Quality management as a determinant factor of productivity

A systematic literature review

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Abstract

Purpose – The purpose of this paper is threefold: first, to analyse the current state of the literature on the relationship between quality management (QM) and productivity as a performance indicator; second, to identify the key constructs of QM practices related to productivity; and, finally, to reveal whether QM can actually be regarded as a determinant of productivity.

Design/methodology/approach – This research was carried out through a systematic literature review, considering 150 papers that studied this relationship between 1997 and 2017 and another 37 papers on the internal determinants of productivity.

Findings – The findings revealed that human resource management, top management and process management were the more relevant constructs of QM practices related to productivity. In addition, 89 per cent of the internal determinants of productivity were related to the proposed constructs of QM practices, which suggest that QM is a determinant factor of productivity.

Originality/value – This review analysed the literature on the relationship between QM and productivity, as few studies have done before, generating original, interesting and useful findings that can guide future research and that also represent a useful tool for researchers, practitioners, managers and policy makers.

Keywords Quality management, Productivity, Literature review, Determinant factor

Paper type Literature review

1. Introduction

One of the notable topics in the growing proliferation and propagation of breakthrough performance management theories and praxes is the study of the relationship between performance and quality management (QM). QM has been widely studied as a mechanism for strengthening performance and considered a distinctive organisational capability, a competitive strategy and a competitive advantage within the theory of the resource-based view of a firm (Elshaer and Augustyn, 2016; Del Río *et al.*, 2017). The study of the relationship between QM and performance is a current topic and still of interest, with a growing trend for researchers and practitioners, as evidenced by the large number of publications in different contexts and disciplines. However, the large number of publications has focused mainly on studying the relationship with performance using general approaches such as firm; very few studies have looked at the relationship with more specific indicators of interest to organisations such as productivity.

QM has been recognised as a management philosophy that is related to productivity, profitability, firm performance (FP) and competitiveness and consolidated by Quality Gurus such as Feigenbaum (1951, 1961), Crosby (1979), Ishikawa (1976, 1985), Deming

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(1982, 1986), Garvin (1984, 1987) and Juran (1986, 1988). According to Sedani and Lakhe (2011), the most popular approaches of QM are total quality management (TQM) and the ISO 9000 International Standards series; for this reason, this paper approached QM with these two approaches. TQM is defined as the integration of all functions, processes and levels of an organisation in order to achieve continuous improvement of the quality of products and customer satisfaction (Ross, 1993; Dubey and Gunasekaran, 2014), and the ISO 9000 International Standards series approaches QM through certification. The first version of the ISO 9000 standard was disseminated in 1987, later revised and updated in 1994, 2000, 2008 and 2015. According to Fonseca (2015), ISO 9000 cannot be considered a TQM, but he suggested, as Lizarzaburu (2016) did, that the ISO 9001:2015 version is closer to TQM because it is based on the seven principles of QM that are more consolidated, in contrast to the eight principles of the previous version (2008). The current principles of ISO 9001 are: customer focus, leadership, engagement with people, process approach, improvement, evidence-based decision making and, finally, relationship management.

Regarding productivity, it has been defined as the efficiency in the conversion of inputs to outputs (Syverson, 2011) and as an operational concept in terms of a saleable, quality product output per unit of input (Shahin, 2008); in summary, it is typically expressed as an output-input ratio (Solow, 1957; Chew, 1988; Tangen, 2005; Shahin, 2008; Syverson, 2011). On the other hand, productivity has been identified as the most important driver of long-term economic growth (Harris and Moffat, 2015) and one of the most vital factors affecting manufacturing company competitiveness (Tangen, 2005), and used as an indicator of the current and real situation of the economy of a firm, industry or country (Miranda and Toirac, 2010).

Studying the relationship between QM and productivity is important for both researchers and practitioners and was proposed several decades ago, with contributions from Deming (1982), Saraph *et al.* (1989), Flynn *et al.* (1994, 1995), Hendricks and Singhal (1997) and Samson and Terziovski (1999). Despite the importance of this relationship, most of the studies have focused on the relationship between QM and general performance approaches, as evidenced in literature reviews, such as the study by Sousa and Voss (2002), where the impact of QM on FP was discussed; the research of Nair (2006), who identified which QM practices (QMp) are positively related to improved performance through a meta-analysis of correlation; and the study by Ebrahimi and Sadeghi (2013), which analysed QM and performance relationships. The valuable contributions of these reviews to the field of QM are evident; however, they have focused on studying the relationship between QMp (as an operationalization of QM) and general performance approaches, and in addition, they have approached literature review with a mainly narrative approach and have not been often totally encompassing.

Therefore, our research sought to provide a systematic literature review (SLR) of the current state of the literature on the relationship between QM and productivity as a performance indicator. In addition, it also aimed to identify the key constructs of QMp related to productivity and to reveal whether QM can actually be regarded as a determinant of productivity. To develop this research, a rigorous, well-defined and unbiased process was adopted using protocols that include comprehensive searches for all of the potentially significant studies (Tranfield *et al.*, 2003; Tavares *et al.*, 2016). The steps suggested in the literature for an SLR (namely: planning the review, conducting the review, and findings and discussion) were used as a research methodology. Two separate units of analysis were necessary to achieve the proposed goals, and the samples resulted in two totally different sets of papers, with no overlap, that encompass 150 papers for the first unit of analysis and 37 for the second one.

The main findings were: only 49 of the 150 papers considered productivity as a performance indicator in their analysis; the study of the relationships between QM and

performance and between QM and productivity is still in force, with an increasing trend over time; most of the studies have been conducted in Asia and Europe and few in countries of Latin America and the Caribbean; the majority of the studies focus on manufacturing firms, while few studies have analysed specific sectors; questionnaires were the most used resource, and few studies used more than one resource for data collection; QMp was the most used operationalization for QM; firm and financial were the most studied types of performance; productivity was mostly measured with the Likert scale; the most relevant constructs of QMp related to productivity were human resource management, top management and process management; and QM can be considered a determinant of productivity, since 89 per cent of the 36 internal determinants of productivity were related to the identified constructs of QMp.

