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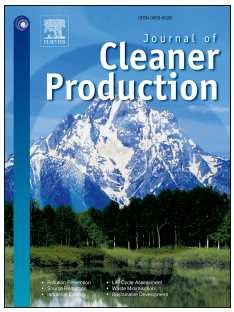

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The support of Quality Management to sustainable development: A literature review

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Abstract

Quality Management is considered to be suitable as support for the integration of sustainability considerations in areas such as product development. The purpose of this paper is to review research in which Quality Management methods, tools or practices have been used in conjunction with sustainable development initiatives. We have identified four themes that synthesize the research on Quality Management and its support to approaches for sustainable development: (I) supporting sustainability through integration of management systems, (II) Quality Management as support to the implementation of Environmental Management Systems and to the management of sustainability, (III) supporting integration of sustainability considerations in daily work, and (IV) supporting stakeholder management and customer focus. By far the most research has been conducted within the first two themes. This paper also contributes with proposals for future research, such as the need to move beyond existing standards and management systems to enable more radical improvements, and the need for empirical evidence of the effect of integrated management systems on environmental performance. We also highlight the point that Quality Management practices and tools must be developed and adapted in order to support sustainability considerations.

Keywords: Quality Management, sustainable development, sustainability, literature review

1 Introduction

For many years, environmental protection or sustainable development were considered unimportant for profit-generating businesses. During the 1980s, environmental regulations were sharpened and progressive companies worked to comply with them (Berry and Rondinelli, 1998). During the 1980s, those regulations primarily aimed to control pollutants found at the "end of the pipe" (Stuart, 2000). In the late 1980s and early 1990s, environmental work in the industrial sector became less driven by compliance and more driven by internal strategy, following increasing environmental expectations from various stakeholders (Lent and Wells, 1994). It has been argued that environmental and sustainability issues are now considered to be of critical strategic importance (Rosen, 2001).

The Brundtland Commission's report entitled "Our common future" expanded sustainable development to not only include environmental concerns, but also social and economic dimensions (Brundtland, 1987). That report can be considered as a starting point for the increased strategic interest. At the Earth Summit in Rio de Janeiro in 1992, new emphasis was placed on the role that corporations play in environmental production and contributing to

sustainable development. Several voluntary environmental management (EM) standards were developed that covered areas such as auditing, labeling, performance evaluations, life-cycle assessment, and product standards (Almgren et al., 2012). These standards, along with other corporate sustainability initiatives, were influenced by Quality Management (QM) (Ammenberg, 2003). Since the creation of EM standards, the development and discourse in the QM field has had an influence on how businesses approach sustainable development. Angell and Klassen (1999) posited that the QM toolbox was suited for the integration of sustainability considerations because it focuses on meeting or exceeding customer expectations (Dean Jr. and Bowen, 1994).

Although QM has been defined in many ways, a common definition is that QM is a philosophy consisting of principles, practices, and tools (Dean Jr. and Bowen, 1994) that includes principles or values such as customer focus, continuous improvement, and fact-based decisions (Hellsten and Klefsjö, 2000). In this sense, sustainability considerations can be seen as a customer requirement, in two ways. First, environmental sustainability is becoming an explicit customer need; second, some QM scholars have argued that society is one form of stakeholder or customer per se (Garvare and Johansson, 2010). Further, Luttropp and Lagerstedt (2006) and Maxwell and Van der Vorst (2003) argued that sustainability considerations are more likely to be considered in daily operations if they are integrated in existing working procedures, rather than requiring development of new ones. It can be argued that existing QM practices such as collecting information concerning customer needs should be applicable in identifying the environmental requirements of products, in addition to other customer requirements. Furthermore, a number of QM practices, such as using Quality Function Deployment and Failure Mode and Effects Analysis, are popularly included in the cluster of Design for Environment tools and practices (Bovea and Pérez-Belis, 2012).

The research on the connection between QM and the contribution of businesses to sustainable development has matured since the Earth Summit in 1992. A few meta studies (literature reviews) have focused on specific topics, such as how QM can be integrated with EM and how this affects firm performance (Molina-Azorín et al., 2009); how Lean management (which is arguably closely connected to QM) is linked to supply chain management and sustainability (Martínez-Jurado and Moyano-Fuentes, 2014); or quality (ISO 9001) and environmental (ISO 14001) management systems (Heras-Saizarbitoria and Boiral, 2013). Thus, previous literature reviews have been specific with regard to linking the fields of EM and QM through certain management concepts such as Lean, or practices such as the use of quality and environmental systems. The present paper seeks to go beyond a specific quality concept and examine how the QM research discourse argues, or find evidence for, that QM can support the contributions of businesses towards sustainable development. In other words, the purpose of this paper is to review and elaborate on the support of QM to business approaches towards sustainable development.

The rest of the paper is organized based on a method section that describes the literature review process, followed by a section that presents the results of the review. The analysis of the results is then presented, before the paper ends with discussion and conclusion sections.

2 Method

This section is presented in three parts: the paper selection process, the coding of the papers, and the generation of themes from the reviewed papers.

2.1 Selection of Papers

Searches in multiple research databases revealed that Scopus and Web of Science contained the largest number of relevant hits due to their coverage of the engineering-based publications. A literature search in Web of Science was performed on January 31, 2014 using

the search path [(sustainable development) OR (sustainability)] AND [(quality management) AND NOT (water quality management)] in the subject fields.

