THE USE OF MIXED METHODS IN QUALITY MANAGEMENT RESEARCH: A LITERATURE REVIEW[1]

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Abstract

The current paper aims to analyse how mixed methods have been applied in quality management research, looking at how qualitative and quantitative methods have been combined, with which purposes and strategies.

To address this purpose, a systematic literature review has been conducted based on articles published in Scopus indexed journals, in the fields of business and management, and engineering.

Fifty-eight articles have been analysed. Findings show that the number of quality management studies using mixed methods has steadily increased over the years. Mixed methods tend to be essentially applied within case studies, with an identical emphasis given to qualitative and quantitative data. Likewise, sequential mixes occur more often than concurrent approaches. The purposes of using mixed methods are not always clearly stated which makes it more difficult to assess their contribution. In any case, the combination of methods seems to contribute to enhancing research validity.

As one of the first papers to examine how qualitative and quantitative methods are being combined in quality management studies, this study is expected to provide some hints on how mixed methods can be more effectively used in quality management research.

Keywords
quality management; research design; bibliometric analysis; quantitative approaches; qualitative approaches

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1. Introduction

The use of mixed methods design is not new to quality management researchers, but, to the author's best knowledge no other papers have crucially reflected upon its use. Many scholars have been recommending the application of both qualitative and quantitative methods in the same project to get a better understanding of complex problems (Currall and Towler, 2003; Molina-Azorin and Cameron, 2010). Yet, little is known concerning the extent to which management and engineering publications dedicated to the study of quality management topics make use of mixed methods, which types of studies have been carried out, and how reflexivity is contemplated in such publications.

To address this gap the current study seeks to answer the following research questions:

- To what extent are mixed methods being used in quality management research? How is the number of publications being evolved?
- How are mixed methods studies distributed in terms of journals, regions, sectors, and quality management topics?
- Which are the main reasons to apply mixed methods in quality management studies?
- How have different studies employed mixed methods? Which approaches dominate? Which data collection and data analysis techniques have been more often combined?

The remainder of the paper is structured as follows. Following this short introduction, section 2 presents an overview of mixed methods in the literature, calling attention to the different purposes behind their application and describing the different approaches used to combine qualitative and quantitative methods. The design of the current study is explained in Section 3. Section 4 presents and discusses the main findings, characterising the publications in terms of journals, topics and geographic coverage together with an analysis of the reasons presented to apply mix methods designs, the approaches followed and the data collection techniques used. Finally, in the last section, some implications are derived and suggestions are offered for future research.

2. An overview of mixed methods

2.1. Purposes and challenges

Although quantitative and qualitative methods have been combined in management research for many decades, mixed methods designs have only emerged as an important research strategy in the last twenty years, having been recognised as a separate methodological tradition (Khoo-Lattimore et al., 2019).

A relevant issue is raised by Morse (2003) when he calls attention to the distinction between "multimethod designs" and "mixed methods designs", associating the former with the use of two or more methods in the same project without really combining them. On the other hand, in mixed methods designs, different methods are not kept separate, but are rather combined and, to some extent, integrated. As Creswell (2014) argues, in mixed methods different forms of data "are integrated in the design analysis through merging the data, connecting the data, or embedding the data."

Creswell (2014) identifies the following main purposes of using mixed methods designs:

- Comparing different perspectives drawn from quantitative and qualitative data;
- Explaining quantitative results with a qualitative follow-up data collection and analysis;
- Developing better measurement instruments by first collecting and analysing qualitative data and then administrating the instruments to a sample;

- Understanding experimental results by incorporating the perspectives of individuals;
- Developing a more complete understanding of changes needed for a marginalized group through the combination of qualitative and quantitative data;
- Having a better understanding of the need for and impact of an intervention program through collecting both quantitative and qualitative data over time.

Mixed-methods approaches eliminate the weaknesses of the single research method and simultaneously enhance its strengths. Mixed methods designs are expected to boost research validity by potentially overcoming some limitations of a single method (either qualitative or quantitative) and providing additional support for the study's findings (Molina-Azorin and Cameron, 2010).