The remainder of the paper is organised as follows: the next section describes the research methodology used in this study, the findings and discussion are seen in Section 3, and Section 4 shows the conclusions of this paper and provides directions for future research.

2. Research methodology

The SLR research method was used to accomplish the stated goals. A systematic review is a typology of reviews in which a search, analysis and evaluation of the research evidence is carried out using a protocol that results in a transparent report of the methods to facilitate its replication (Grant and Booth, 2009). The SLR method has been used in the research of different disciplines and fields of study, such as the research of Seuring and Müller (2008), in which a systematic review of sustainable supply chain management was carried out; the study by Colicchia and Strozzi (2012), which investigated the process of knowledge creation, transfer and development from a dynamic perspective within the context of supply chain risk management, and the study by Lopes *et al.* (2016), which analysed the links between lean manufacturing practices and organisation performance.

In this study, the steps suggested by the above-mentioned papers and by the specific paper on the SLR method (e.g. Carnwell and Daly, 2001; Tranfield *et al.*, 2003, 2004; Cronin *et al.*, 2008; Nightingale, 2009; Randolph, 2009; Tavares *et al.*, 2016) were used as a guide to carry out this research. These steps included: planning the review: the research questions (RQ) and the protocol to delimit the unit of the analysis (inclusion/exclusion criteria) were defined; conducting the review: involved the identification of keywords, application of protocol to delimit the unit of the analysis (inclusion/exclusion criteria), review of abstracts and review of full-text of selected papers; and findings: included analysis and reporting.

2.1 Planning the review

Our review protocol encompassed two units of analysis to achieve the purposes proposed in this study. The first unit of analysis was used to achieve the first purpose. This unit of analysis included the literature on the relationship between QM and performance and between QM and productivity, since productivity is an indicator of performance and frequently analysed within general performance. In order to develop this purpose, the proposed RQ were:

RQ1. What is the current state of the literature on the relationship between QM and performance?

RQ2. What is the current state of the literature on the relationship between QM and productivity?

The identification of key constructs of QMp related to productivity was carried out only with the literature that analysed the relationship between QM and productivity as a

performance indicator and that reported the QMp related to productivity in the results. The RQ proposed for this purpose was:

RQ3. What are the key constructs of QMp related to productivity?

A second unit of analysis, totally different from the first, was used to identify the internal determinants of productivity at the plant or firm level. Subsequently, a theoretical relationship was proposed between the findings of these two units of analysis in order to reveal whether QM can actually be a determinant of productivity. The RQ at this stage was:

RQ4. Can QM be a determinant of productivity?

The following framework (Figure 1) was proposed for this research considering the objectives and previous RQ.

The proposed criteria for the inclusion and exclusion of documents in the two units of analysis are shown in Table I.

The inclusion criteria were taken into account in the selection of filters in each database, and the exclusion criteria were applied in the review of the abstracts of each of the selected documents or when the paper was read in its entirety. The databases used in the identification of the literature of the two units of analysis were Scopus and Web of Science since, according to Mongeon and Paul-Hus (2016) and Aghaei *et al.* (2013), these databases are still the main sources for citation data and are the two most extensive databases. On the other hand, the Source types selected in this study were Journals since, as Cronin *et al.* (2008) stated, journals are regarded as being more up-to-date than books as sources of information.

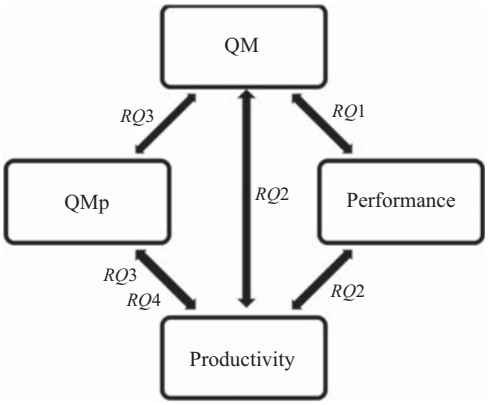

Figure 1.
Research framework

Criteria	First unit of analysis	Second unit of analysis
Inclusion		
Subject area	All subject areas	Engineering; economics, econometrics and finance; business, management and accounting; decision sciences and multidisciplinary
Document type	Empirical articles	All kinds of papers (empirical and theoretical developments and reviews)
Time frame	January 1997 to October 2017	All papers until October 2017
Exclusion	Publications related to lean without a distinction of results between TQM, JIT and TPM Theoretical or anecdotal studies	Publications focusing on public policies and determinants of productivity in macroeconomic level

Table I.
Inclusion/exclusion criteria

2.2 Conducting the review

To conduct the review, "QM" and "Productivity" were selected as the main keywords for the first unit of analysis, and "Determinants" and "Productivity" were selected for the second one. Related keywords or synonyms (Table II) were identified through the review of the papers that included the main keywords and their respective bibliographic citations.

Both units of analysis were identified in the databases, combining the keywords with Boolean operators and using the filter "article title". In addition, an additional filter (article title, abstract and keywords) with the words "plant", "firm", "industry", "manufacture" and "manufacturing" was used. With this information, the search equations were created for use in the different databases, as follows.