After the literature search, the first author scanned the abstracts. Some articles (such as studies related to air quality management) were considered to reside outside the scope of this study and were disregarded. The remaining 58 articles were selected for the review. On the same date, the first author performed a Scopus search using the search path [(sustainable development) OR (sustainability) OR (environmental management)] AND [(quality management) AND NOT (water quality management)] in the subject fields. The SCOPUS search generated a large number of hits that were outside the scope of the study. As this review focuses on support from QM to contributions of businesses towards sustainable development, and is based on a QM research discourse, we decided to limit the Scopus search to journals that we believed captured that discourse. The most relevant SCOPUS hits were found in the TQM Magazine (and its successor, the TQM Journal), Quality Progress, and the Journal of Environmental Management; therefore, the SCOPUS search was limited to those journals. After eliminating duplicates and reading the abstracts, 38 additional Scopus hits were added to the Web of Science results. The total of 96 articles was considered sufficient for the first round of the review and these were distributed amongst the authors for classification. Figure 1 below shows an overview of the paper selection process.

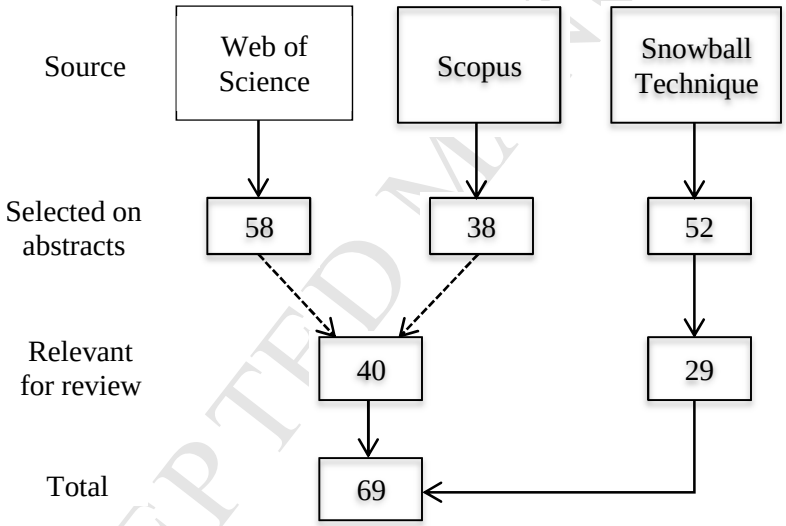

Figure 1: Overview of paper selection process

After the first round of reviews, 40 of the initial 96 articles were considered relevant. These 40 articles contained 52 other potentially interesting references, which were distributed for a second round of reviews. Because the added references were not limited to specific journals covered by the used databases, the snowballing review covered a broader range of publications. Twenty-nine of the snowballing references were considered relevant and thus added to the original set. Finally, the review was summarized. At this point, two duplicates were found, which means that the 69 reviews covered 67 articles.

2.2 Coding of Articles

The first step of the literature review was to select a method and to generate a literature classification sheet. Inspired by Barratt, Choi, and Li (2011), a classification sheet was created and distributed to all authors, along with five articles chosen for a calibration review. After this calibration round, the authors met to discuss the review of individual articles, the review

process, and the classification sheet classes. At the meeting, the authors had to motivate their classifications. A few clarifications for the review were made and additional coding criteria were introduced, with some of these being elaborated on (see Table 1). As indicated in section 2.1, the reviewers were instructed to note references from the articles that appeared noteworthy for inclusion in the snowballing review (see Figure 1).

Table 1: Coding criteria (adapted from Barratt et al., 2011)

Coding criteria	**Description of coding**
Publication year	The year in which the article was published
Conclusion/synopsis/ contribution	A short description of the content of the article in terms of conclusions and contribution
Type of article	Empirical, conceptual, or review.
Data collection method	For example, survey, case study, interview, questionnaire.
Methodology	For example, case, survey, experiment, action research, review, or interview study
Research strategy	Quantitative or qualitative.
Outcome	The outcomes of the articles, such as models, frameworks, propositions.
Level of focus (QM)	The level of focus in the articles on QM was categorized as principles, practices, and tools.
Main focus on triple bottom line	Main focus on the triple bottom line was categorized as environmental, economic, or social.
Emphasis	The main points of departure of the studies, categorized as QM or sustainable development.

The selected articles were randomly assigned to the authors for review, with 16 articles per author. If a reviewer was assigned an article that he or she had co-authored (this happened once), the review assignment was switched to another author, but the article was still included.

Regarding the review method for this article, the two duplicates inadvertently facilitated a reliability check. When examining the duplicates, it was found in one case that both reviewers were unanimous regarding the classification of the relevance of the article, the theme, the outcome, that the paper was conceptual, that practices were a certain level of focus, and that the main focus was the economic perspective. In the other duplicate review, the reviewers were unanimous regarding relevance, theme, methodology, and units of analysis, but disagreed on whether the emphasis had a QM or environmental focus, whether the main focus of article was on the triple bottom line, and whether the paper focused on principles and tools other than the practices. The quality classification differed slightly too. One reviewer had classified the article as a "3" on a 2–5 scale (with 5 being the top quality), while the other had classified it as "4". Thus, the agreement was good on a majority of coding criteria. Despite slight differences in coding, the replicate measures could be considered fair, considering the subjectivity inherent in some criteria.

2.3 Generation of themes

All authors used an Excel sheet table containing the coding criteria and description for their reviews. All coding criteria listed in Table 1 were used for basic quantitative analysis, except for the coding criteria of conclusion/synopsis/contribution. This particular coding criterion was used to create suitable themes to further categorize the articles based on their contribution. For example, many of the reviewed articles were focused on the topic of quality and environmental management systems, where an integrated management system (quality and environment) was suggested. Hence, a theme related to "integration" was created. The

other themes were created using the same methodology; that is, they were based on the contents of these articles and on the relevance to the purpose of this review.

3 Findings

The four classification themes are summarized in Table 2, along with the references included in each theme. Each theme is elaborated upon after the table.