The application of mixed methods in one project poses important challenges. First, the cost and time needed to carry out the research typically increase (Bryman, 1988; Molina-Azorin and Cameron, 2010). Moreover, since different methods call for different competencies and skills, mixed methods research requires more experienced scholars and/or the formation of a research team (Creswell, 2014; Molina-Azorin and Cameron, 2010).

2.2. Approaches to mix methods

Several approaches can be followed when mixed methods studies are carried out. Two main dimensions distinguish such approaches: implementation and priority.

Implementation of data collection refers to the sequence that the researcher uses to collect both quantitative and qualitative data. Concurrent (simultaneous or parallel) design is used when data is gathered at the same time. The main goal is to search for congruent findings (Molina-Azorin and Cameron, 2010), that can enhance research validity. On the other hand, in sequential (or two-phase) design data is collected in phases. Quantitative methods can either precede or succeed qualitative methods. In general, when qualitative data collection precedes quantitative data collection, the intent is to first explore the problem under study and then follow up on this exploration with quantitative data. Alternatively, when quantitative data precede qualitative data collection, the intent is to test the variables with a large sample and then carry out a more in-depth exploration of a few cases during the qualitative phase.

In addition, the researcher can give identical priority to both quantitative and qualitative methods or emphasise one over the others. Accordingly, mixed methods designs can be labelled as "equivalent" or "dominant".

From the combination of these dimensions, nine alternative designs emerge. Table 1 summarises the main approaches that are followed when mixed methods are applied and describes some of their key features.

Table 1. Main approaches proposed in the literature to conduct mixed methods research

	Concurrent mixed methods	**Sequential mixed methods**
Equivalent	QUAL + QUAN (1) (1) Quantitative and qualitative data are collected and analysed separately. Equivalent importance is given to both methods. Results are then compared to see if the findings confirm or disconfirm each other.	QUAN→QUAL (2) or QUAL→QUAN (3) (2) It involves a two-phase project in which the researcher collects quantitative data in the first phase, analyses the results, and then uses the results to plan (or build on to) the second, qualitative phase. Equivalent importance is given to both methods. The overall intent of this design is to have the qualitative data help explain in more detail the initial quantitative results. (3) Is a design in which the researcher first begins by exploring with qualitative data and analysis and then uses the findings in a second quantitative phase. Equivalent importance is given to both methods. The qualitative data analysis can be used to develop an instrument with good psychometric properties. A researcher can also analyse the qualitative data to develop new variables, to identify the types of scales that might exist in current instruments, or to form categories of information that will be explored further in a quantitative phase.
Dominant	QUAL+quan (4) or QUAN+qual (5) (4) As (1) but qualitative methods dominate over quantitative methods, which are regarded as complementary. (5) As (1) but quantitative methods dominate over qualitative methods, which are regarded as complementary.	quan→QUAL (6) or QUAN→qual (7) or QUAL→quan (8) or qual→QUAN (9) (6) As (2) but qualitative methods dominate over quantitative methods, which are regarded as complementary. (7) As (2) but quantitative methods dominate over qualitative methods, which are regarded as complementary. (8) As (3) but qualitative methods dominate over quantitative methods, which are regarded as complementary. (9) As (3) but quantitative methods dominate over qualitative methods, which are regarded as complementary.