First unit of analysis:

(TITLE ("quality management" OR tqm OR iso OR lean)
AND TITLE (productivity OR efficiency OR "technical progress"
OR performance OR profitability) AND TITLE – ABS – KEY
(plant OR firm OR industry OR manufacture OR manufacturing). (1)

Second unit of analysis:

(TITLE (determinants OR "determining factors" OR "decisive factors"
OR "Factors influencing" OR "Factors affecting" OR "influence factors" OR
"Affecting factors" OR "important factors" OR "Key factors"
OR "factors that influence")AND TITLE(efficiency OR productivity OR
"operational performance" OR "Technical progress" OR "Production performance"
OR "manufacturing performance" OR "plant performance") AND TITLE – ABS – KEY
(plant OR firm OR industry OR manufacture OR manufacturing). (2)

Subsequently, the papers were selected. Figure 2 shows the selection of the papers used in the first unit of analysis. With Equation (1), we found 672 papers in the Scopus database and 318 in Web of Science. However, after applying the inclusion/exclusion criteria, the final

First unit of analysis		Second unit of analysis	
Main keywords	Related keywords	Main keywords	Related keywords
Quality management	ISO	Determinants	Determining factors
			Decisive factors
			Factors influencing
	TQM		Factors affecting
			Influence factors
			Affecting factors
	Lean		Important factors
			Key factors
			Factors that influence
Productivity	Performance	Productivity	Production performance
			Operational performance
			Manufacturing performance
	Profitability		Plant performance
	Efficiency		Efficiency
	Technical progress		Technical progress

Table II. Main keywords and related keywords

sample was 483 documents. It is important to note that, in this study, lean articles with a global result and without a separation between TQM, JIT and TPM were not taken into account because these studies would not clearly identify the results for TQM, which is the topic of interest for this study. Then, all of the abstracts were reviewed in their entirety, and 150 documents were selected and used to analyse the current state of the literature on the relationship between QM and performance (*RQ1*). Afterwards, only 49 of the 150 papers were selected to analyse the current state of the literature on the relationship between QM and productivity (*RQ2*) because only these papers considered productivity as a performance indicator. Finally, 28 out of the 49 articles were used to answer *RQ3* and to identify the key constructs of the QMp related to productivity. Both databases detected the same articles, which evidence the strength and rigorousness of the search. Additionally, articles cited in references (snowball search) were used as additional sources, but not many additional articles were found.

Similarly, the selection of the papers used to identify the second unit of analysis is shown in Figure 3, resulting in a sample of 37 papers. It is important to emphasise that the 37 papers found in this section were completely different from the 150 of the first unit of analysis, with which the internal determinants of productivity were identified and the possibility of QM being one was considered (*RQ4*).

3. Findings and discussion

The findings are divided into three sections. In Section 3.1, the first unit of analysis was used to analyse the current state of the literature on the relationship between QM and performance (*RQ1*) with 150 papers. In addition, in this section, the current state of the literature on the relationship between QM and productivity (*RQ2*) was analysed with the 49 papers that studied this relationship (see in greater depth the explanation of the selection of the 49 articles in Section 3.1.1). In Section 3.2, the key constructs of the QMp related to productivity were identified using 28 papers (*RQ3*). Finally, in Section 3.3, the second unit of analysis, with 37 papers, was used to identify the internal determinants of productivity and to reveal whether QM is one (*RQ4*).

3.1 Current state of the literature on the relationship between QM and performance and between QM and productivity (RQ1 and RQ2)

In Sections 3.1.1–3.1.6, the first unit of analysis was used, in which two samples were analysed. A sample of 150 papers was used for the analysis of the current state of the literature on the relationship between QM and performance (represented in the figures with the black colour and the legend performance), and another sample of 49 papers was used for the analysis of the current state of the literature on the relationship between QM and productivity (represented in the figures with the grey colour and the legend productivity).

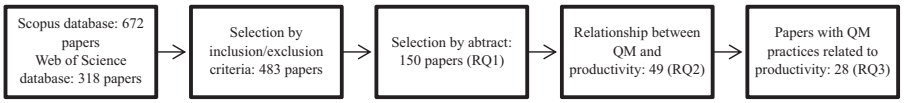

Figure 2.
Selection of papers in the first unit of analysis

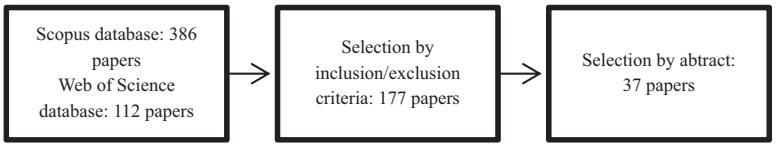

Figure 3.
Selection of papers in the second unit of analysis

The studies of Seuring and Müller (2008), Colicchia and Strozzi (2012) and Lopes *et al.* (2016) were used as a model in order to carry out this analysis, evaluating aspects such as the type of performance studied, the distribution of papers published over time, the classification by region, sector, type of data collection, operationalization of QM and other relevant factors of the groups of papers.

3.1.1 Type of performance studied. The range of performance approaches in the empirical studies was broad, which were classified into the categories: FP, financial performance (FnP), operational performance (OP), productivity or TFP (Pty), quality performance (QP), manufacturing/plant performance (MP), innovation performance (IP) and combination of performances (CP). The FP category included the denominations organisational, business, firm and non-financial and financial performance. The CP category encompassed papers that mentioned the analysis of various performances, within which 12 different combinations were found.

Figure 4 shows that FP was the most cited type of performance, which encompasses a global vision of companies, while more specific approaches, such as OP, QP and productivity or TFP, were less studied. On the one hand, our results are in line with those by Nair (2006), who, like us, found that some studies considered a multidimensional operationalization of performance, while others considered a single performance construct. On the other hand, the results of Ebrahimi and Sadeghi (2013), who stated that OP is a primary performance measurement (since it follows directly from the actions taken during QM implementation), differed from our results since we found that the percentage of studies that directly evaluated the OP was still low. In addition, according to our findings, it was evident that the number of papers that studied the direct relationship between QM and productivity is few in number (6 per cent, corresponding to nine papers); however, 40 additional studies involved productivity as an indicator of other performances, which means that 49 papers were used to analyse the current state of the literature on the relationship between QM and productivity.