Table 2. Summary of themes

Theme	Description	References
I. Supporting sustainability through integration of management systems (31 articles)	Integrated management system (IMS) is argued to be a means of reducing redundancies and managing resources efficiently. Further, an integrated management system is seen as one way to identify aspects of a QM system that could be supportive of sustainability in general.	Aboulnaga, 1998; Bernardo et al., 2009, 2012; de Oliveira, 2013; Fresner and Engelhardt, 2004; Jabbour, 2010; Jonker, 2000; Jørgensen et al., 2006; Karapetrovic and Casadesús, 2009; Karapetrovic and Willborn, 1998; Kuei and Lu, 2013; Li, 2013; Matias and Coelho, 2002; Matias and Coelho, 2011; Pojasek, 2006; Pun and Hui, 2002; Rebelo et al., 2014; Rocha et al., 2007; Rodríguez-Antón et al., 2012; Salomone, 2008; Santos et al., 2011; Seghezzi, 2001; Simon et al., 2011; Tarí and Molina-Azorín, 2010; To et al., 2012; Wilkinson and Dale, 1998, 1999a, b; von Ahsen and Funck, 2001; Zeng et al., 2007; Zeng et al., 2011
II. QM as support to environmental management system implementation and to managing sustainability (22 articles)	The reviewed research argues that QM principles, practices, and tools could be used to support the management of environmental considerations. Some articles translate the logic of principles, practices, and tools to environmental management and sustainability. Most articles included in this theme deal with how the QM practices can be used to support the introduction of environmental management.	Bergenwall et al., 2012; Borri and Boccaletti, 1995; Corbett and Cutler, 2000; Craig and Lemon, 2008; Curkovic et al., 2000; Giancarlo, 2005; Isaksson and Garvare, 2003; King and Lenox, 2001; Klassen and McLaughlin, 1993; Kuei and Lu, 2013; Lawrence et al., 1998; Molina-Azorín et al., 2009; Pereira-Moliner et al., 2012; Rusinko, 2005; Ruzevicius et al., 2004; Stevens et al., 2012; Theyel, 2000; Wiengarten and Pagell, 2012; Yang et al., 2010; Yang et al., 2011; Zairi, 2002; Zhu et al., 2013
III. Supporting integration of sustainability considerations in daily work (6 articles)	This theme argues for the integration of sustainability considerations into existing QM practices and tools. Some examples are combinations of QM practices and tools and life cycle analysis (LCA), and application of QM tools such as the House of Quality matrix and Design of Experiments 'as-is' and show how they can support sustainability.	Besseris, 2012; Rothenberg et al., 2001; Sakao, 2004; Zhang et al., 1998; Zhou and Schoenung, 2003; Zhou and Schoenung, 2007
IV. Supporting stakeholder management and customer focus (8 articles)	The reviewed articles emphasize the inherent focus on customers within QM and how that can help support necessary stakeholder management in sustainable development. This is argued to be achieved by broadening the sometimes narrow definition of a customer as a buyer, to a definition that encompasses more stakeholders.	Asif et al., 2011; Garvare and Isaksson, 2001; Garvare and Johansson, 2010; Isaksson, 2006; Jørgensen, 2008; Karapetrovic and Jonker, 2003; Klefsjö et al., 2008; Walker, 2000

3.1 Theme I – Supporting sustainability through integration of management systems

The analysis of the reviews reveals that 31 of the 67 articles are about or based on the integration of management systems; every one of those article argues for integration. The management systems of concern here are the Quality Management Systems (QMS) (ISO 9001), the Environmental Management Systems (EMS) (ISO 14001), and the occupational health and safety management systems (OHSAS 18001). Several arguments are presented for an integration of management systems. The most common of these arguments is for administrative gains. An example is cost reductions in maintaining standards and efficient usage of resources, which reduce wasteful redundancies and have the potential to create synergy effects (Karapetrovic, 2002). Another example involves decreased implementation times (Karapetrovic and Casadesús, 2009).

To et al. (2012) pointed to the benefits of working with ISO9001 and ISO14001, as the companies in their study that had integrated management systems (IMS) had better corporate, quality, and marketing performance than companies that worked only with ISO9001. Another argument for integrated management systems is that if such a system is used to integrate quality and environmental aspects in decision making, the IMS can be supportive of improved environmental protection. Von Ahsen and Funck (2001) stated that: "the success of corporate environmental protection does not depend on whether the company has implemented a separate environmental management system or an IMS. What is crucial is the rank of environmental protection within the company's system of objectives" (p. 174).

Some of the articles within this theme focus on the implementation of IMS. Bernardo et.al. (2012) pointed to implementation difficulties such as inadequate implementation of the first management system, lack of time for integration, and differences between the models underpinning the standards. Many articles focused on integration levels and strategies for implementing IMS to facilitate the integration (Bernardo et al., 2009; Douglas and Glen, 2000; Jørgensen et al., 2006; Karapetrovic and Jonker, 2003), while others provide advice for such integration (e.g., Rebelo et al., 2014, and de Oliveira, 2013).

3.2 Theme II – Supporting environmental management and implementation of an environmental management system

The second theme deals with how QM can be used to support environmental management and managing sustainability. A total of 22 articles were categorized as belonging to Theme II, with most dealing with how current QMS can support the introduction of EMS. Hence, the scope of these articles is rather narrow; only a few dealt with the similarities of managing quality and managing sustainability at the level of principles.

Borri and Boccaletti (1995) proposed the introduction of Total Quality Environmental Management, emphasizing the similarities between quality and environmental improvement. These similarities include a strong focus on customer (end users, surrounding community, or public authorities) satisfaction, continuous and proactive improvements, and relations with external parties such as suppliers (Borri and Boccaletti, 1995). In the same vein, Curkovic et al. (2000) established principles for QM as a prerequisite for support to environmentally responsible manufacturing.

