

Quality management practices and firm performance in the industrial sector: Evidence from a PRISMA guided systematic review

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Abstract

Given the wide disparity among studies on the quality management practices and performance relationship in terms of context, conceptual framing, quality factors, and performance dimensions, no coherent or integrated understanding of the phenomenon has yet been established. This review addresses that gap through a systematic synthesis that consolidates the empirical evidence and appraises its methodological quality using an explicit, reproducible protocol. It seeks to clarify the nature and the consistency of this relationship, and to characterize the mediating mechanisms and contextual conditions documented in the literature.

The PRISMA 2020 protocol guided the identification, selection, and extraction of studies from Scopus and Web of Science. After applying eligibility criteria, a final corpus of 54 articles was retained. The methodological quality of each study was evaluated using the Mixed Methods Appraisal Tool (MMAT).

The retained studies cover a wide range of international contexts and rely predominantly on correlational designs and structural equation modelling of which 42 out of 54 studies achieved a high MMAT score ($\geq 4/5$). Besides, 44 studies report a positive and significant association between quality management practices and performance, particularly on operational and quality related dimensions whereas financial effects tend to be delayed and indirect. In sum, this review suggests that quality management practices benefit industrial performance, though the predominance of cross-sectional designs and limited control for confounders warrant caution on causality. Stronger designs such as longitudinal, before/after, control-group, and event studies nonetheless confirm the robustness of this link and clarify its temporality.

Keywords: Quality management, industrial performance, impact, systematic review, PRISMA.

Classification JEL : L15, M11, L25.

Paper type: Theoretical Research

1. Introduction

Industrial companies today are operating in a far more challenging environment. Competition is more global, supply chains are more fragile, and the expectations surrounding quality and sustainability are growing. Managers must use structured managerial approaches to cope with these challenges to make sure their firms remain competitive, absorb shocks and survive in the long term. In this quest, quality management practices (QMP) have taken a central position, becoming more and more a strategic lever than a technical tool to reach a higher performance (Sahoo, 2020).

Such practices are rooted in the concepts of total quality management (TQM) and include several mutually interrelated elements, including leadership, customer focus, staff involvement, process management and continuous improvement (Sila, 2007). The focus of quality management has changed quite from the early contributions of Deming (1986) and Juran (1988). A logic of inspection and control has been replaced by a more systemic and anticipatory logic rooted in the firm's strategy (Kaynak, 2003). Quality has become a real source of differentiation and a competitive advantage in the process (Sadikoglu & Olcay, 2014).

Research on the relationship between quality management and organizational performance has grown significantly in the last few decades. Much of the evidence suggests a positive relationship between the adoption of quality management practices and many aspects of performance such as operational, financial, or performance related to stakeholder satisfaction and innovation (Kaynak, 2003; Nair, 2006; Sadikoglu & Olcay, 2014). However, some studies found weak, not significant or even negative effects on some performance measures, highlighting the importance of the context conditions and the moderating variables such as firm size, industry or institutional setting (Sila, 2007; Zehir et al., 2012).

Such contradiction suggests a more fundamental disagreement concerning the nature of the quality management practices and performance relationship, its magnitude, and the mechanisms underlying it. The contexts of the research, the conceptual framework, the quality factors and performance dimensions used in the studies differ greatly, making it impossible to develop an integrated picture of what is actually known (Nair, 2006). In view of this fragmentation, there is a need for a prudent and methodical synthesis of the available empirical findings.

Unlike a narrative review, which risks reproducing the same selective, non-transparent reading of the literature that has produced this fragmentation, a systematic review applies an explicit and reproducible protocol to the identification, selection, and appraisal of studies offering a more reliable basis for establishing an understanding of the phenomenon.

This is the focus of the present paper conducting a systematic literature evaluation using the PRISMA 2020 protocol (Page et al., 2021) with the objective of reviewing, in a transparent and reproducible way, the empirical evidence on the impact of quality management practices on performance specifically in the industrial sector, covering manufacturing and other goods-producing activities distinctively from services.

The distinctive contribution of this review lays in the three-layer analytical approach, which combines a bibliometric representation of the structure of the field, a systematic methodological evaluation of each study with the MMAT protocol (Hong et al., 2018), and a thematic synthesis of substantive findings. Previous reviews of the literature on quality management practices and performance, including the work of García-Fernández et al. (2022), have generally relied solely on a combination of systematic searches and qualitative syntheses without a comparable appraisal layer.

This review covers the empirical studies published in a time span from 1995 to 2025. This period captures both the foundational TQM/ISO 9001 literature of the mid-1990s and more recent contributions addressing industry 4.0 and sustainability-related quality practices.

Hence, the main research question for this review is the following:

“What does the empirical research, between 1995 and 2025, say about the impact of quality management practices on the performance of firms in the industrial sector?”

This leads us to address in detail three research questions:

RQ1: *“What are the studied aspects of quality management practices in empirical research?”*

RQ2: *“What are the performance dimensions mostly associated with these practices?”*

RQ3: *“What are the mediating factors and the contextual conditions that impact this relationship?”*

To answer these questions, the article is structured as follows. The first section presents the theoretical framework on quality management practices and organizational performance. The second one explains the systematic review process based on the PRISMA 2020 protocol, completed with an assessment of the methodological quality of each research using the Mixed Methods Appraisal Tool (MMAT, version 2018) (Hong et al., 2018). The third part shows the results based on the corpus of selected empirical studies. Thereafter, the article discusses the theoretical and managerial consequences and future research perspectives.

2. Quality management practices and performance: key definitions

In an environment marked by an intensifying competition, rising customer expectations, and the globalization of value chains, quality has become an essential determinant of organizational competitiveness.

The concept of quality, which was originally linked to the technical control of the finished product, has evolved profoundly towards a general management philosophy that involves all the functions and hierarchical levels of the company. This evolution was solidified in the concept of total quality management (TQM), viewed not as a set of isolated tools, but as an integrated system of managerial practices focused toward customer satisfaction and continual improvement (Dean & Bowen, 1994).

From a conceptual point of view, quality management practices refer to the systematic compilation of activities, methods and principles used by a firm to plan, control, assure and enhance the quality of its products and processes. The abundance of empirical research on these practices suggests their theoretical and managerial relevance, but also demonstrates a degree of heterogeneity in the way they are defined and operationalized (Sila & Ebrahimpour, 2002).

Quality management practices are represented in the literature as a multidimensional construct. Therefore, the validated instrument of Saraph et al. (1989) and the subsequent refinements of Flynn et al. (1994) and Ahire et al. (1996) revealed a recognizable core of dimensions of quality management that proved durable across settings. It is the seven principals concerning: leadership and the visible commitment of top management, the sustained orientation toward the customer, the disciplined management of processes, the training and involvement of employees, the ethic of continuous improvement, the cooperative relationships with suppliers, and the systematic collection and use of data. These are not random categories. They are recurring because, during decades of instrument development, they kept getting assembled together, and kept identifying firms that managed quality well from those who did not.

More crucial for the present framework than the list of dimensions itself is a distinction that extends across it. Flynn et al. (1995) divided what the field now refers to as the soft and hard aspects of quality management practices and the separation has guided the thinking ever since. Soft, or infrastructure, practices (leadership, human-resource management, supplier and customer relations) do not alter a product. They create the working environment, the incentives and the relationships within which work is done. The hard or core practices (process control, statistical method, information and analysis) act directly on the operational system, on the machines and procedures that transforms inputs into outputs. This distinction was used by Nair

(2006) in a quantitative synthesis of the field and has been one of the most reliable conceptual tools since then.