These findings suggest that the analysis of the relationship between QM and more specific indicators of great utility for companies such as productivity should be included in future research, which could generate results of interest not only for academics, but also for practitioners, managers and policy makers since, as Harris and Moffat (2015) stated, productivity has been identified as the most important driver of long-term economic growth, one of the most vital factors affecting manufacturing company competitiveness (Tangen, 2005), and used as an indicator of the current and real situation of the economy of a firm, industry or country (Miranda and Toirac, 2010).

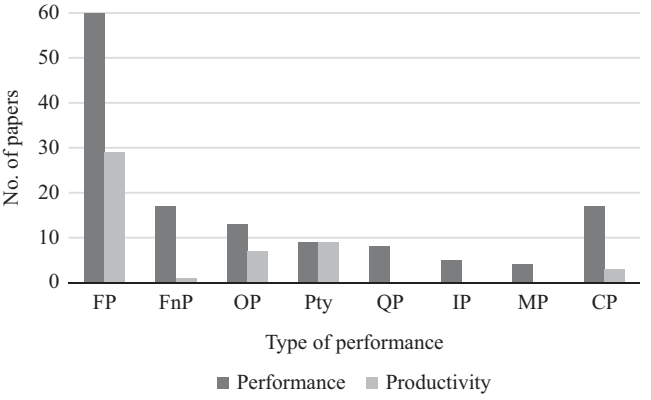

Figure 4.
Distribution of papers by type of performance

3.1.2 Distribution of papers published over time. The papers that studied the relationship between QM and performance and between QM and productivity were classified into three periods of time, seven years each (Figure 5).

The current state of the literature on both relationships has shown a growing trend, which demonstrates that this topic is still of interest despite the fact that it was addressed for the first time several decades ago by scholars such as Deming (1982, 1986), Saraph *et al.* (1989), Flynn *et al.* (1994, 1995), Hendricks and Singhal (1997) and Samson and Terziovski (1999). This trend can be attributed on the one hand to the importance of strengthening performance and productivity for company competitiveness and, on the other hand, as Sedani and Lakhe (2011) affirmed, to the fact that QM is currently seen as a pervasive management practice in modern business management, which generates great interest in studying the possible relationships and/or effects between these two variables.

3.1.3 Distribution of papers by region. The classification of the sample was done in eight categories (Figure 6). The region "Asia" included the countries India, Jordan, Taiwan, Singapore, China, Malaysia, Thailand, Iran, Turkey, Palestine, Qatar, Pakistan, Vietnam, Japan, Indonesia and the Philippines. "Europe" included Spain, Italy, Portugal, Greece, Serbia and one study in the European continent generally without specifying any countries. "Oceania" covered Australia and New Zealand. "North America" (North A) included the USA and Canada. "Africa" covered Tunisia, Ghana, Libya, Mauritius and Egypt. The category "Various Regions" corresponded to studies that analysed several countries from different regions. "Latin American and Caribbean countries" (Latin A) involved one study conducted in Brazil and one that included 31 Latin American and Caribbean countries. Finally, the category "Not Reported" (NR) corresponded to papers that did not report or did not clearly define a country or region of study.

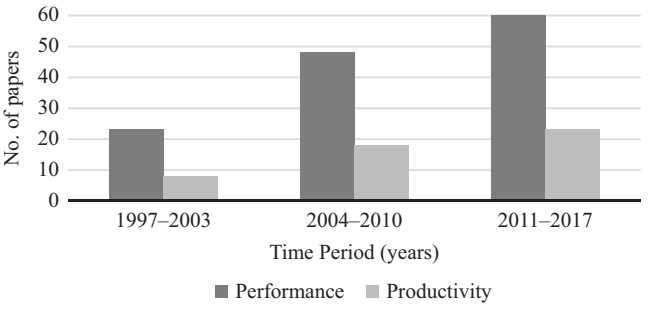

Figure 5.
Distribution of papers published over time

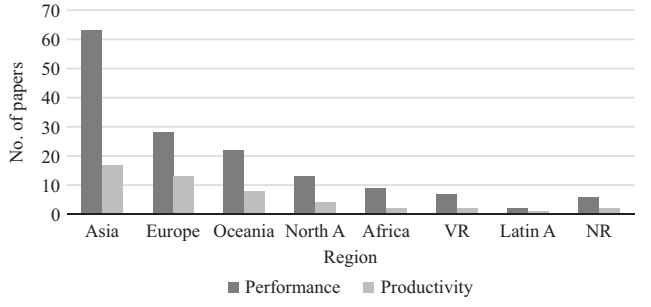

Figure 6.
Distribution of papers by region

Our findings show that the region Asia had the greatest amount of papers for both analysed relationships, followed by Europe and Oceania, while the regions Africa and Latin American and Caribbean countries had a lower concentration of studies (Figure 6). The more studied countries were India (13 per cent of papers), Australia (11 per cent) and Greece (8 per cent), representing a greater number of research than those found in regions such as Africa (6 per cent) and Latin America (1 per cent). The interest in conducting research in Asia and Europe can be attributed to the large number of ISO 9001 certified firms in these regions. According to the ISO (2017) Survey, 52 per cent of certifications are in Asia and the Pacific, and 37 per cent are in Europe, while in Latin America and Africa, the percentage is lower (4 and 1 per cent, respectively). Regarding to the high number of studies conducted in India can be attributed to the fact that, as Sedani and Lakhe (2011) affirmed, India has emerged as one of the top 10 countries in recent years, becoming the fourth largest manufacturing economy in the world.

Our findings can be explained from different perspectives and even supported by research, such as Ebrahimi and Sadeghi (2013), who asserted that most of the research studies on QMp–performance relationships have been conducted in developed countries, with few studies in developing countries; however, these findings also show that it is necessary to guide future research towards conducting studies in regions of developing countries, which have specific economic and social contexts, and in which different findings could be obtained that would be of interest to the field of knowledge.