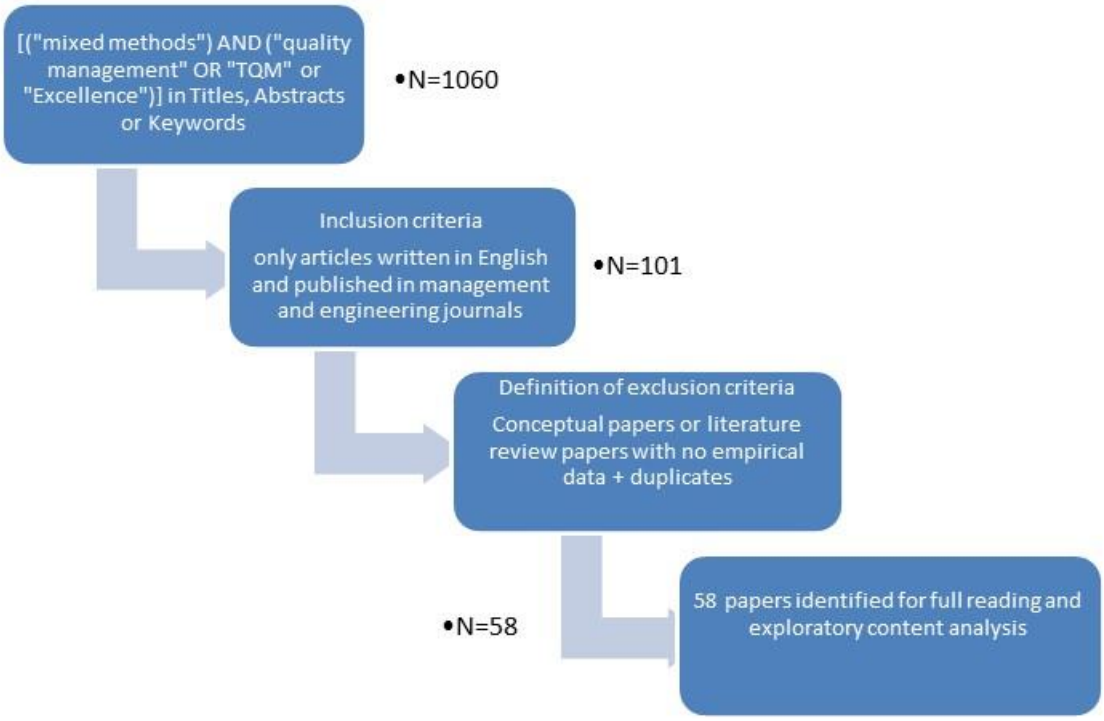
3. Research Design

This paper follows a systematic literature review based on a process consisting of the following steps: (1) establishing the review purpose and identifying the research questions; (2) selecting the databases, search terms, and selection/exclusion criteria; (3) searching databases, screening search outcomes against the criteria identified earlier and fine-tuning the exclusion and inclusion criteria; (4) computing the main bibliometric indexes; and (5) analysing the results.

Based on the review goals and research questions that guide the present study (stated earlier in the introduction), the terms “mixed methods” and “quality management” or “TQM” were

selected. The Scopus database was chosen, given its wide coverage of ranked quality journals. The results of the literature search are summarised in Figure 1.

Figure 1. Research strategy of the systematic literature review



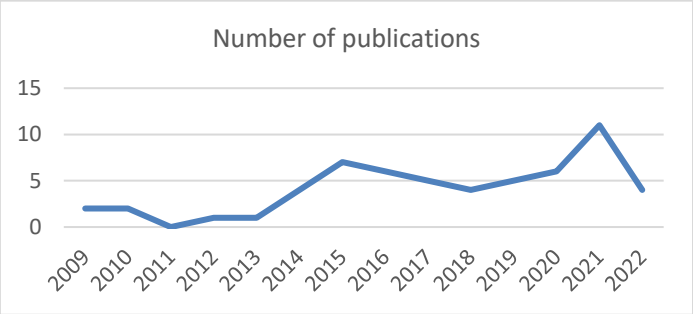
The initial search using Scopus resulted in 1060 articles. The search string used was "mixed methods" AND "quality management" OR "TQM" OR "excellence" in the Titles, Abstracts or Keywords. A filter was applied to include only articles written in English and published in management and engineering journals (since these are two main fields of quality management studies). This led to the identification of 101 articles. Removing duplicates and conceptual papers or literature review papers with no empirical data left 58 articles for analysis, which were read in full.

