has been under researched if not ignored, even though the need to engage these stakeholders is underlined in the literature.

Finally, one of the limitations of the present study also suggests lines for possible future research. There is a need for a less restrictive perspective to review the scholarly empirical works that analyze the impact of QM on EM. Further work should try to shed more light on the implications, shortcomings and contradictory nature of many of the scholarly studies of the field.

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