3.1.4 Distribution of papers by sector. This classification was made with seven categories (Figure 7), namely, manufacturing (manuf), manufacturing and service (manuf and serv), service (serv), automotive industry (automotive), NR, specific sectors (specific) and cross sectors (cross). The specific sectors category involved papers from 19 different sectors, such as hotel industry, textile industry, pharmaceutical industry, stock exchange, food manufacturing and cement manufacturing, among others. The cross sectors category included manufacturing and non-manufacturing; manufacturing, service and construction industries; manufacturers, service providers and wholesale traders; manufacturing, construction, retail and services sectors; and manufacturing, service, and computer and construction industries.

Manufacturing was identified as the sector in which more studies have been carried out (Figure 6). This result is in line with the study by Nair (2006), who found that most of the studies have focused on manufacturing. In addition, as Ebrahimi and Sadeghi (2013) argued, manufacturing firms have adopted QM principles to a larger extent than service ones (3 per cent), which explains the substantial difference in the number of studies between these two macro-sectors.

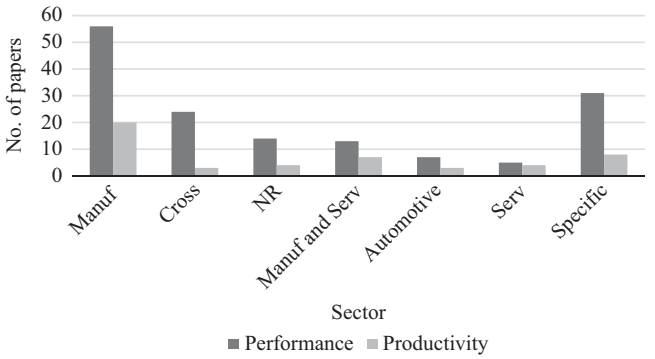

Figure 7.
Distribution of papers by sector

In the paper by Sousa and Voss (2002), the need to increase research on the studied topic in specific sectors was manifested; a need that, according to our results, has not yet been satisfied because, although specific sectors were studied by a large number of papers, it is important to note that this category involved 19 sectors, which is equivalent to an average of only 1.1 per cent for each one. As a guide for future research, carrying out studies on the relationship between QM and productivity in specific sectors is recommended using as a model the studies carried out in the manufacturing sector since this is the most approached sector. This paper suggests that studies be carried out in relevant sectors for each of the regions with developing countries with key sectors for sustainability, such as the agro-industry or agro-food sector.

3.1.5 Type of data collection resource. Six data collection resources were singled out in this study (Figure 8): questionnaire (Quest), secondary sources (Ss), interview and questionnaire (Int+Quest), secondary source and questionnaire (Ss+Quest), interview and secondary source (Int+Ss) and interview, secondary source and questionnaire (Int+Ss+Quest). The category secondary sources encompassed the studies that collected data from sources such as other studies, company documents, government institutions, and data from institutions outside the company. Questionnaire was the most used data collection resource (70 per cent), followed by secondary sources. The popularity of questionnaire among researchers can be attributed to the fact that it allows easy and quick data collection, without the need for the presence of the researcher in the investigated units or direct contact with the interviewee, using phone calls or e-mails, which facilitates the evaluation of a large sample. In addition, sometimes questionnaire surveys are administered by market research companies, so that the research team can focus on the data analysis.

The percentage of articles that used more than one data collection resource was very low (11 per cent) when compared to those that used only one (89 per cent). The use of more than one resource of data collection in research implies the use of more economic resources, time and people, among others, but offers the possibility of triangulating data; a practice that, according to Voss *et al.* (2002), ensures validity in the results.

In future research, the use of more than one data collection resource is suggested in order to obtain more reliable results, which would be more useful for companies. The use of more than one data collection resource can be applied within different methodological approaches, one of which is case study; a method that, according to Ebrahimi and Sadeghi (2013), involves several resources at the same time.

In addition, Table III shows that the use of more than one data collection resource began in 2003 in the selected samples, but the highest concentration was found in 2010. This finding shows that, in the last decade, the interest of researchers in including more than one data collection resource has been growing, which reinforces the direction of

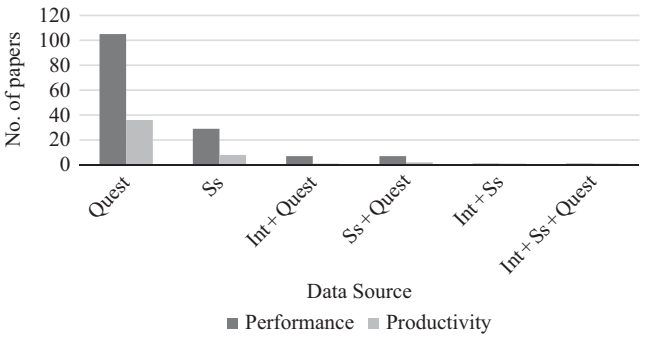

Figure 8.
Distribution of papers by type of data collection resource

Year	No. of papers relationship QM with Performance > 1 Resource	Performance ⩽1 Resource	Productivity > 1 Resource	Productivity ⩽1 Resource
2003	1	7	1	4
2004	1	3	1	1
2005	0	7	0	3
2006	0	9	0	5
2007	0	4	0	2
2008	1	12	0	5
2009	0	6	0	0
2010	1	7	0	2
2011	2	9	0	2
2012	1	9	0	1
2013	1	13	1	4
2014	3	14	1	5
2015	1	11	0	5
2016	3	15	1	6
2017	1	8	0	0
Total	16	134	5	45

Table III. Distribution of papers with more than one data collection resource over time

future research towards the use of multiple data collection resources to increase the validity of results.

3.1.6 Operationalization of QM. The operationalization of QM was classified into five groups: QMp; certified vs non-certified firms; NR; implemented TQM; and quality award. The operationalization through QMp was the most used (63 per cent) for both relationships, followed by certified vs non-certified companies (14 per cent). Similarly, the findings of Nair (2006) showed that the operationalization of the QM was carried out mainly through multidimensional construct (QMp) or single construct; unfortunately, in this study, the distributions were not presented for each one of the operationalization. Furthermore, in our findings, the QMp was named with different terms, such as TQM factors (e.g. Fotopoulos and Psomas, 2010), QM criteria (e.g. Sadiq Sohail and Hoong, 2003), TQM elements (e.g. Meftah Abusa and Gibson, 2013), QM dimensions (e.g. Sharma, 2006), TQM measures (e.g. Akgün *et al.*, 2014), TQM variables (e.g. Terziovski, 2006) and critical success factors of TQM (e.g. Mehralian *et al.*, 2017).