Their architecture is essential since it supports a hypothesis about the relation between the two forms of practice. The soft practices are not expected to act on results in their own but are supposed to enable the hard practices that act on the outcomes. A culture of improvement without the analytical tools to act on it creates enthusiasm without adhesion, whereas sophisticated process control without leadership and engagement to sustain it tends to decline into a ritual. The framework thus does not view infrastructure and core practices as two interchangeable groups but as two layers in a sequence with the first setting the conditions under which the second works.

Another step in the evolution of quality management practices is strategic quality management in which quality is considered a source of competitive advantage instead of a cost control mechanism and quality management is explicitly linked to strategic planning, market positioning and long-term capability development. At the same time, the perspectives on continuous improvement and organizational learning have matured. Singh and Singh (2015) review of continuous improvement literature reveals that continuous improvement philosophies such as Kaizen, Six Sigma and Lean management are not only isolated tools but learning mechanisms that build organizational capability through successive improvement cycles.

Moreover, the most important change in recent decades is related to the digital quality management, “Industry 4.0” and “Quality 4.0”. Ranjith Kumar et al. (2022) define “Quality 4.0” as the reconfiguration of quality practices around data connectivity, analytics and smart manufacturing technologies. Furthermore, Thekkootte (2022) identifies data, analytics and connectivity, organizational culture and leadership as joint enablers for successful Quality 4.0 implementation, pointing out that technological adoption alone is not enough without complementary organizational and cultural adaptation. The discussion is extended in Bousdekis et al. (2023) by mapping how data analytics techniques are integrated in quality functions. On the other hand, Ali & Johl (2022) argue that the difference between soft and hard TQM needs to be reformulated in the context of Industry 4.0, because digital technologies influence both the mechanisms of employee involvement and the precision of process control.

Finally, quality management has been reoriented towards sustainability, resilience and organizational agility. Siva et al. (2016) indicates that quality management systems are not a competing strategy but an implementation instrument that provides the structural and cultural framework of sustainable development initiatives. Most recently, Pertusa-Ortega et al. (2025) find that organizational agility mediates to some extent the relationship between quality management and firm performance, suggesting that the performance effects of quality management are increasingly achieved through the firm’s adaptive capacity, rather than through direct operational improvement alone. This suggests that quality management is not a static control system but rather an antecedent of dynamic capability development. This reframing has direct implications for the pace and pathways through which its effects on performance can be expected to emerge.

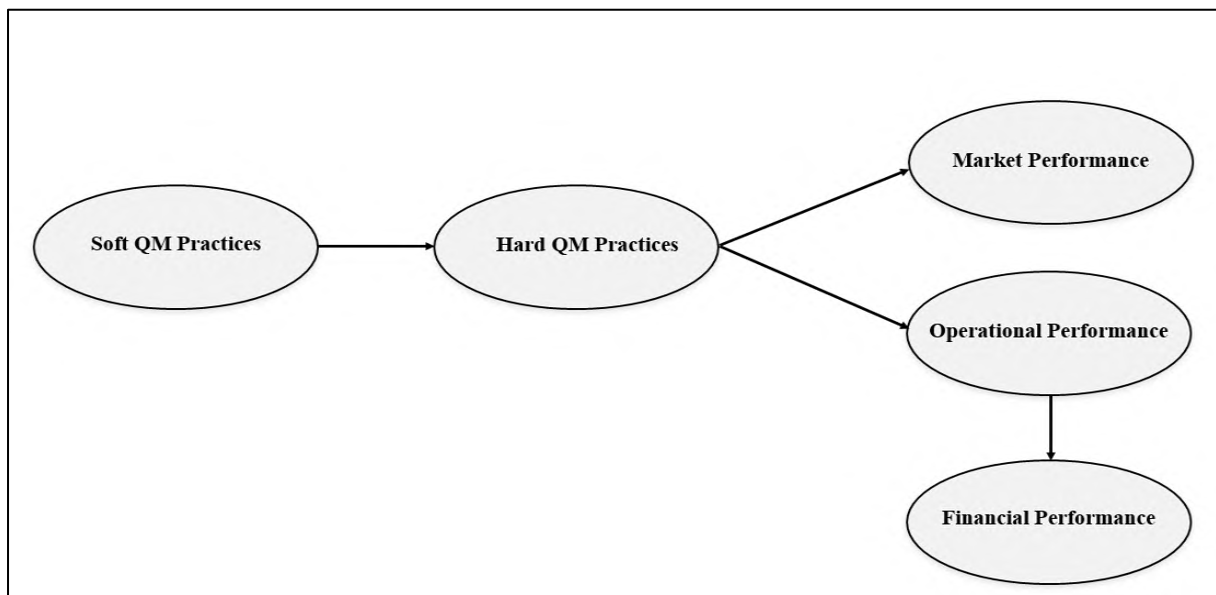
Regarding the second pillar of our theoretical framework which is the industrial performance. Its operationalization presents similar challenges as those found for quality management practices. The literature is generally against any unidimensional vision of performance. This to say that to evaluate it by a single indicator, most commonly financial, induces a blindness to the range of effects caused by quality management practices. This is the issue that Kaynak (2003) pointed out as one of the reasons for the conflicting results found in prior studies, some of which even failed to find any significant correlation by not distinguishing the impacted levels of performance.

In the industrial sector, it is typical to list at least three principal dimensions of performance. Operational performance refers to the efficiency of production processes through scrap rate,

productivity, lead times, inventory turnover and delivery reliability. Financial performance encompasses profitability, revenue growth and return on investment. Finally, market or customer performance involves satisfaction, loyalty and market share. Sila (2007) added to this typology a dimension related to human resources, documenting that TQM's human resource oriented practices such as teamwork, employee empowerment and involvement in decision making produce outcomes like reduced turnover and absenteeism, higher job performance and satisfaction that are conceptually and empirically distinct from customer or financial outcomes. Critically, human resource results in this model occupy a mediating position in the causal chain leading to financial performance. The model's structural path estimates show that TQM has a direct, significant effect on human resource results, which in turn exerts a direct, significant effect on organizational effectiveness itself a significant predictor of both customer results and financial and market performance.

Overall, this hierarchy of effects is of some theoretical interest. This shows that there is a causal chain in which operational improvements serve as an intermediary mechanism through which quality management practices eventually influence financial outcomes. At the conclusion of a meta-analysis on the links between quality management practices and performance, Nair (2006) states that the strength and relevance of the link vary considerably with the performance dimensions and the contextual factors. This result justifies a modelling method, as shown in Figure 1, which extends the assumption of a global effect, and decomposes performance and quality management practices including mediation processes that may explain the transmission of effects.

Figure 1. Conceptual framework of the impact of quality management practices on performance



Source : Authors

3. Methods

3.1. Design of the review

This systematic review follows the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) recommendations, which offer a standardized and reproducible framework for identifying, selecting, extracting, and synthesizing studies. Therefore, a systematic review is much more methodologically consistent than the narrative one as it sets the search, screening and selection rules in advance and disclose them in a transparent way so that the process from thousands of candidate records to the final corpus can be inspected and, if necessary, contested (Tranfield et al., 2003).

This approach is based on Denyer and Tranfield (2009) who argue that the four principles that traditionally support Cochrane-style systematic reviews in medicine are unadaptable to management and organizational studies and instead propose four alternative principles namely transparency, inclusivity, explanatory power and heuristic value. Two implications of this framework directly contributed to this methodology's design. First, an aggregative synthesis strategy was ruled out in favour of an interpretive, explanatory narrative synthesis since an aggregative synthesis requires a high level of homogeneity in effect measures and pre-specified, comparable mediators and moderators across studies. Second, in line with the principle of inclusivity, the review's inclusion criteria were designed to retain studies across a wide range of methodological quality, appraised using the MMAT rather than filtered through a strict quality criterion, since a heterogeneous set of designs can in itself strengthen, rather than weaken, the validity of a narrative synthesis by enabling quality to be explored as an analytical variable rather than a limiting criterion. Finally, the CIMO logic (Context, Intervention, Mechanism, Outcome) proposed by the same authors directly guided the design of the data extraction structure and the five thematic axes guiding the synthesis. The "Context" component supports the systematic extraction of sector, country and sample characteristics for each included study, while the "Mechanism" component supports the axis specifically dedicated to mediation processes between quality management practices and performance.