4. Review findings

4.1. Bibliometric characterisation of publications

The 58 selected quality management papers employing mixed methods were published between 2009 and 2022, which shows that the use of mixed methods in quality management research is relatively recent. Moreover, the number of publications has steadily increased over the years. As depicted in Figure 2, after a period when these research designs were slowly adopted (from 2009 to 2013), there was a period (from 2014 to 2019) when the pace of use of mixed methods rapidly increased. From 2020 onwards we have entered a period of 'consolidation'. The year 2022 is still not fully reflected on the results since the review process took place in May.

Figure 2. Number of quality management papers employing mixed methods over time



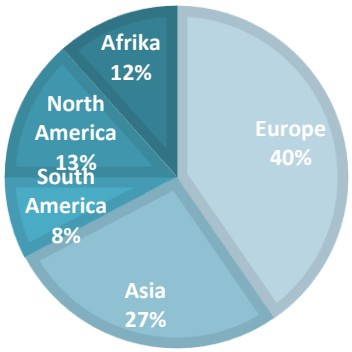
Peer-reviewed quality management articles using mixed methods were published in 33 management and engineering journals (see Table 2), which indicates that papers are scattered across a considerable number of publications. Four journals have four or more papers fitting the chosen criteria: the Journal of Healthcare Quality Assurance (9), the International Journal of Quality and Reliability Management (6), the Journal of Health Organization and Management (4), and the TQM Journal (4).

Table 2. Journal distribution of the 58 quality management papers employing mixed methods

Journals	**No. of papers**
Academy of Strategic Management Journal	1
Accounting Education	1
African Journal of Hospitality	1
Applied Ergonomics	1
British Food Journal	1
Business Process Management Journal	1
Corporate Ownership and Control	1
Electronic Journal of Business Research Methods	1
Engineering Management Journal	1
e-Review of Tourism Research	1
IEEE Access	1
IISE Transactions on Healthcare Systems Engineering	1
International Journal of Construction Management	2
International Journal of Culture, Tourism, and Hospitality Research	1
International Journal of Event and Festival Management	1
International Journal of Health Care Quality Assurance	9
International Journal of online and biomedical engineering	1
International Journal of Production Research	1
International Journal of Quality and Reliability Management	6
International Journal of Quality and Service Sciences	2
International Journal of Recent Technology and Engineering	1
Journal of Health Organization and Management	3
Journal of Industrial Engineering and Management	2
Journal of Management in Engineering	1
Journal of Service Theory and Practice	1
Leadership in Health Services	2
Operations Management Research	1
Problems and Perspectives in Management	1
South African Journal of Industrial Engineering	1
Supply Chain Management	2
Total Quality Management and Business Excellence	1
Tourism Management	2
TQM Journal	4
Worldwide Hospitality and Tourism Themes	1

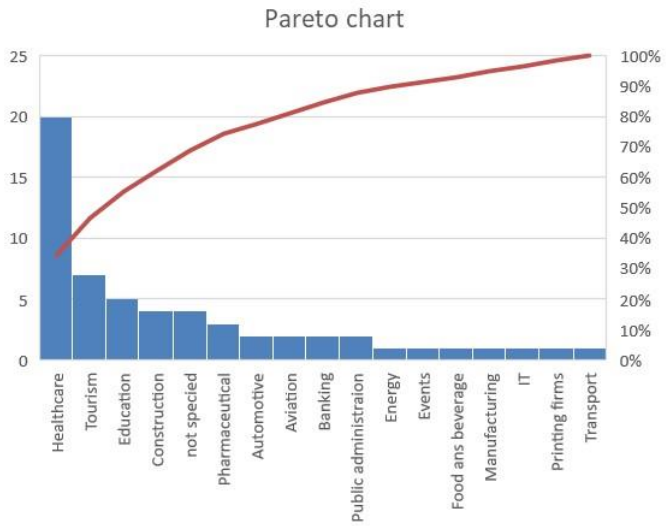
From a geographical perspective, and based on the affiliation of the first author, it is possible to notice that, as depicted in Figure 3, mixed methods are being used by researchers from all continents. European authors seem to be taking the lead on this matter.