Isaksson and Garvare (2003) proposed that global stakeholder needs be viewed as a starting point for measuring sustainability: "For true sustainable development the organization performance needs to be related to global performance" (p. 649). In general, the two main stakeholders identified are humanity and nature, and it is argued that QM has a feasible basic structure that could be augmented with environmental and ethical considerations. In a similar manner, Kuei and Lu (2013) proposed integrating QM principles into sustainability management; they labeled this as quality-driven sustainability management. Other elaborations of contributions from QM towards sustainability considerations focus on specific approaches; for example, King and Lenox (2001) and Bergenwall et al. (2012) elaborated on

Lean and Toyota Production Systems, respectively, as supportive towards improved environmental performance.

However, the majority of the articles focused on certified management systems. QM standards predated the environmental standards, with the first ISO 9001 being launched in 1987 and the first ISO 14001 in 1996, and it likely that QMS predates EMS in many companies. Several authors also found that QMS are beneficial for the introduction of EMS (Borri and Boccaletti, 1995; Corbett and Cutler, 2000; King and Lenox, 2001; Klassen and McLaughlin, 1993; Lawrence et al., 1998; Molina-Azorín et al., 2009; Pereira-Moliner et al., 2012; Theyel, 2000; Wiengarten and Pagell, 2012; Yang et al., 2010; Zhu et al., 2013). No articles in this theme focused on the ease of QMS implementation once EMS is implemented.

3.3 Theme III – Supporting integration of sustainability considerations in daily work

In the research literature at least, Quality Function Deployment (QFD) appears to have been commonly applied as a means of addressing sustainability concerns in product and process development. For example, Sakao (2004) first elaborated on differences between Quality Function Deployment for Environment and Life Cycle Analysis (LCA), regarding differences in the type of analysis supported (focus on product characteristics versus performance of a product). The conclusion from the comparison is that Quality Function Deployment for Environment and LCA support different sustainability concerns and should be used in combination.

Sakao (2004) argued that QFD, with its focus on translation of needs into characteristics or functions, can be used to relate product characteristics not only to an end-customer, but also to analyzing how the choice of characteristics affect environment. LCA, on the other hand, is used as a means to quantify the actual effects a product has on the environment during its life cycle. The benefits of combining QFD and LCA have also been put forth by Zhou and Schoenung (2007).

Other articles in this theme elaborate on how practices and tools from the QM area can be means of integrating sustainability considerations in daily practices. QFD has been considered useful in assessing the environmental impact of various design alternatives (Zhou and Schoenung, 2003). Design of Experiments has been used to assess the environmental impact of product or process alternatives; for example, by applying an environmental indicator as the response variable (Besseris, 2012). In summary, it can be argued that well-known QM practices and tools can be used to support sustainability considerations.

3.4 Theme IV – Supporting stakeholder management and customer focus

Garvare and Johansson (2010) presented a conceptual model of stakeholder management, expanding on the relationship between organizational sustainability and global sustainability. Inspired by Foley (2005), those authors considered stakeholders to be “actors that provide essential means of support required by an organization; and could withdraw their support if their wants or expectations are not met” (Garvare and Johansson, 2010) (p. 238). Interested parties are all actors who have any interest in the organizational activities, output, or outcome, but do not possess the power to influence the organization or its stakeholders. According to Garvare and Johansson (2010), organizational sustainability will be achieved if the organization always at least satisfies the demands of its critical stakeholders. The authors argued that global sustainability will only be promoted if organizational sustainability is achieved without compromising the ability of interested parties to meet their needs, both present and future.

QM, with its traditional strong focus on customers, and sometimes a wider range of stakeholders, has been argued to hold potential for stakeholder management support. Klefsjö et al. (2008) discussed the status of QM in terms of perspectives on customers, stakeholders, and other interested parties. They argued that whereas top managers have to address all parts

of business, there is a need to separate quality issues from other issues and to differentiate QM from business excellence. In this respect, both Garvare and Isaksson (2001) and Asif et al. (2011) found that while sustainability considerations are addressed to some extent in business excellence models, economic prosperity remains the dominant perspective.

Walker (2000) argued that it makes good business sense to take a wider view of the customer concept, including a wide range of affected parties. Walker used a case study to illustrate how perceptions of the client/customer have shifted from satisfying the needs of a narrow 'paying customer' to ensuring a balanced view of quality from the outcome perspectives of 'all major stakeholders'. Given that organizations must address the needs of several different stakeholders, Karapetrovic and Jonker (2003) argued for the integration of function-specific management systems as one contributing action.

Jörgensen (2008) presented different levels of MS integration to support sustainability considerations. She argued that companies with certified management systems should not only strengthen collaboration with stakeholders, but also take a life cycle perspective and extend their focus to the entire product chain. The case study suggests that integration of MS concerns the creation of a culture of learning, focus on stakeholders, continuous improvements, and synergies between the subject areas. Jörgensen (2008) concluded that the performance of a company in relation to a sustainable management system depends on the internal willingness and capability of making improvements, as well as the external forces that affect the process.

4 Analysis

This section consists of two parts: analysis of the literature reviewed based on coding criteria as described in the method section; and a thematic analysis in which relationships between themes and a number of coding criteria are presented.

4.1 Review data analysis

Data from the coding was analyzed in order to categorize articles in terms of year of publication, outcome, etc., following the criteria listed in Table 1. Figure 2 shows the distribution of articles based on the date of publication. The number of articles published has increased over time.