Specifically, the goal of this review is not to pool effect sizes into a single statistical estimate, but to map how a collection of empirical work conceptualizes and tests the quality management practices and performance relationship, to weigh the methodological quality of that work, and to draw out the patterns and tensions running through it. This is a reflection of the evidence. The constructs, measures, and contexts of the primary studies are so diverse that combining them into one coefficient would falsely assume homogeneity. Moreover, the decision not to conduct a quantitative meta-analysis is not only motivated by general conceptual heterogeneity but rather heterogeneity that precedes conventional statistical diagnostics such as I^2 (Higgins & Thompson, 2002; Higgins, Thompson, Deeks, & Altman, 2003). Conventional guidance suggests that I^2 values greater than about 75% indicate considerable heterogeneity, at which point there is little benefit to combining one summary effect size even if technically feasible. However, the obstacle is more fundamental in the present corpus as the 54 included studies are not reporting a common effect-size metric that can be used for estimating I^2 in the first place. Studies report the quality management practices and performance associations as Pearson or Spearman correlations, standardized path coefficients from structural equation models, unstandardized regression betas, or mean-difference statistics from group comparisons, depending on the study. It is this heterogeneity of constructs and metrics, rather than statistical heterogeneity itself, that prevents an effective quantitative synthesis and justifies the narrative, MMAT-based synthesis approach adopted in this review.

Hence, a structured qualitative synthesis, guided by explicit appraisal, is a more honest way to deal with such heterogeneous material (Snyder, 2019). This approach is consistent with recent assessments in the quality management field that have also used systematic search across Scopus and the Web of Science followed by qualitative synthesis instead of meta-analysis (García-Fernández et al., 2022).

As for the analytical part three layers are combined. A bibliometric layer characterizes the form of the corpus to reflect its growth over time, its outlets, its dominating terms and its geographical location. The methodological reliability of each study is assessed by a quality-appraisal layer, using the MMAT (Mixed Methods Appraisal Tool). The thematic layer examines the substantive content and structures the findings in a coherent way. The three layers together guard against the characteristic weaknesses of each as bibliometrics can describe a literature

without understanding it, appraisal can judge studies without connecting them, and thematic synthesis can interpret without disciplining its claims against evidence quality. The combination of these three layers is intended to be greater than the sum of its parts.

3.2. Data sources and search strategy

The literature search was conducted in the major international academic databases of management sciences, which are Scopus and Web of Science. Both index a large body of work in management and operations, but neither is a superset of the other and using a single source would have introduced a coverage bias of unknown direction. Querying both and merging results increases coverage while allowing duplicate records to be identified and removed (Mongeon & Paul-Hus, 2016).

The search technique was based on two conceptual blocks that correspond to the two core poles of the study. The first block captured quality management practices integrating terms such as “quality management”, “total quality management”, “TQM”, “quality management practices”, and “quality assurance”. The second block referred to the outcome. “Firm performance”, “organizational performance”, “operational performance”, “financial performance” and “business performance” were combined. To account for the terminological variability of the subject, the terms were combined inside each block using the Boolean operator “OR”, and the two blocks were combined using “AND” in order to obtain only the literature addressing the intersection of quality management practices and performance, rather than each theme solely. Search terms were applied to the title, abstract and keyword fields, the level at which the study's concerns are typically declared.

In accordance with PRISMA 2020 reporting item (Page et al., 2021), the systematic search of Scopus and Web of Science Core Collection was conducted on April 14, 2026, covering records indexed up to that date.

In order to adapt the corpus to the scope of the study, some filters were applied to the search. We retained only peer reviewed journal publications and review articles as peer review provides a baseline of methodological scrutiny that is not always guaranteed for conference papers, book chapters and reports. Only publications in English and French were included. The search was limited to the industrial and manufacturing sector that characterizes the study and to a publication window, set in advance, to published papers between 1995 and 2025. The 30-year window was selected so that the corpus would begin soon after the foundational measurement work of the early 1990s that provided the field with its first validated instruments and continue to present, thus capturing both the consolidation of the quality management practices-performance literature and its most recent developments.

No truncation or proximity operators were used in either database as all search terms in the quality and performance blocks were entered as indicated in the table 1, combined with the Boolean OR operator within each block and AND between blocks. This choice favored precision over recall. Furthermore, the search was not restricted to full-text-accessible records at the identification or title/abstract screening stages. Full-text accessibility was assessed only at the retrieval stage following the screening of the 105 reports sought for retrieval, 14 could not be obtained since their full text could not be found and were excluded at that stage, as shown in the PRISMA flow diagram (Figure 2), consistent with PRISMA guidance to avoid excluding potentially relevant records at the screening stage based on access constraints alone. The complete configuration of the two database queries is presented in Table 1 below.

Ultimately, it is important to point out that the screening and the eligibility assessment were conducted by a single reviewer. To minimize subjective interpretation in the absence of independent dual screening, eligibility criteria were defined in advance and applied systematically according to the explicit decision protocol summarized in Table 1, rather than through ad hoc judgment at the point of screening. The absence of independent second-rater

verification and of an associated inter-rater or intra-rater reliability coefficient is acknowledged as a limitation of this review, consistent with recommended reporting practice for single-author systematic reviews (Belur et al., 2018).

Table 1. Search strategy

Element	Scopus	Web of Science Core Collection
Search field	Title, abstract, keywords (TITLE-ABS-KEY)	Topic (TS): title, abstract, author keywords, Keywords Plus
Quality block	“quality management” OR “total quality management” OR “TQM” OR “quality management practices” OR “quality assurance”	“quality management” OR “total quality management” OR “TQM” OR “quality management practices” OR “quality assurance”
Performance block	“firm performance” OR “organizational performance” OR “operational performance” OR “financial performance” OR “business performance”	“firm performance” OR “organizational performance” OR “operational performance” OR “financial performance” OR “business performance”
Document types	Article and Review	Article and Review
Language	English and French	English and French
Publication window	1995–2025	1995–2025
Records retrieved	4698	2302

Source : Authors

3.3. Eligibility criteria

While search filters mechanically narrow a corpus, the eligibility criteria narrow it by judgement. The eligibility criteria and search filters were kept separate so that each excluded record could be attributed to a specific stated reason. Inclusion and exclusion criteria were specified before the screening process and were used uniformly. For a study to be retained, inclusion criteria had to be met while failing to meet any one was enough to exclude a study. The criteria are summarized in Table 2.