Figure 3. Geographical coverage of mixed methods research in quality management



Furthermore, mixed methods have been applied in studies in different sectors. Figure 4 shows that healthcare, tourism, and education account for more than 55% of all research.

Figure 4. Sector distribution of the 58 quality management papers employing mixed methods



Mixed methods have been used to conduct empirical research on a diversity of quality management topics. As shown in Table 3, quality management systems and the impact of improvement programs are among the most researched themes.

Table 3. Most researched topics

Topic	No. of papers
Quality Management Systems and Quality Assurance	11
Effectiveness of quality management and improvement programmes	9
Lean management and Six Sigma	7
Service quality	6
Supply Chain Management	5
Relationship with customers/users	5
Leadership and people management practices	5
Others	10

4.2. Reasons to use mixed methods

By analysing the research design described in each paper it was possible to identify the justification for the use of mixed methods and to map the approaches followed. Yet, in many cases the rationale is not explicitly stated.

Using Creswell's (2014) classification of the main purposes to use mixed methods, Table 4 was produced. It must be said that the justification for the use of mixed methods is not always explicitly stated in the papers. In 8 cases such purpose was not clear when reading the full paper.

Table 4. Main purpose for the use of mixed methods

Comparing different perspectives drawn from quantitative and qualitative data (18 papers)	Explaining quantitative results with a qualitative follow-up data collection and analysis (4 papers)	Developing better measurement instruments by first collecting and analyzing qualitative data (24 papers)
Understanding experimental results by incorporating the perspectives of individuals (0 papers)	Developing a more complete understanding of changes needed for a marginalized group through the combination of qualitative and quantitative data (0 papers)	Having a better understanding of the need for and impact of an intervention program through collecting both quantitative and qualitative data over time 99 (4 papers)
Not clear (8 papers)		

It becomes evident that mixed methods in quality management studies are mainly applied to develop better measurement instruments by collecting qualitative data prior to the administration of quantitative tools (24 papers) and to compare different perspectives drawn from qualitative and quantitative data (18 papers). Among the reasons included in the first group are:

> *In this study focus group (qualitative) is used as a preliminary method for refinement of measurement scales developed from published literature. Then a survey method is used to collect quantifiable data from a larger population (Tayyab et al., 2022).*
>
> *The need to provide a numeric scale to systematically rank potential EWRs measures required a combination of qualitative and quantitative tools (Reed, 2020).*

whereas in the latter group we find arguments such as:

> *It will thus afford a complete understanding of the research question by comparing the results of the two studies. The convergent design helped to obtain complementary data on the same topic (…) comparing the results of both qualitative and quantitative studies to answer the research question (Antony et al., 2021).*

Although not dominant, it was interesting to find studies that use mixed methods to have a better understanding of the need for and impact of an intervention program. This purpose seems to make particular sense given the importance in quality management of assessing improvement initiatives over time.

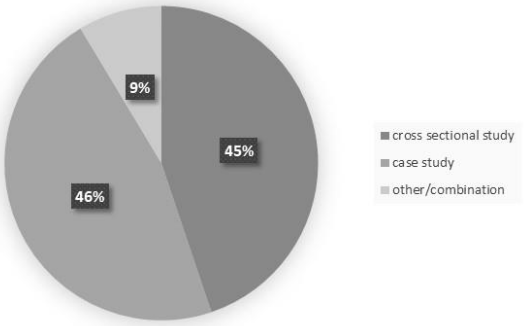
> *The research design took the form of a mixed methods, longitudinal 3.5-year study aimed at exploring transformational change in terms of content, context, process and outcomes (Hunter et al., 2015).*

Finally, we identified four studies that used mixed methods to explain or to deepen the findings obtained with quantitative tools.