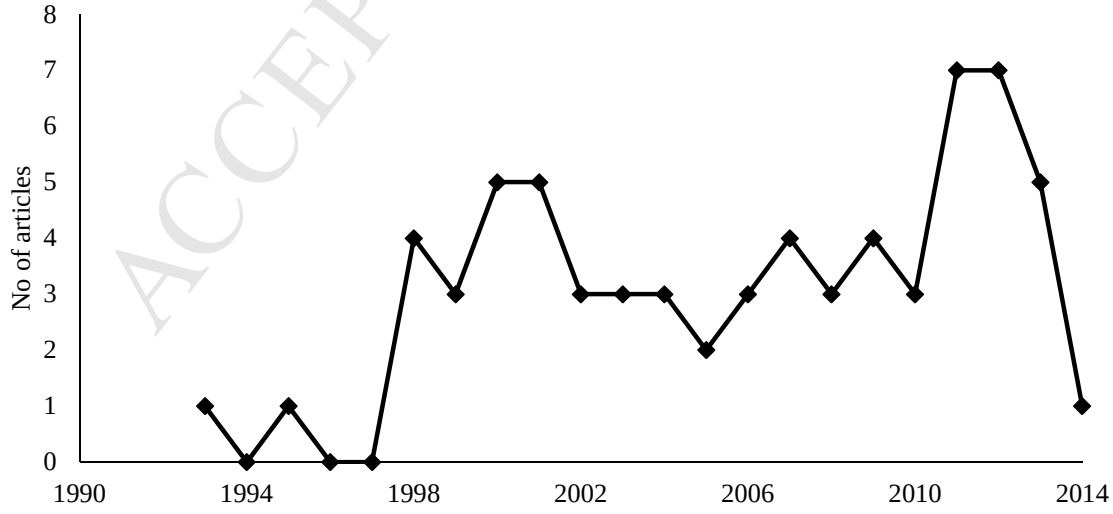

Figure 2. Publication timeline of examined articles

Approximately half of the examined articles (33 out of 67) were considered to contribute towards descriptive insights regarding how QM could support sustainable development; see Figure 3. Articles concluding with models, propositions, or frameworks were found to be less common.

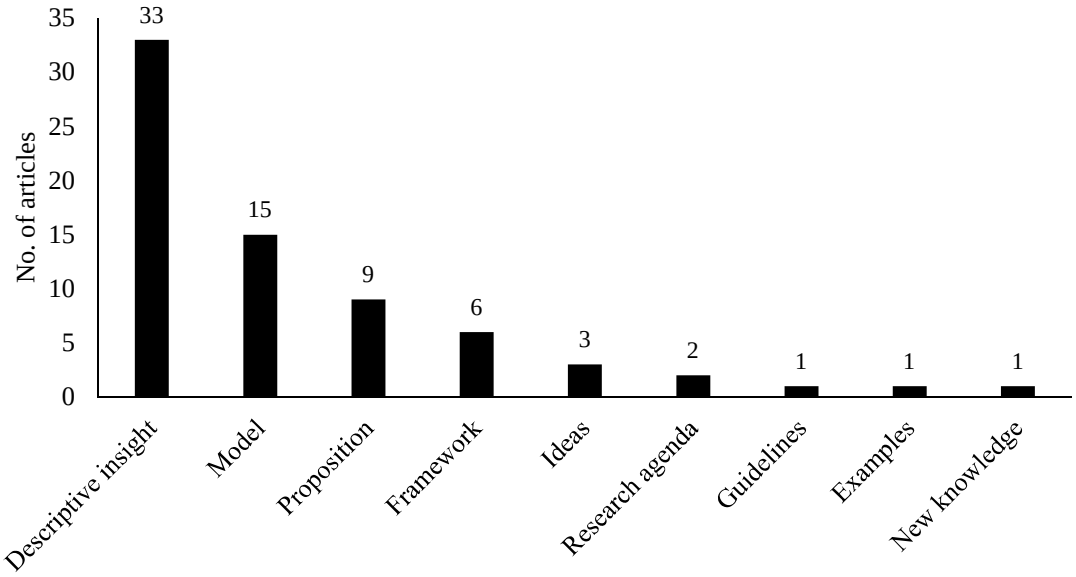

Figure 3. Categorization of outcome of the examined articles

Figure 4 concerns the distribution of methodologies applied in the articles. Most articles were surveys, followed by review papers, and case studies. There were 37 empirical articles and 30 conceptual ones.

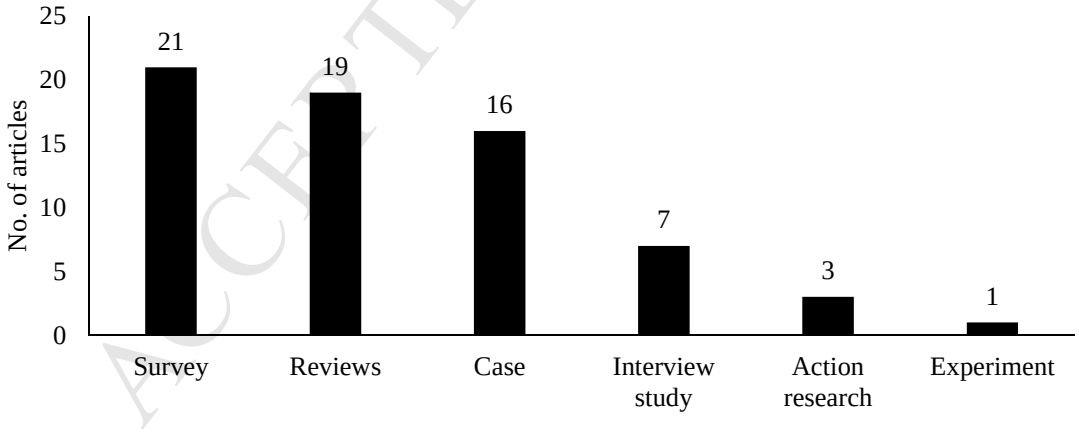

Figure 4. Distribution of methodologies applied in examined articles

We also analyzed the focus areas of the QM articles and of the sustainable-development-oriented articles. Within QM, the focus was divided between principles, practices, and tools; for sustainable development the focus was on environment, economy and social aspects. See Figures 5 and 6. Principles and practices of QM have been more in focus in terms of the contribution towards sustainable development, while fewer articles discussed QM tools and

their contribution towards sustainability. Within the area of sustainability (environmental, economic, and social), the main focus was on environmental sustainability.