Table 2. Inclusion and exclusion criteria

Criterion	Inclusion	Exclusion
Topic focus	Studies examining a relationship between quality management practices and firm performance	Studies addressing quality or performance in isolation, without a relationship between them
Empirical content	Empirical studies (quantitative, qualitative or mixed) and systematic reviews	Purely conceptual or opinion pieces without empirical or review content
Sector	Industrial and manufacturing firms	Studies set wholly outside the industrial sector with no transferable relevance
Availability	Full text accessible	Records without retrievable full text

Source : Authors

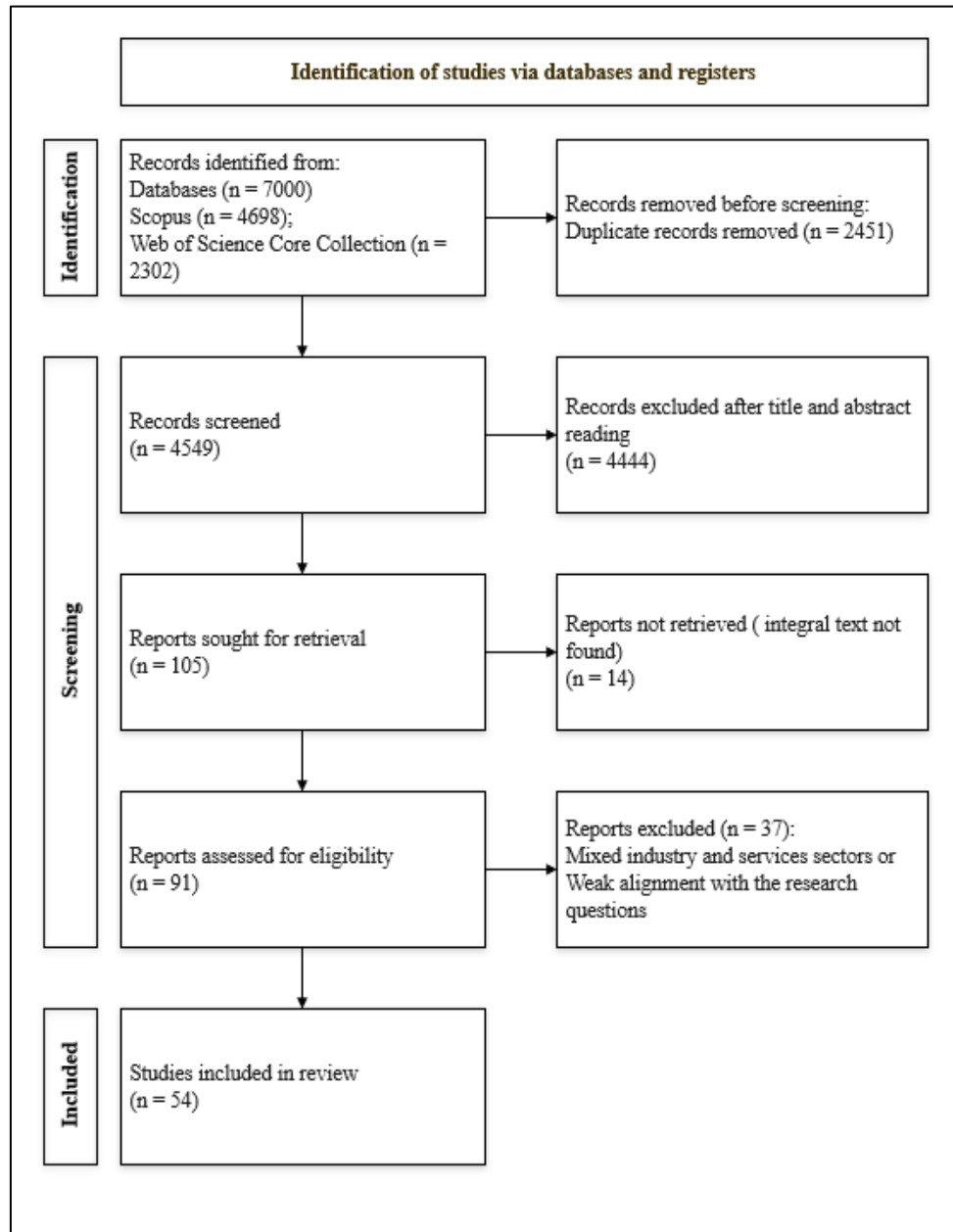
3.4. Screening and data selection

The selection was based on the PRISMA 2020 flow with its four stages: identification, screening, eligibility, and inclusion. In the identification phase, the records acquired from Scopus and Web of Science were exported and integrated into a single working file. Duplicate records were identified and eliminated using the Digital Object Identifier (DOI) as the primary matching key and a normalized title as a secondary key for entries with missing or inconsistent DOIs. This provided the collection of unique records entered into the screening phase.

At the screening stage, the titles, abstracts and keywords of these unique records were then checked and records that were clearly outside of the scope of the study were excluded. Those records that made it through this first pass then went to the eligibility stage where the full texts

were read in depth and analyzed again against every criterion. It is crucial to note that reasons for exclusion were noted by category in regard to an insufficient focus on the quality management practices and performance relationship, a lack of empirical or review content, a setting outside the industrial sector or an unavailable full text. The final corpus, constituted of 54 papers, taken for analysis included records, which passed full-text assessment. As shown in Figure 1, the number of records lost at each stage in the PRISMA flow diagram is reported.

Figure 2. PRISMA flow diagram



Source: Authors, Prisma 2020 Framework

3.5. Methodological quality appraisal

Including a study is not equivalent to approving it. A systematic review is only as reliable as the studies it is based on. Each study in the final corpus is evaluated using the Mixed Methods Appraisal Tool in its 2018 version in order to make the quality of the evidence explicit rather than implicit (Hong et al., 2018). The MMAT is chosen because the corpus is methodologically

mixed and the tool is purpose-built to appraise all kinds of methods within a single, comparable framework.

There are two stages to the assessment process. First, two screening questions determine whether a study presents genuine empirical research with sufficient data and a clear question. After that, each study is evaluated using five criteria selected from the category that corresponds to its design. In fact, two of the tool's categories apply to the empirical research that are retained in our case. The majority of the corpus is made up of questionnaire-based studies that assess firm performance and quality management practices at a single point in time, this type of studies is evaluated under the quantitative descriptive category, which criteria is related to the statistical analysis's appropriateness, the sampling strategy's relevance, the sample's representativeness, the measurements' appropriateness, and the low risk of nonresponse bias. On the other hand, a smaller set of studies relies on before-and-after comparisons, control groups, longitudinal panels, and group comparisons that represent comparative or causal designs. These studies are evaluated separately under the quantitative non-randomized category, whose criteria add the control of confounders corresponding to such designs.

In accordance with the tool's own guidelines, the results are not reduced to a single superfluous score as no study was eliminated based only on its score. Instead, each study's confidence is weighted during synthesis using the criterion-by-criterion evaluations, giving robust studies greater interpretive weight.

Explicitly, results from studies with high methodological quality are given interpretive priority, while results from lower-scoring studies are reported with explicit limitations rather than ignored. This weighting is demonstrated by two distinct examples from the corpus. The lowest MMAT score in the corpus (1/5) was obtained by Berrouguet et al. (2015), a single-firm case study without a comparison group or confounding factor control. This study shows that certification improves firm performance, but because its design cannot rule out other explanations for the observed association, this finding is presented in the discussion as merely suggestive rather than corroborating evidence for the corpus-wide effect. In contrast, Lima et al. (2000), which uses longitudinal secondary data to compare certified firms against a matched control group, obtained the highest MMAT score (5/5) and reported no apparent performance difference between certified and non-certified firms, this null finding is regarded as carrying significantly more evidentiary weight in the discussion of boundary conditions than the positive but low-quality finding from the single-case study, despite pointing in the opposite direction. According to the tool's intended application, these examples show that MMAT-based scoring functions regardless of the reported effect's direction (Hong et al., 2018).

3.6. Data extraction and synthesis strategy

From each study in the final corpus, a structured set of fields was extracted including bibliographic identifiers (authors, year, sector, country), the methodological design and the significant outcomes, were extracted and combined into a single matrix. This matrix transforms a set of heterogeneous papers into a database that can be queried and compared.