These findings reveal that there is a lack of standardisation in the terms used for QMp, which implies confusion in academics and industries. Researchers should make an effort to standardise the vocabulary used for the operationalization of QM in order to facilitate the compression of studies, facilitate the search for information and contribute to the solid construction of knowledge. Therefore, this paper used the term "QMp" since it was the most frequent operationalization found in the scientific literature.

3.1.7 Productivity as a performance indicator. This section and Section 3.1.8 used the 49 papers that studied the relationship between QM and productivity as the sample. The productivity was addressed with different approaches (Table IV), which was viewed through FP in 29 papers while only 9 papers directly studied productivity.

These findings reveal that productivity does not have a clear and standardized conceptualised across studies, and, in many cases, it has been confused with performance since, as Tangen (2005) affirmed, the concepts of productivity and performance are often mixed up and considered interchangeable. These findings can be attributed to weak knowledge on the concept of productivity, its implications and its importance, which has led to this indicator being relegated to a second rank and neglected or ignored by those who influence production processes and by researchers, managers and policy makers. A clear

Approach to Productivity	Paper reference number[a]	Total papers
Pty	3, 11 , 13, 16, 54, 67, 125, 132, 137	9
OP → Pty	20, 23, 24, 108, 115, 127	6
OP → QtyP → Pty	9	1
CP → Pty	1, 100	2
CP → QtyP → Pty	93	1
FnP → Pty	19	1
FP → Pty	45, 81, 82, 92, 101, 112, 113, 120, 128, 133, 138	11
FP → OP → Pty	8, 12, 42, 62, 73, 74, 80, 96, 97, 98, 99	11
FP → OtP → Pty	7, 21, 65, 75, 95, 118, 134	7

Table IV. Approach to productivity

Notes: FP, firm performance; OP, operational performance; OtP, other performances; FnP, financial performance; CP, combination of performance; QtyP, quality performance; Pty, productivity. [a]The paper reference number can be found in the bibliography, next to the reference

conceptualization of the variables is recommended for future research in order to obtain reliable results and adequate interpretations. Because of the lack of a defined performance umbrella that covers productivity, and in concordance with the definition of productivity (relationship between ratios of output to the inputs), in this research we suggest that this indicator should be covered by OP, and OP should be covered by FP.

3.1.8 Productivity measurement techniques. Measurement techniques were classified into four groups (Figure 9). The category "other measures" included specific indicators of productivity. The results showed that this variable has been mostly measured with the Likert scale (71 per cent), followed by Cobb–Douglas, stochastic frontier or DEA (14 per cent) and less frequency with the use of specific indicators of productivity "other measures" (8 per cent).

The Likert scale generally measures variables through an evaluation based on perceptions or on the concepts that the respondent has about the variable, in this case productivity. In addition, evaluations are often done with a single respondent (often a top manager)

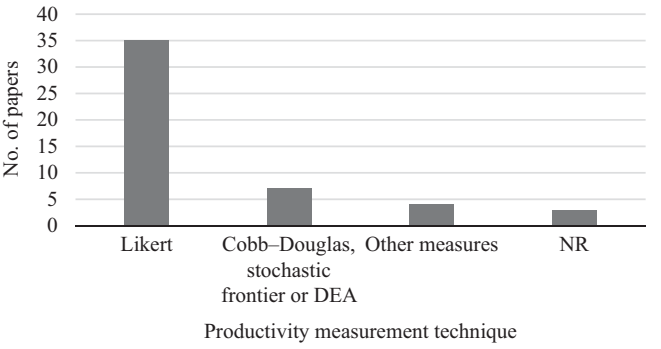

Figure 9. Distribution of papers by productivity measurement technique

who evaluates all the variables. These conditions imply a risk for the objectivity and impartiality of results since, as Tangen (2005) affirmed, "many people who make decisions (top managers) to improve plant efficiency do not know what Productivity is and often confuse it with performance".

According to these findings, future research should increase the use of specific indicators of productivity as a measurement technique in order to obtain reliable and valid data that subsequently allow for the generation of proposals for improvement. In addition, the visions of respondents from other levels and departments should be included in order to increase the reliability and validity of studies.

3.1.9 Other relevant factors of the papers. In this analysis, the total of the sample of the first unit of analysis was taken into account (150 papers). It was found that 131 of the 150 papers used a cross-sectional study. On the one hand, 50 per cent of these 131 papers evaluated the "relationship", "association" or "correlation" between variables, which demonstrated the consistency between the hypotheses or RQ and the type of study (cross-sectional study). On the other hand, 40 per cent evaluated the "impact", "effect" or "influence" between the variables, thus showing the inconsistency between the hypotheses or RQ of these papers and the type of study addressed (cross sectional study). Finally, 10 per cent of the papers did not propose hypotheses or RQ.

Our findings reflect the inconsistency that exists in the analysed literature for the type of study proposed (cross-sectional or longitudinal) and the hypotheses, objectives or RQ. Future research should employ a rigorous use of terms for relationships and impacts, with an adequate selection of the type of study, preferably using longitudinal studies to evaluate the impact or effect of QM on productivity or performance over time. The data collection resources of a longitudinal study could include secondary sources such as files and databases, among others, providing greater availability of information over a long period of time.