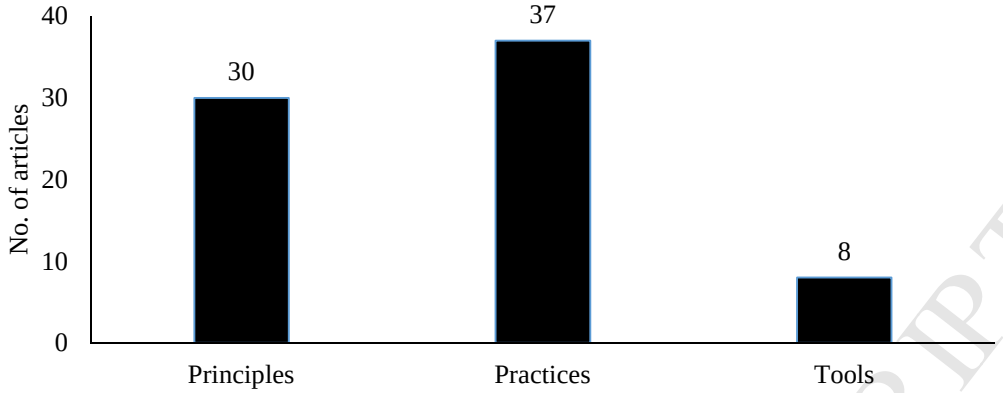

Figure 5: Number of articles based on elements of QM

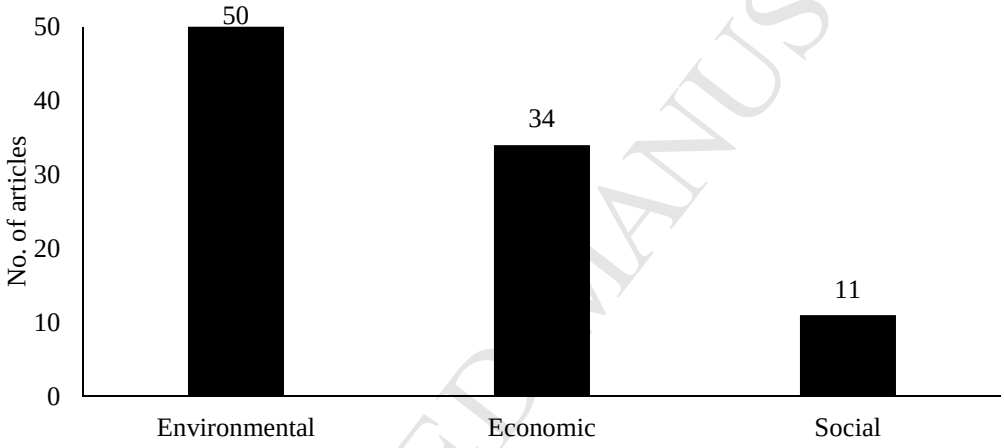

Figure 6. Number of articles based on elements of SD

4.2 Thematic analysis

Themes I to IV were analyzed in relation to a number of coding criteria (see Table 1), such as outcome, type of paper, methodology applied, focus on QM (principles, practices, and/or tools), focus on the triple bottom line (environmental protection, economic prosperity, and/or social equity), and main point of departure (QM, EM, and/or SD).

Some articles contained more than one methodology. These were classified as "case and action research", for example, whereas some articles presented more than one outcome; for example, "proposition and research agenda". Similarly, certain articles were found to be focused on more than one element of QM, such as "principles and practices", and also focused on more than one of the triple bottom line of sustainable development, such as "environment and economic".

Data analysis was conducted using IBM SPSS Statistics 22 software to identify correlations between themes and criteria. Cramér's coefficient (V) was used as a chi-square-based measure of association between categorical (nominal) variables (Conover, 2006). Cramér's V is a rescaling of the ratio of the chi-square statistic to the weighted total number of observations so that its maximum value is 1. Cramér's V is a measure of the strength of the relationship between two nominal variables, where the values of V of 0.1 present low, 0.3 as medium, and 0.5 as strong measures of relationships (Field, 2014; Huck, 2009).

Table 3 presents cross-tabulation data between themes and types of paper. The rows indicating "% within theme", "% within type", and "% of total" specify the percentages of articles from each theme for each type of paper categories. Based on the cross-tabulation, V shows a value of 0.263, indicating a less-than-medium relationship between the themes and the type of papers. This could be interpreted as meaning that there is no strong evidence to link the studies related to how QM can be applied towards contributing to sustainability to the type of papers. In other words, we did not find that studies concerning the contribution of QM to sustainability were linked to the type of papers, such as conceptual, empirical, or review papers.

Table 3. Cross-tabulation of themes and type of paper

Theme		**Type of papers**					**Total**
		Conceptual	Conceptual & review	Empirical	Empirical & conceptual	Review	
Daily work	Number of articles	2	0	4	0	0	6
	% within Theme	33.3%	0%	66.7%	0%	0%	100%
	% within Type	7.7%	0%	11.4%	0%	0%	9.0%
	% of Total	3.0%	0%	6.0%	0%	0%	9.0%
EM	Number of articles	8	0	13	0	1	22
	% within Theme	36.4%	0%	59.1%	0%	4.5%	100%
	% within Type	30.8%	0%	37.1%	0%	50.0%	32.8%
	% of Total	11.9%	0%	19.4%	0%	1.5%	32.8%
Integration	Number of articles	9	2	17	2	1	31
	% within Theme	29.0%	6.5%	54.8%	6.5%	3.2%	100%
	% within Type	34.6%	100%	48.6%	100%	50.0%	46.3%
	% of Total	13.4%	3.0%	25.4%	3.0%	1.5%	46.3%
Stakeholder	Number of articles	7	0	1	0	0	8
	% within Theme	87.5%	0%	12.5%	0%	0%	100%
	% within Type	26.9%	0%	2.9%	0%	0%	11.9%
	% of Total	10.4%	0%	1.5%	0%	0%	11.9%
Total	Number of articles	26	2	35	2	2	67
	% within Theme	38.8%	3.0%	52.2%	3.0%	3.0%	100%
	% within Type	100%	100%	100%	100%	100%	100%
	% of Total	38.8%	3.0%	52.2%	3.0%	3.0%	100%