Before the interpretation of its content, the bibliometric analysis provides an external representation of the field by describing the structure of the corpus, including the distribution of publications over time, the most-cited studies, and the geographical distribution. The substantive findings are then organized in the thematic synthesis. The evidence is grouped into analytical themes that capture how quality management practices relate to the various performance dimensions and through what mechanisms. By ensuring that the weight assigned to each finding matches the methodological reliability of the study that produced it, the quality appraisal links the two layers together and moderates the synthesis. The outcome is meant to be a synthesis which claims are disciplined by both the structure and the quality of the fundamental evidence, rather than by a mere description or a simple interpretation of the literature.

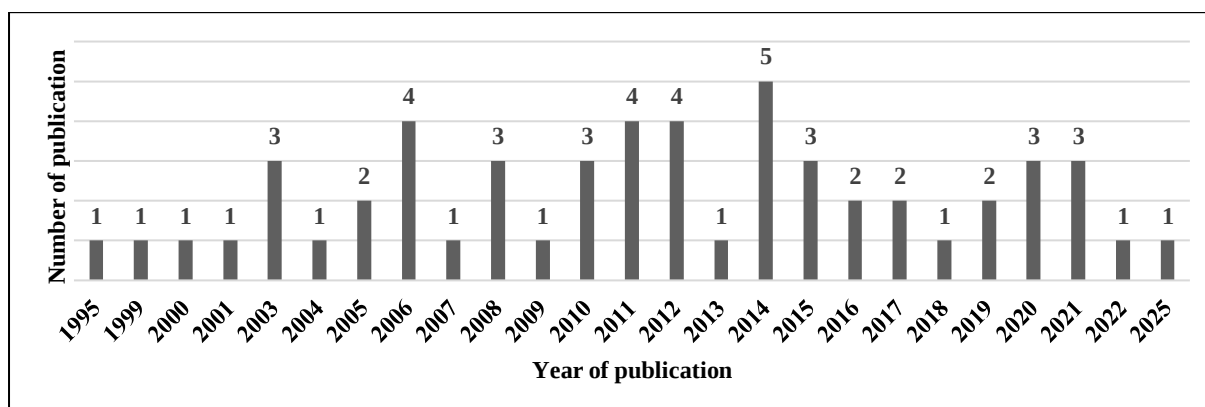
4. Results and discussion

4.1. Descriptive and bibliometric overview

The final corpus covers 54 empirical studies examining the relationship between quality management practices and firm performance. Before proceeding to the thematic synthesis, this section characterizes the corpus along three descriptive dimensions regarding the temporal distribution, the geographical distribution, and the scholarly influence in order to situate the evidence base and expose its structural features.

Figure 2 reports the distribution of the 54 included studies by year of publication. The retained studies span the period from 1995 to 2025. Their distribution is uneven as eligible studies are infrequent in the late 1990s, become more frequent through the 2000s, and cluster most densely between 2008 and 2016, with annual peaks of four included studies and a further peak in 2020 and 2021. The comparatively low counts for the recent years may partly reflect indexing and retrieval lags at the time of the search, and should not be interpreted as a decline in scholarly activity.

Figure 3. Temporal distribution of the selected studies by year of publication

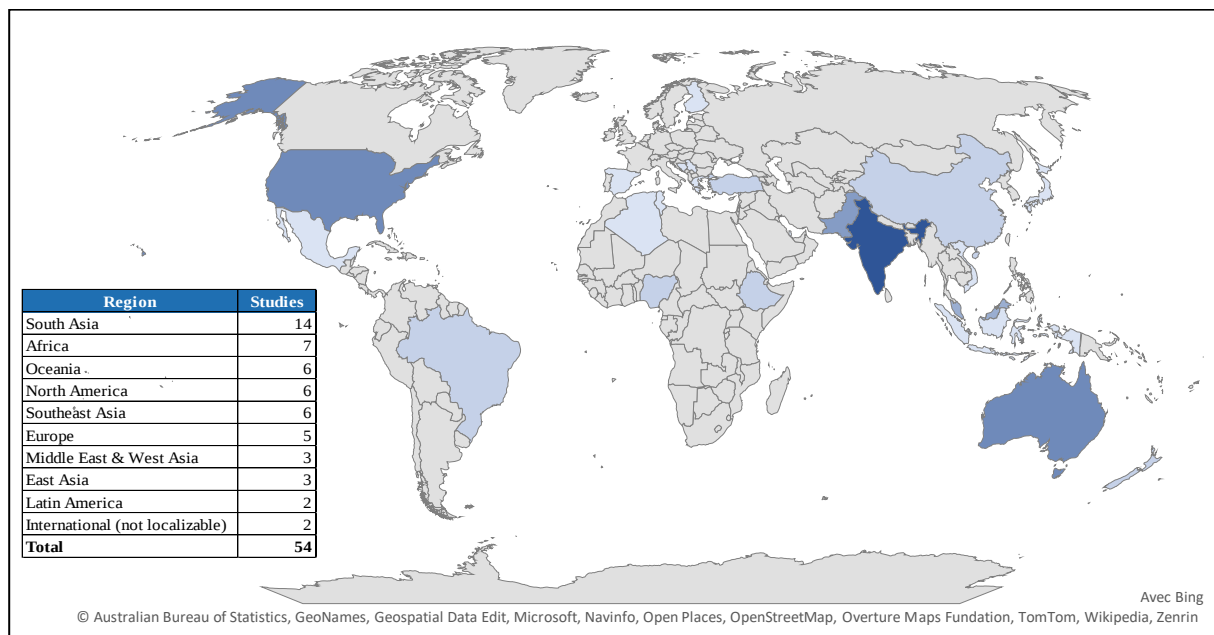


Source: Authors

The corpus is evidently international in scope, with studies undertaken in over twenty countries on five continents as shown in Figure 3. South Asia is the most significant region in the evidence base with 14 research (mainly in India and Pakistan), followed by Africa with 7 studies (Tunisia, Nigeria, Ethiopia, Algeria, Mauritius). Oceania, North America and South East Asia each provide 6 studies and Europe 5. The other studies are scattered over Middle East and West Asia (3), East Asia (3) and Latin America (2). Two other studies are cross-national and could not be attributed to one country. This distribution reflects a concentration of empirical research in emerging and developing manufacturing economies, especially in South Asia, where the quality certification and the adoption of total quality management have been relevant strategic concerns. At the same time, the distribution confirms the global reach and contextual diversity of the corpus.