> *This involved initially a quantitative approach offering the capability to measure the opinions and views of a selected sample (…). The interviews were conducted and based to support the results discovered in the questionnaire. The method aimed to expand the investigation through in-depth discussion with industry professionals of some specific findings (Keenan and Rostami, 2021).*

It is also interesting to notice that mixed methods have been almost equally used in the context of case studies and in cross-sectional studies (Figure 5).

Figure 5. Type of studies that used mixed methods



4.3. Approaches used

The majority of the studies adopted a sequential mix (71%) and among these, there is a slight prevalence of papers where either quantitative or qualitative methods dominate. Among the research that simultaneously uses both types of methods the balance between equivalent and dominant studies is even higher (see Table 5). All in all, sequential papers where one of the methods is dominant is the most popular approach, representing 40% of the papers analysed.

Table 5. Sequential versus concurrent approaches reported in the 58 quality management papers employing mixed methods

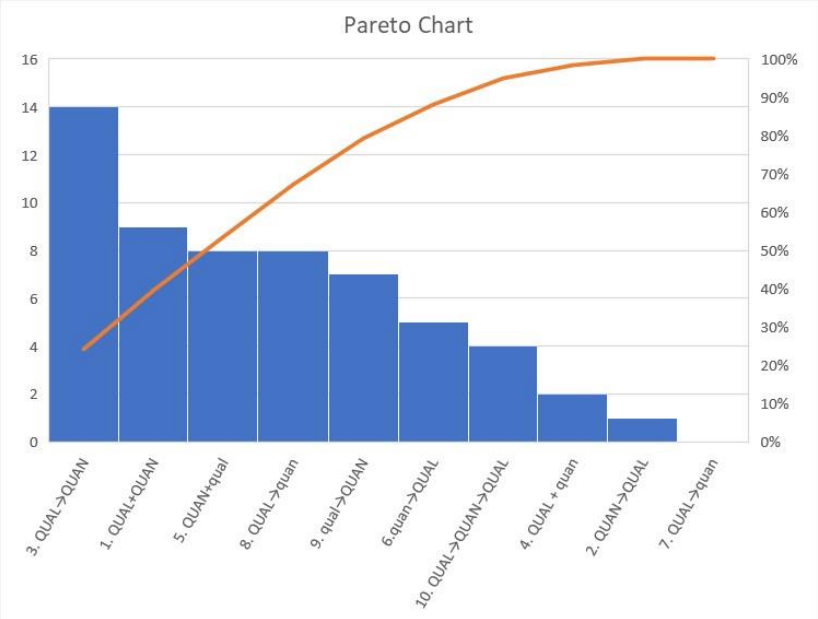
Type of mix	No.	%		No.	%
Sequential	41	71	Equivalent	18	31
			Dominant	23	40
Concurrent	17	29	Equivalent	9	15
			Dominant	8	14
Total	58	100	Total	58	100

Among the studies classified as "Dominant" (n=31), there is a balance between those in which quantitative methods prevail (n=17) and those in which qualitative methods are more intensively used (n=14).

As for sequential approaches (n=41), only 9 began with a quantitative method (22%). The majority uses qualitative methods first, often with the purpose of obtaining knowledge to develop scales and design questionnaires that will be applied to larger samples.

Figure 5 summarizes de main approaches identified in the 58 papers analysed. Studies that begin by using qualitative methods and give identical emphasis to both types of data are the most frequent (n=14), followed by studies where quantitative and qualitative methods are also equally important, but are used in parallel (n=9). On the other hand, studies using approaches classified in Table 1 as 2, 4, and 7 are residual or even inexistent. Four studies use what we might call "advanced mixed methods" designs, where different forms of data (quantitative or qualitative or both) are combined within a larger design (e.g., an experiment) or various methods are mixed within a longitudinal study with a focus on a common objective for the multiple projects.