3.2 Constructs of QMp related to productivity (RQ3)

In this section, the sample of 49 papers that studied productivity was used. Only 29 of the 49 papers operationalized the QM through QMp; therefore, these 29 papers were selected to identify the QMp constructs related to productivity (*RQ3*). One of the 29 papers did not find any relationship between QMp and productivity; therefore, this study was not considered, and the final sample was 28 papers (Figure 10). The QMp identified in the sample were 38, classified in the eight proposed constructs described in Table V.

The results of this section were organised in Figure 10 taking into account the classification of the proposed QMp constructs. In this figure, the 28 papers that identified the QMp related to productivity were coded with a number, which were classified within the performance from which it addressed productivity (column papers that report QMp for the performance that involves productivity) or were directly classified in productivity when their results clearly showed the QMp related to productivity (column papers that report QMp for productivity). The frequency represents the amount of QMp related to productivity and reported by each author. This frequency can be evaluated by each construct, author and performance or productivity.

Our findings reveal that, on the one hand, 17 of the 28 papers (61 per cent) studied productivity in their data collection, but, in their research results, they did not report the QMp related to productivity since they only reported the QMp related to the general performance from which it was addressed. On the other hand, only 11 papers (39 per cent) identified the QMp related to productivity in their research results. The QMp constructs with the highest citation frequency in the papers that report QMp for the performance that involves productivity and in the papers that report QMp for productivity were human

Reference Number[a] / Construct QMp	Papers that report QMp for the performance that involves productivity																Papers that report QMp for productivity											Frequency
	FP					QtyP			OP								Pty											
	11	92	95	118	120	9	75	93	8	12	23	24	74	80	98	108	115	1	3	7	13	16	81	82	100	101	112	127	
Human resource management	•	•	••	•					••	••	•	•	•	•	•	•		••	•	•		••	•	••	••	•	•	•	31
Frequency	5					0			10									16											
Top management	•	••	••	•	•				••	•	•					•		•		•	••	•	•		•		•	•	23
Frequency	7					0			5									11											
Process management	••			••	•	•	•	•	•		••			•				•		••			•	•	••		••	•	22
Frequency	5					3			4									10											
Customer focus	•	•		•						•	•		•	•	•	•		•		•			•		•	•	•		15
Frequency	3					0			6									6											
Process control			••	•		•		•			•	•					•	•		•	•	•	•	•					14
Frequency	3					2			3									6											
Supplier management				•	•	•		•						•				•					•		•	•			9
Frequency	2					2			1									4											
Continuous improvements			•										:				•	•				•			•	•			8
Frequency	1					0			3									4											
Product/service design						•	•											•			•								5
Frequency	0					2			0									3											
Frequency	26					9			32									60											127

Figure 10.
QMp related to productivity

Notes: FP, firm performance; QtyP, quality performance; OP, operational performance; Pty, productivity; Frequency, frequency of occurrence. [a]The paper reference number can be found in the bibliography, next to the reference

Construct QMp	QMp	Construct QMp	QMp
Top management	Leadership	Process management	Process management
	Top management support		Business and service process management
	Top management commitment		Quality of process, product/service
	Factual approach to decision making		Strategic quality planning
Human resource management	Human resource management		Strategy, policy and planning
	Training and education		Process focus
	Employee relations		Organisation for quality
	Employee involvement/participation	Supplier management	Supplier quality management
	Employee empowerment		Supplier relationship
	Reward and recognition		Supplier involvement
	Favourable work environment and culture	Customer focus	Customer satisfaction focus
Process control	Information and analysis		Customer focus
	Systemic approach and documentary evidence for quality system		Customer relations
	Quality data and reporting	Continuous improvements	Continuous improvements
	Measuring results and performance		Feedback
	Process monitoring and control		Prevention of non-conformance
	Process control	Product/service design	Product/service design
	Selective application of tools and techniques		Interfunctional design
	Statistical tools		New product quality

Table V.
Constructs of QMp

resource management, followed by top management and process management. Additionally, the more cited QMp were leadership, human resource management, training and education, employee involvement/participation, process management and strategic quality planning. According to these findings, the key constructs of QMp related to productivity are the three mentioned above; however, it is advisable to perform a test with empirical studies to validate this result.

Our results revealed that the number of investigations that study the identification of QMp related to productivity is still scarce, which prevents the consolidation of the theory of the relationship of these variables. The three QMp constructs identified with the higher frequencies of citation named human resource management, top management and process management can be used as inputs for future research, where with empirical studies will test these findings in order to nourish and consolidate the theory and, at the same time, give practitioners, managers and policy makers a useful guide for strengthening productivity.

3.3 Internal determinants of productivity and its relationship with QM (RQ4)

The last section identifies the internal determinants of productivity and analyzes whether QM can be considered one with the 37 papers of the second unit of analysis. In the results reported by the different studies, 36 internal determinants of productivity were identified, which were subsequently classified within the QMp constructs proposed in the previous section or in contingency factors (see Figure 11). The findings were organised in Figure 11, where each paper was coded with a number, and the citation frequency of each determinant and of each construct was calculated.

This study identified 10 determinants encompassed by human resource management construct, 14 by process management, 2 by supplier management, 2 by top management,