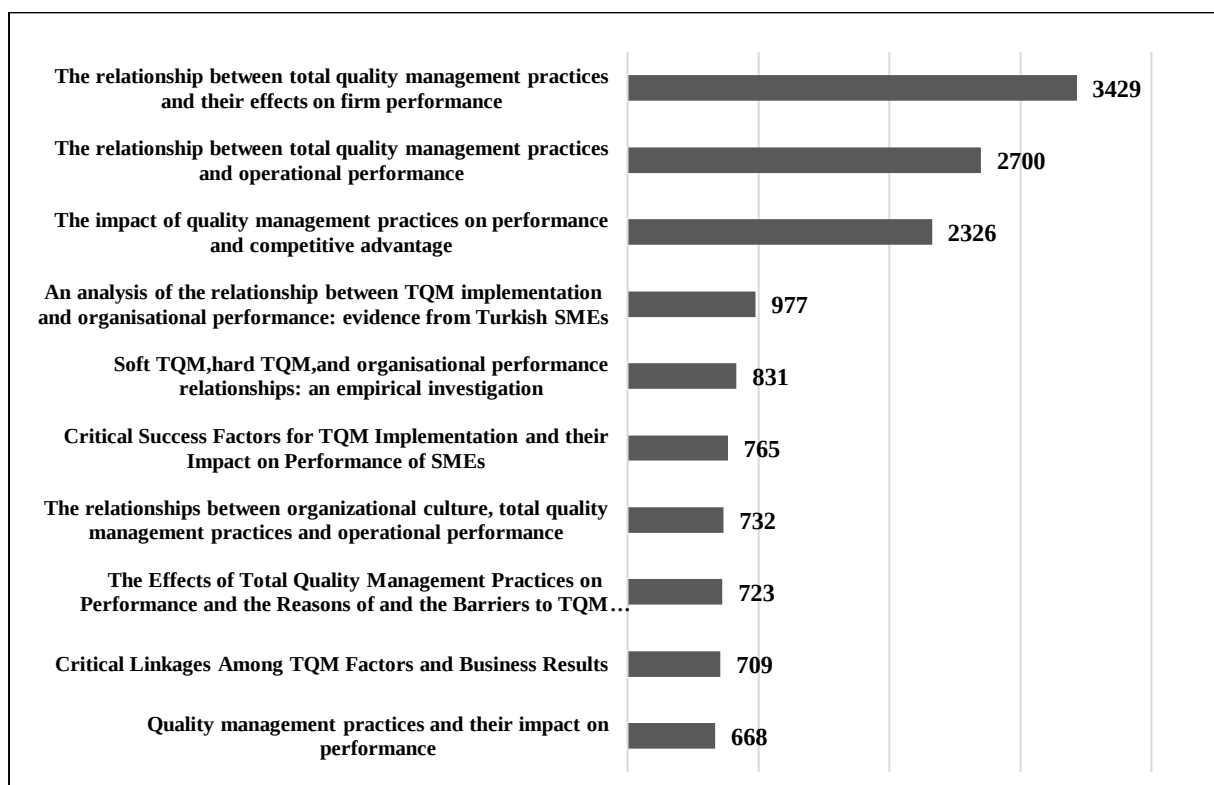
The citation analysis shows a small set of highly influential contributions that support the field (Figure 4). The ten most cited studies range from around 670 to almost 3430 citations, indicating a sharp concentration of scholarly significance. The most cited study is on the relationship between TQM practices and their effects on firm performance (3429 citations). Then, we have a study on TQM practices and operational performance (2700 citations) and a study on the impact of quality management practices on performance and competitive advantage (2326 citations). There is a clear separation between this top three and the rest of the top 10, which has citation counts ranged between about 670 and 980 citations. The prominence of these works, many of which operationalize TQM as a multidimensional construct and clarifies its effects on operational, financial and market performance, reflects the conceptual and methodological references that have shaped subsequent empirical work in the corpus.

Figure 4. Geographical distribution of the selected studies



Source : Authors

Figure 5. Most cited studies in the corpus (Top 10)



Source: Authors; Retrieved count on (30/06/2026)

4.2. Thematic synthesis

From the analysis of the relationships considered in the corpus, five main axes derived as shown in Table 3. These axes are not mutually exclusive, as one study may examine several relationships.

Table 3. Axes of the quality management practices and performance relationship in the corpus

Relationship axis	Trend of the results	Associated studies
TQM (integrated practices) and performance	-Most frequent relationship tested in the corpus -Positive effect dominant on operational and quality dimensions.	49
ISO 9001/9000 certification and performance	-Positive effect on operations but weaker, mixed financial link -Important role of the internalization	14
Soft and hard quality management practices	-Soft practices act mainly indirectly, via hard practices and process improvement	5
Mediation mechanism	-Financial performance is mediated by quality and operational performance	16
Certified / non-certified and control comparison	-Different designs strengthening causal inference	9

Source : Authors

A detailed reading of the primary studies offers a precise characterization of each axis in addition to a better understanding of the practices effectively examined, the performance dimensions on which an effect is observed, the analytical mechanism through which that effect operates, and the degree of consistency across different contexts. The five axes are presented below.

◆ **Axis 1: Total quality management practices and performance**

The most populated axis groups studies that address comprehensive quality management as an integrated collection of mutually reinforcing practices rather than as isolated levers. The finding that recurs, across very different settings, is that the explanatory power of TQM rests on the coherence of the system as the practices act largely through one another, and several of them influence performance indirectly, by enabling the proper functioning of the core operational practices rather than by acting on outcomes directly.

This integrated reading is supported in developing-economy environments, where the corpus is very abundant. A study conducted on certified manufacturers in Ethiopia, reports a positive and significant impact of a validated TQM framework on operational performance. It highlights that there was almost no prior evidence in African contexts and that such evidence did not often possess the required methodological rigor to properly test the causal linkages. Studies conducted on Chinese award-winning organizations show that the operational and profitability benefits of integrated quality management are substantial but limited in duration. The certification or award year itself shows the clearest positive stimulation and it is confirmed that the profitability gain may decrease subsequently. Expected sales growth gains do not always get materialized. Therefore, the integrated TQM and performance relationship is solid on operational and quality dimensions, and more conditional on the financial side.

Another refinement along this axis involves the interaction between TQM with adjacent operational systems. Studies that have associated TQM with total productive maintenance (TPM) have shown that the two systems are complementary rather than substitutable, because TPM has a strong direct impact on operational performance and also supports TQM, which transmits the effect onto performance, in that case a joint adoption is better than either system alone. The studies that combined TQM with supply chain management (SCM) show a similar conclusion as both constructs have substantial and interdependent impacts on operational performance. The conclusion of this axis is that quality management practices deliver its full effect when it is established in a coherent operational architecture.

◆ **Axis 2: ISO 9000/9001 certifications and performance**

The second axis concentrates on the studies in which the quality management practice under consideration is the certification to an ISO 9000 family standard. The recurrent empirical

pattern is a positive, and relatively stable, relationship with operational variables (process discipline, traceability, compliance, customer related process) as opposed to a much weaker, and more mixed, relationship with financial and market outcomes. Studies of Australian ISO 9001 certified firms reveal that the impact of ISO 9001 certification on operational and business performance is real but is contingent on how the standard is implemented.

As noted by several authors, the heterogeneous results reported in the ISO literature should not be interpreted as evidence that the standard is ineffective, but rather as evidence that its content is mediated by the manner of its implementation, as the failure, when it occurs, is attributed not to the requirements of ISO 9000 itself, but to the way the standard is internalized within the organization. The recurrent image of a void between the certification and the outcome captures the core difficulty represented in this axis and motivates the development of the internalization mechanism.

◆ **Axis 3: Hard and soft quality management practices**

The third axis concerns studies that deliberately decompose quality management into a soft dimension represented by leadership, top management commitment, employee involvement, customer focus, quality culture and a hard dimension represented by statistical process control, design management, process and data tools. The decisive empirical result here is structural rather than purely correlational. A study analyzing 261 Australian manufacturers, show that soft TQM applies only a limited direct effect on performance but a substantial indirect effect transmitted through its influence on hard TQM. It is explained that soft practices create the organizational environment in which hard tools can be diffused and used effectively. Another study generalizes this finding to innovation outcomes across an eight country sample where hard quality management practices affect quality performance directly and innovation both directly and indirectly, whereas soft quality management practices operate almost entirely through its effect on hard quality management. The convergent finding of the axis is that soft and hard quality management practices are not competing alternatives but sequential layers in a way that the soft layer is an enabling condition, while the hard layer is the proximate driver of measurable results. This has a direct practical result, namely that investing in tools without first securing leadership and cultural conditions tends to reduce their expected effects on performance.