Figure 5. Approaches used in the 58 papers analysed



4.4. Data collection methods used

Table 6 summarises the data collection approaches used in the mixed methods studies we analysed and highlights the combination of interviews and surveys as the most common mixed

method design (34%, i.e., 20 out of the 58). If we add to this number, the papers that use other methods, such as document analysis or focus groups, in addition to interviews and surveys, the prevalence is even higher (50%). Eight studies use surveys as the unique data collection method, probably with different types of questions (open vs. closed) at different stages. The same number of papers apply focus groups or document analysis as one of the data collection methods in combination with other tools.

Table 6. Data collection methods used in the 58 quality management papers employing mixed methods

Methods	No. of papers
Audits and surveys	1
Document analysis and surveys	1
Document analysis and interviews	2
Document analysis and focus groups	1
Document analysis, interviews and surveys	2
Document analysis, surveys and focus groups	1
Document analysis, interviews and direct observation	1
Fieldnotes, interviews and records	1
Focus groups and surveys	4
Focus groups, interviews and surveys	2
Focus groups and reports	1
Focus groups, surveys and photo walkabouts	1
Interviews	1
Interviews and surveys	20
Interviews and quantitative secondary data	1
Interviews and participant observation	1
Interviews, surveys and records	1
Interviews, surveys and reports	1
Interviews, surveys and direct observation	2
Interviews, surveys and quasi-experiments	1
Surveys	8
Surveys and records	1
Delphi questionnaires	1
Web reviews	1
More than 3 methods	1

5. Concluding remarks

Research in quality management topics has been mainly based on quantitative studies. Empirical studies tend to rely on the collection of a large number of observations, usually by means of self-administered questionnaires, resulting in robust statistical power and analysis of cross-sectional variation. Qualitative approaches have been mainly used to further validate scales and shed some light on contradictory (or unexpected) quantitative findings that have arisen in previous studies. According to the literature, mixed methods designs can be applied to increase the validity, completeness, and confirmation of findings, and minimize the inherent weaknesses of monomethod approaches.

This paper identifies and characterises the use of mixed methods in quality management research. Fifty-eight papers were selected and kept for full-text reading. It was found that papers are scattered among different journals, regions and sectors, even if in this latter case the healthcare sector dominates.

The rationale for using mixed methods often is not explicit. It is important in future studies to better justify why mixed methods are used so that the contribution of combining qualitative and quantitative data to answer the research questions can be easily assessed. There seems to

be a correspondence between the complexity of the research purposes and the sophistication of the research design. In larger studies, with a broader time span, different methods are combined at different stages. At the same time, it was possible to find papers where there is a poor identification of mixed methods and their design. When analysing the papers in detail, it was possible to identify that a small number of scholars who adopted a sequential mix actually utilised a multi, rather than their claimed mixed methods approach. This is particularly the case of papers where it did not become evident with which purpose mixed methods were being applied.

We suggest that quality management scholars should better justify their research methodology in order to eliminate the biases that arise through the selection of convenient methodologies. Thus, future studies should incorporate both qualitative and quantitative aspects when formulating mixed method research questions, emphasize the rationale of their choices.

In the articles analysed there is a prevalence of sequential approaches, as well as of studies that tend to give an identical emphasis to both qualitative and quantitative methods. A variety of data collection methods are employed, but most studies tend to make use of combinations that involve surveys and interviews.

The current study has some limitations. First of all, due to the keywords used in the search, some papers that address quality management issues but do not have the selected terms in the title, abstract or keywords might have been ignored. Moreover, it would have been interesting to determine whether the expected benefits of mixed methods have been achieved in each study. Yet, the lack of clarity in many papers regarding the purposes of mixed methods use makes such assessment more difficult and subjective.

Despite these limitations, this literature review provides a summative starting point for researchers who wish to get an overview of what has already been undertaken by others who have applied mixed methods when conducting quality management studies. Yet, there remains a need for a more cohesive framework that clearly identifies best practices in the selection and coupling of appropriate methods for quality management research. Moreover, future work in this area could build on alternative mixed methods typologies that integrate interpretive and evaluative approaches that were not included in the descriptive review presented in this article.

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