QMp Construct	Determinant	Paper reference number[a]																																					Frequency by determinant	Frequency by construct QMp
		2	6	10	15	17	18	28	29	33	34	37	39	44	52	53	56	57	59	63	64	68	69	70	76	77	78	79	87	88	102	104	105	109	119	123	129	136		
Human resource management	Employee quality	•		•									•			•			•	•							•								•	•			9	45
	Skilled labour	•				•	•									•			•		•	•					•												8	
	Training								•							•		•							•	•				•		•				•			8	
	Incentive programs											•				•						•	•										•				•		6	
	Experience		•									•																		•						•			4	
	Wages per employee										•					•								•					•										4	
	Labour–staff ratio														•									•															2	
	Favorable working environment															•					•																		2	
	Labour productivity																							•															1	
	Employing university graduates																									•													1	
Process management	Capital employed							•	•				•			•										•				•			•	•		•	•		10	42
	Investment in plant and machinery/technological innovation/modernization		•	•	•												•							•						•		•				•			8	
	Clarity of technical specifications							•												•		•	•														•		5	
	Organization and planning																					•	•							•							•		4	
	Quality of products/service										•														•					•									3	
	Inventory										•																			•				•					3	
	Capacity of production										•																			•									2	
	Variety of products																													•									1	
	Seasonality of operation																														•								1	
	Infrastructure																													•									1	
	Methods of production																													•									1	
	Standardized procedures																													•									1	
	Management system																													•									1	
	Distribution system																													•									1	
Supplier management	Availability and use of raw material							•				•			•					•								•		•			•						7	9
	Quality of raw materials				•																							•											2	
Top management	Leadership and competency of management											•		•						•		•	•													•	•		7	9
	Structure decisions															•																				•			2	
Product/service design	Innovation in products (R&D)		•															•			•								•							•			5	5
Process control	Make measurements (For example levels of waste, percentage of defective articles or reprocessing)																													•									1	2
	Information and communication technologies																		•																				1	
Costumer focus	Quick response to customers										•																												1	1
Contingencial factors	Firm size					•	•		•				•	•			•							•				•		•	•				•			•	12	34
	Type of firm ownership					•	•			•							•	•								•	•				•				•				9	
	Firm age					•	•		•	•			•	•	•			•																					8	
	Location					•	•											•												•	•								5	

Note: [a]The paper reference number can be found in the bibliography, next to the reference

Figure 11.
Relationship between the determinants of productivity and QM

1 by product/service design, 2 by process control, 1 by focus costumer and 4 by contingent factors. The findings also revealed that the two QMp constructs with the higher frequencies of citation and that encompassed the largest number of determinants were human resource management (with a frequency of 45 times) and process management (with a frequency of 42 times), results in line with the findings of Section 3.2 of this paper where these two constructs formed part of the three key constructs of QMp related to productivity.

The human resource management and process management constructs encompassed 24 of the 36 determinants (67 per cent), which suggests that these two constructs are relevant and should be considered in future research. The high citation frequency of human resource management can be attributed, among other factors, to the fact that many articles that study productivity often address it from the labour productivity perspective, where the main input is human resources. Taking into account the previous findings and realizing that 89 per cent of determinants are related to the constructs of QMp, QM can be considered a determinant of productivity. However, future research should look at these results with empirical studies with more indicators apart from labour productivity, such as raw materials, capital, energy and waste, among others. In addition, contingency factors should always be considered in studies, since they represent a very influential determinant for both QM and productivity.

4. Conclusions and further research

This SLR encompassed two totally different units of analysis, the first one was used to analyse the current state of the literature on the relationship between QM and productivity in order to identify the key constructs of QM related to productivity and, the second one was used to identify the principal internal determinants of productivity. Subsequently, a theoretical relationship was proposed between the findings of these two units of analysis in order to reveal whether QM is a determinant of productivity. The analysis was carried out in terms of the distribution of papers over time, with classification by region, sector, type of data collection, operationalization of QM, type of performance studied, type of Productivity measurement technique used, QMp related to productivity, main internal determinants of productivity and the relationship with QM.

This paper analysed the literature that studied the relationship between QM and productivity as few studies have done before. Previous revisions to this one used a mainly narrative approach, whereas in this systematic review, a more rigorous, well-defined and unbiased process was adopted, in which important indicators for companies, such as productivity, were taken into account, providing interesting and useful findings that will guide future research and that are a useful guide for researchers, practitioners, managers and policy makers. The main findings are summarised in the following paragraphs.

The current state of the literature on the relationship between QM and productivity has seen a growing trend, which shows that the issue still generates interest in researchers and practitioners. Asia and Europe were the regions with the higher concentrations of studies, whereas regions with developing countries such as Latin America and Africa had a lower concentration. Manufacturing was the general sector in which more studies were performed in comparison with contexts, such as specific industrial sectors. Questionnaire was the principal data collection resource, Likert scale was the most frequent measurement technique and perception of a single respondent was the most common source of information. In contrast, the use of more than one data collection resource is still scarce, and interest in its use has grown in the last decade. General approaches such as FP were the most analysed types of performance, whereas specific approaches such as productivity have received little attention. The key constructs of QMp related to productivity included human resource management, top management and process management. Furthermore, there was a relationship between 89 per cent of the internal

productivity determinants and the QMp constructs, which suggests that QM is a determinant of productivity. To conclude, some studies lacked methodological rigour because they did not have a conceptualization of the analysed variables that was clear and standardized or because they did not have consistency between the hypotheses or RQ and the type of study carried out (cross sectional or longitudinal).

This study has several implications for research, practice and society. The findings, on the one hand, show that QM is a determining factor for productivity (performance indicator of great importance for the economic growth of industries and countries) and, on the other hand, they reveal that the key constructs of QMp related to productivity are human resource management, top management and process management. These findings contribute to the consolidation of the theory of the relationship between QM and productivity, are a basis and guide for future research and are also a useful tool for managers and policy makers in the formulation of industrial policies that strengthen productivity.

Future research should conduct studies in contexts different from traditional ones, such as the regions of Latin American and African, and in specific industrial sectors in order to know their contingency factors and to propose alternatives for improvement and strengthening of these contexts. In addition, in order to obtain reliable and valid results, we suggest to use a standardisation of terms (e.g. QMp, performance, productivity, effect and relationship), use more than one resource of data collection involving visions of more than one respondent from different levels and departments, use objective productivity measurement techniques (e.g. productivity indicators) and perform more longitudinal studies that evaluate the effect of QM on productivity or performance. To conclude, the limitations of our paper are mainly focused on the low number of papers that studied the relationship between QM and important specific performance indicators such as productivity. For this reason, for future research we suggest performing empirical studies in different contexts in which this relationship is analysed and our findings are tested in order to feed the performance management theories and praxes, provide a guide for the decision making of practitioners, managers and policy makers and also contribute to the strengthening of productivity.

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