◆ **Axis 4: Mediation mechanism**

The fourth axis gathers the studies that mainly contribute to specify the mechanism between quality management practices and performance. The most prevalent and imitated structure is a cascade where quality management practices first increase quality and operational performance, which then impact competitive and market performance that converts into financial performance. Financial returns are the final term in this causal chain, not a direct effect. This result is structurally recovered, in different contexts, across samples in the corpus from Australia, Japan, China, Brazil, India and Europe.

On the other hand, two particular mediators appear. Quality performance mediates the link between hard quality management practices and innovation performance, supporting the understanding that quality and innovation are cumulative rather than opposing. Knowledge management is a second relay that TQM practices considerably improve. Knowledge management practices, which in turn support innovation performance although the effect is not uniform across all sub-dimensions. The argument is similar for studies of Six Sigma from another perspective, which confirms that the technique increases corporate performance primarily through the efficiency with which human resources are deployed, through the use of an operational mediator and not a direct financial lever. The converging contribution of this axis is the existence of an intelligible nature of the relationship between the quality management

practices and performance as the effect is real but transits through operational and intangible mediators.

♦ **Axis 5: *Certified / non-certified and control comparison***

The fifth and less predominant axis is the most challenging methodologically, and includes designs that strengthen causal inference through comparisons of adopters with non-adopters, or through the use of before/after and longitudinal designs. Its weight in the synthesis is greater than its numeral share, because it is the major safeguard for the corpus against publishing bias and perceptual confounding. A Brazilian study based on a carefully matched control group compares certified enterprises with two control firms each and finds almost no apparent difference in performance indicators between the two groups for most measures.

The cautionary tone of this axis is supported by longitudinal studies which emphasize that much of the favorable evidence elsewhere is based on managerial perceptions surveyed cross-sectionally, with little independent measurement and that more objective designs are required to confirm the direction of causation between quality management practices and financial outcomes. However, this skepticism is tempered by the use of event-study and panel methodologies since panel analysis indicates that TQM improves operational, productivity and business performance simultaneously while event studies of Six Sigma adopters find a sustained post-adoption advantage. Collectively, this axis does not reverse the corpus's positive result, but rather limits it. It suggests that the influence is most secure on operational dimensions, weaker and more conditional on financial ones.

4.3. General discussion

Read jointly, the five axes describe a coherent rather than a fragmented body of evidence. The integrated TQM and soft and hard dimensions establish what the effective practice consists of. It is represented as a coherent system in which cultural and leadership conditions enable operational tooling. The mediation axis establishes how the effect propagates through quality and operational relays toward financial outcomes. The ISO certification axis establishes the principal boundary condition being the difference between formal compliance and genuine internalization. And the comparison and control axis establishes the limits of confidence. The two mechanisms developed in the following sections concerning the mediation through operational performance and internalization of practices are precisely the threads that run across all five axes and give the corpus its fundamental unity.

As shown in Table 4, the most salient finding is the corpus's convergence toward a positive effect of quality management practices on industrial performance.

Table 4. Cross-referencing between the MMAT score and the nature of the reported effect

MMAT score	Nature of the reported effect			
	Insignificant	Nuanced	Positive	Total
5/5			5	5
4/5			6	6
3/5			1	1
2/5		4	15	19
1/5	1	5	17	23
Total	1	9	44	54

Source: Authors

Cross-referencing the MMAT score and the nature of the reported effect shows a clear methodological trend as all 12 studies with a low-to-moderate MMAT score (1 to 3/5) reported an exclusively positive effect, while among the 42 methodologically robust studies (4–5/5) this proportion decreased to 76.2%, with the remaining 23.8% reporting a nuanced effect (n = 9) or a non-significant effect (n = 1). This descriptive gradient is in line with a well-documented bias

in systematic reviews where studies with simpler protocols (small samples, no mediation testing, univariate descriptive or correlational analyses) tend to report only direct, significant relationships, while studies using more demanding modelling approaches (SEM, individualized hypothesis testing, control-group comparisons) are precisely the studies that find partial, unsupported or non-significant effects. A practical example lies in what was demonstrated by Lima et al. (2000), the only study in our corpus with an explicit control group, rated 5/5 on the MMAT, whose conclusion reports the absence of a significant difference between certified and non-certified firms. This comparison does not undermine the overall conclusion of a generally positive effect of quality management practices on performance, but rather strengthens it as the positive effect remains the majority finding even within the sub group of the most methodologically robust studies. Moreover, the nuanced or non-significant results come from the most rigorous designs and not the weakest ones, a fact supporting the overall validity of the results. Besides, the mentioned study reinforces the credibility of the synthesis as the presence of a null result from a nearly experimental design mitigates the suspicion of publication bias. To assert this outcome, we examined two descriptive subgroup trends. First, among the studies for which a numerical sample size could be extracted, the proportion of exclusively positive findings does not decrease with increasing sample size, which does not support a small-study effect typically associated with publication bias. Second, the distribution of results across four publication periods shows a non-monotonic pattern rather than a linear decline, with nuanced and non-significant results in the earliest (1995-2005) and most recent (2020-2025) periods. Taken together with the MMAT effect gradient reported earlier, these descriptive examinations provide converging evidence against a straightforward publication bias explanation for the predominance of positive findings. This descriptive evidence does not attenuate the suspicion of publication bias but it doesn't contradict it whilst acknowledging that a formal quantitative test of publication bias was not possible due to the qualitative nature of this synthesis. On another note, due attention is needed with the fact that the consistency of the results nonetheless varies with the performance dimension considered. The effect appears clearest and most significant on operational and quality performance. It is more mixed on financial and market performance, where several studies struggle to establish a robust direct link. This contrast is explained on one hand, by the fact that financial returns of quality approaches are delayed and indirect and on the other hand, that they transit through operational mediators. This mediated structure is one of the most solid and most replicated contributions of the literature, found across various contexts. A second mechanism, across the corpus, concerns the internalization of practices. Work on ISO 9000 certification converges on the idea that performance does not come from formal certification as such, but from the degree to which the normative requirements are effectively integrated into the organization's routines and coordinated with suppliers and customers. Certification adopted for purely symbolic or external conformity reasons produces weaker effects than internalized certification. Finally, it is important to state that the regional distribution of the corpus shows that the largest single regional bloc identified is South Asia accounting for 14 of the 54 included studies (25.9%). These studies cover manufacturing firms that are primarily SMEs operating in cost-driven competitive contexts, frequently pursuing ISO certification as a requirement for market access rather than as a result of an established internal quality infrastructure. Therefore, the regional composition and the degree to which the reported findings apply to developed-economy industrial contexts where certification motives, regulatory pressure, and baseline quality maturity differ may have an impact on the strength and consistency of the quality

management practices and performance relationship documented in this review. This is identified as a boundary condition for the synthesis's generalizability and a potential perspective for further region-stratified analysis.

4.4. Methodological quality of the corpus

The MMAT appraisal reveals a corpus of overall satisfactory quality: 42 of the 54 studies obtain a high score ($\geq 4/5$), of which 23 reach the maximum of 5/5. The latter include several designs strengthened for causal inference. At the other end, a small number of studies present clear methodological weaknesses, tied to very small samples, low response rates, inadequate units of analysis, or impossible generalization. Particularly, studies by Zaidi and Ahmad (2020), Seth and Tripathi (2006), Adedeji (2025), Ahmad et al. (2018), and Berrouguet et al. (2015) share the lowest MMAT score in the corpus (1/5). Consistent with the recurrent flaw mentioned above for criterion Q4 (control for confounding factors/non-response bias), these five studies include small, non-random, or low-response-rate samples. In line with the protocol, these studies remain in the corpus but their results are reported for indicative purposes and are not mobilized to weight the evidence.