Cramér's V value is 0.263

Figure 7 shows the number of articles classified under each theme and the type of article (conceptual, conceptual and review, empirical, empirical and conceptual, or review). The least common theme is theme III, supporting integration of sustainability considerations in daily work; this is an area that has earlier been argued as a key to QM support towards sustainability considerations in businesses (Angell and Klassen, 1999). For theme IV it can be noted that there is a lack of empirically-based studies. However, in this theme the included articles are more recent than in the other themes and a development towards more empirical research might be expected.

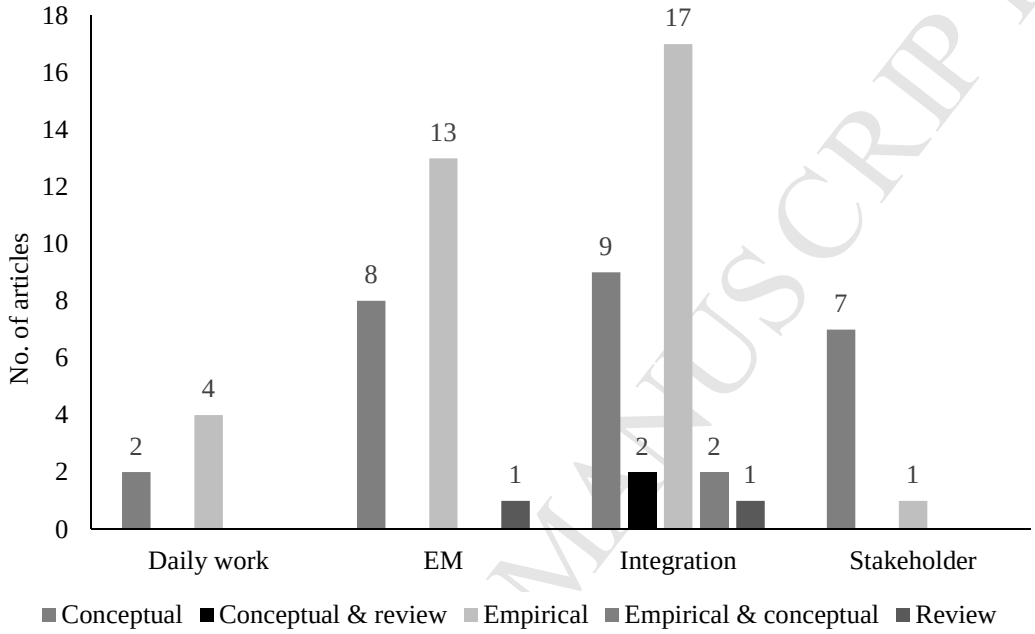

Figure 7. Type of paper based on themes

We also analyzed the relationship between the review themes and the emphasis of the research. Table 4 presents cross-tabulation where V is 0.274, indicating a less-than-medium relationship between themes and the emphasis of the studies. Studies concerning the contribution of QM towards sustainability cannot be said to originate from a specific research area. In other words, there were no strong evidences to indicate that studies concerning contribution of QM towards sustainability are specific to the research areas of QM, EM, or SD.

Table 4. Cross-tabulation of themes and emphasis of studies

Theme		Emphasis					Total
		EM	QM	QM & EM	QM & SD	SD	
Daily work	Number of articles	0	3	0	1	2	6
	% within Theme	0%	50.0%	0%	16.7%	33.3%	100%
	% within Emphasis	0%	7.3%	0%	50.0%	25.0%	9.0%
	% of Total	0%	4.5%	0%	1.5%	3.0%	9.0%
EM	Number of articles	2	16	1	0	3	22
	% within Theme	9.1%	72.7%	4.5%	0%	13.6%	100%
	% within Emphasis	16.7%	39.0%	25.0%	0%	37.5%	32.8%
	% of Total	3.0%	23.9%	1.5%	0%	4.5%	32.8%
Integration	Number of articles	9	16	3	1	2	31
	% within Theme	29.0%	51.6%	9.7%	3.2%	6.5%	100%
	% within Emphasis	75.0%	39.0%	75.0%	50.0%	25.0%	46.3%
	% of Total	13.4%	23.9%	4.5%	1.5%	3.0%	46.3%
Stakeholder	Number of articles	1	6	0	0	1	8
	% within Theme	12.5%	75.0%	0%	0%	12.5%	100%
	% within Emphasis	8.3%	14.6%	0%	0%	12.5%	11.9%
	% of Total	1.5%	9.0%	0%	0%	1.5%	11.9%
Total	Number of articles	12	41	4	2	8	67
	% within Theme	17.9%	61.2%	6.0%	3.0%	11.9%	100%
	% within Emphasis	100%	100%	100%	100%	100%	100%
	% of Total	17.9%	61.2%	6.0%	3.0%	11.9%	100%

Cramér's V value is 0.274.

5 Discussion

This paper presents a review of the literature regarding support of QM to business approaches towards sustainable development. The reviewed articles can be clustered into four themes: (I) supporting sustainability through integration of management systems, (II) QM as support for EMS implementation and to managing sustainability, (III) supporting integration of sustainability considerations in daily work, and (IV) supporting stakeholder management and customer focus. Along with the main findings of the review, as captured in these themes,

several issues concerning the identified themes can be discussed. These include the level of integration of MS, the effect of IMS on environmental performance, the focus on existing practices and MS, the lack of adaptation of QM practices and tools, and the potential of stakeholder management.

First, most scholars seem to agree that the best way for business to contribute to sustainable development is to integrate their different management systems. The use of multiple MSs in a single business has created the need for organizations to explore an IMS where the overlapping or similar procedures, practices, and tools of various management systems could be applied more efficiently. Pojasek (2006; p. 96) defined the term 'integration' in this context as "a genuinely integrated system is one that combines various management systems using an employee focus, a process view, and a systems approach". However, if these IMSs are not truly integrated with corporate governance and core business processes, as well as implemented into every level of the organization, the effect of the IMS on company sustainability could be limited (von Ahsen and Funck, 2001). The need for further research on the integration of corporate sustainability approaches with core business processes has been emphasized (Asif et al., 2011). In addition, scholars have often suggested the importance of such approaches being implemented into every level of an organization if they are to have a meaningful impact (Castka et al., 2004; Shahin and Zairi, 2007; Zadek, 2007).

Second, the reviewed articles concluded that an IMS is beneficial for practitioners based on the commonalities found in the QMS and EMS standards. It has been argued that an integrated management system supports a reduction in redundancies in terms of procedures and workflows (Karapetrovic, 2002). However, an integrated management system does not guarantee that the application of QM principles, practices, or tools will support the sustainability initiatives in organizations. For example, investigations of specific QM standards contributing to EM outputs, or vice versa, are not evident in the literature. Instead contradictory results have been presented (Klassen and Whybark, 1999; Narasimhan and Schoenherr, 2012). We conclude that there is a lack of empirical investigations regarding specific QM standards and their contribution in applying specific EM standards or practices. More empirical research is also needed on the synergies between integrated QM and EM and its effects on environmental performances.

Third, a majority of the articles focus on existing MSs as a foundation for the businesses' contributions to sustainability. This could be problematic, since Könnölä and Unruh (2007) showed that the effects of MS on major improvements of a more innovative nature (as opposed to small production and process changes) are virtually nonexistent. They argued that MS can potentially have initial positive effects, but that the systems limit the organizational focus to developing current production systems in many small steps, instead of exploring the major innovations that are more discontinuous (Könnölä and Unruh, 2007). The need for larger more discontinuous steps concerning corporate sustainability can be exemplified by the urgency for climate change mitigation measures in industry. Recent research has shown that management system standards that focus on environmental and energy improvement are constructed specifically for efficiency measures; for example, energy efficiency improvements (Laskurain et al., 2015). However, the standards have not established any clear element to promote the use of renewable energy sources, which would most likely require more innovative solutions. In fact, Laskurain et al. (2015) also found that the certified management systems had a very limited effect on the promotion of renewable energy in companies. Furthermore, even if it has been claimed that some QM approaches could be advantageous to innovation, the question of whether QM in general supports innovation or not remains unresolved (Steiber and Alänge, 2013). Therefore, new practices are needed beyond MS in order for the industry to help solve the complex global environmental problems. Research also shows that the MS almost always has a limited focus on the processes within

the business and does not include activities upstream or downstream of the supply chain (Kautto, 2006; Schylander and Martinuzzi, 2007). Therefore, it is desirable that future research look beyond the existing standards and MS.

Fourth, several studies have elaborated on how practices and tools originating from the QM area (such as QFD and Design of Experiments) can be used to support sustainability considerations; for example, in product development and design or in the assessment of environmental impact of product or process alternatives. However, not much effort has been made in these studies to adapt current QM practices and tools to better align with sustainability considerations, which earlier research has claimed is necessary (Luttropp and Lagerstedt, 2006; Maxwell and Van der Vorst, 2003). We argue that, in order to advance this field of research, it is necessary for further studies to not only apply the current practices and tools in new areas, but also develop and adapt them to better support sustainability considerations.

Lastly, during the same period as some scholars have addressed the usefulness of QM for environmental management and IMS, others have applied a stakeholder management (Freeman, 2010) approach to elaborate on linkages between sustainable development and QM. As the stakeholder management concept has expanded, moving away from owners as the only dominating stakeholder, QM scholars have widened the traditional customer concept. In this discourse, there have also been attempts to operationalize stakeholder management by means of sustainable management systems (e.g., Jörgensen, 2008), where stakeholders and their needs have a central role. This MS approach thereby connects this line of research with the work described here in Themes I and II. As stakeholder management has received increased attention during the last few years (for example, as the basis for corporate social responsibility), the discourse connecting QM and sustainable development through stakeholder management might have an important role to play in future research. As the analysis shows, there is a need for future research in this area based on empirical studies, given that the reviewed work has mainly been conceptual.

6 Conclusions

The purpose of this paper was to review and elaborate on the support of QM to business approaches towards sustainable development. We identified four themes: (I) supporting sustainability through integration of management systems, (II) QM as support to EMS implementation and to managing sustainability, (III) supporting integration of sustainability considerations in daily work; and (IV) supporting stakeholder management and customer focus. Most articles were found to reside in the first two themes dealing with management systems. In summary, there is contradictory evidence of the possible support of the QMS on the environmental management outputs, and vice versa. In the other themes, much of the research is done at a conceptual level, pointing to ideas of synergies. However, few articles can support the potential stated by empirical evidence.

This review has pointed to many areas of future research that could help exploit the potential of QM to support sustainable development. First, more research is needed on how to link IMS to critical business processes as a means of having impact on business decisions and performance. Second, empirical investigations into the effect of IMS on environmental performances are required. The third area of future research, also related to MSs, is the need to move beyond existing standards and MSs to enable more radical improvements. Fourth, for QM tools and practices to support sustainability considerations as much as possible, it is necessary to develop and adapt the tools and practices, rather than apply them as they are. Lastly, the so-far mainly conceptual work on stakeholder management as a means of connecting QM to sustainable development must be further developed through empirical studies.

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