Table 5. Distribution and interpretation of the methodological quality score of the corpus

MMAT score	Number of studies	Status
5/5	23	Very robust
4/5	19	Robust
3/5	1	Acceptable
2/5	6	Weak
1/5	5	Very weak

Source: Authors

The most frequently problematic criterion is the accounting for confounders (Q4), as most cross-sectional studies do not statistically adjust their estimates for structural variables (size, sector, age). On the other hand, the appropriateness of measurements (Q2) and the validity of the exposure measure (Q5) are almost systematically satisfied.

5. Conclusion

The 54 reviewed studies, drawn from a wide range of geographical, sectoral, and methodological settings, point to a consistent finding, emphasizing that quality management practices are linked to better organizational performance, and this link is strongest on the operational and quality dimensions. But the relationship is neither simple nor immediate. It unfolds in stages as practices first sharpen quality and operational outcomes, and only later, through several mediating mechanisms, do these gains show up in market or financial results. Anyone evaluating a quality initiative on a short horizon, or through financial metrics alone, is likely to underestimate what it actually delivers.

Two conditions seem to separate the firms that benefit from those that merely comply. The first is the gap between certification and internalization. Holding an ISO 9001 certificate does not, on its own, improve the performance as what matters is whether quality management practices have actually been rooted into daily routines and extended to suppliers and customers. In practice, this means managers need to stop treating certification as a purpose and start treating it as a starting point for real organizational change. The second condition is the enabling the role of soft practices such as leadership, employee involvement and customer orientation. These rarely drive performance on their own but create the conditions under which harder, process level practices can actually work. Top management commitment stands out repeatedly across the corpus as close to a precondition for the rest to succeed.

These patterns sit comfortably within a resource-based reading of quality management since what generates an advantage is not the possession of a standard or the mere implementation of a quality management practice but the accumulation of complex, internally built capabilities that competitors struggle to copy. They also nuance the institutional account of why firms adopt certification in the first place as adoption may well be driven by a normative pressure, but its payoff depends on whether the firm moves past that pressure into a substantive practice. And the recurring pattern of delayed, mediated effects fits naturally with dynamic capabilities view, in which quality practices gradually reshape how a firm operates rather than delivering an instant return.

Moreover, this theoretical frame map onto different aspects of the five thematic axes found in this review, rather than just being contrasted. The Resource-Based View is most directly related to Axis 1 and Axis 3 considering it explains why integrated, holistically applied TQM practices are more likely to be rare, valuable, and imperfectly imitable resources than isolated or strictly technical or hard tools, which are easier for rivals to replicate. The adoption of ISO 9001/9000 certification as a response to coercive, normative, or mimetic pressures for external legitimacy is explained by the institutional theory, which also explains why several studies in our corpus find weak or null performance differences between certified and non-certified firms when certification is separated from genuine internal practice change. The Dynamic Capabilities approach, which frames quality management practices as inputs that must be sensed, seized, and reconfigured into advanced capabilities such as innovation capability, supply-chain integration and knowledge management processes, before they translate into performance outcomes, is ultimately the most helpful in interpreting Axis 4. This approach offers a theoretical justification for why mediation, rather than a direct effect, is the mechanism most frequently identified among the methodologically strongest studies in our sample. The conceptual coherence of the framework previously presented is strengthened when all three perspectives are viewed together since they provide complementary rather than conflicting explanations across the five axes.

For managers, the practical implications are to judge quality management initiatives on a longer and broader timeline than financial reporting cycles typically allow, to track operational and quality indicators as leading signals, to prioritize the substantive integration of quality requirements into routines, information systems, and supplier and customer relationships over the pursuit of certification for its own sake, to treat top-management commitment as a requirement to secure before rolling out other practices, and finally to invest in soft and hard practices together since the evidence suggests neither works as well in isolation as the two do in combination.

The conclusion of this systematic review come with real methodological cautions. Most of the included studies are cross-sectional, which limits what can be said about causality as only the minority using longitudinal, before/after, control-group, or event-study designs allow anything close to a causal claim, and the corpus's generally weak handling of confounders reinforces that limitation. Moreover, the quality management practices and performance measures across studies are operationalized too differently to allow a proper quantitative meta-analysis at this stage, and the MMAT appraisal, however useful for structuring judgment, still involves an irreducible element of subjectivity as its numerical score is a readability aid, not a validated metric. Selection and publication bias also cannot be fully excluded, though the presence of at least one null result in the corpus is some reassurance against the most severe form of that bias. Overall, since no inter-rater reliability statistic could be calculated in the absence of a second rater, the amount of any of the preceding risks is, by definition, unmeasured. In order to eliminate these risks rather than just acknowledging them, we recommend that future

replications of this review include independent double screening, double data extraction, and double MMAT appraisal with a formal inter-rater agreement statistic. For all these reasons, the MMAT-effect gradient reported in this review should be interpreted as indicative rather than definitive evidence.

These gaps set a clear research perspectives related to more longitudinal and quasi-experimental designs, more systematic adjustment for confounders, and enough harmonization in how quality management practices and performance are measured to eventually support a genuine meta-analysis. A logical and feasible extension of the contribution of the present review, is the creation of an open-access and shared longitudinal database with participating researchers contributing harmonized study-level data using a standard reporting template. If hosted on an open-science platform and collaboratively maintained, a properly powered quantitative meta-analysis for this field would be possible. It would gradually build up the comparable, effect-size-level data that the current narrative synthesis explicitly lacks. Further, the ability to select and merge sector-specific sub-sets for more detailed analysis and to identify and merge longitudinal and quasi-experimental studies separately from cross-sectional ones would also directly benefit the other perspectives mentioned earlier. Another possibility is a closer look at heavily regulated industrial sectors, since regulatory pressure may be exactly the kind of contextual factor that determines whether a quality initiative is internalized or merely performed.

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Appendix A. Summary table of the studies included in the corpus

Authors	Application context	Analysis method	Main outcomes
Samson & Terziovski (1999)	Multi-sector manufacturing - Australia / New Zealand	Multiple regression	- TQM explains a significant share of the variance in performance; - Leadership, people management, and customer focus are the strongest levers.
Rahman & Bullock (2005)	Manufacturing - Australia	Structural equation modeling (SEM)	- Soft TQM affects performance both directly and indirectly through hard TQM - Significant positive relationship is found.
Sila & Ebrahimpour (2005)	Manufacturing - United States	Structural equation modeling (SEM)	- Significant links exist between TQM factors and business results; - Leadership is the main driver for the entire system.
Lakhal et al. (2006)	Plastics industry - Tunisia	Structural equation modeling (SEM)	- Positive relationship exists between QMP and performance; - Infrastructure practices act on operational performance while core practices act on product quality.
Zaidi & Ahmad (2020)	Manufacturing - Malaysia	Descriptive analysis, correlation, and regression	Positive relationship between TQM practices and operational performance.
Salaheldin (2009)	Manufacturing (SMEs) - Qatar	Structural equation modeling (SEM)	- Substantial positive effect of TQM on both operational and organizational performance; - Operational performance mediates the effect on organizational performance.
Sadikoglu & Olcay (2014)	Manufacturing (process industries) - Turkey	Multiple regression	- Different TQM practices affect different performance measures; - The strength and direction of the effects vary by practice.
Zeng et al. (2015)	Manufacturing - International (8 countries)	Structural equation modeling (SEM)	- Soft QM influences hard QM; - Quality performance mediates the relationship between QM and innovation performance.
Nguyen et al. (2016)	Construction - Vietnam	Regression	- Significant relationship between TQM and performance; - Employee involvement and process management stand out as the strongest drivers.
Yusr et al. (2017)	Manufacturing - Malaysia	Structural equation modeling (SEM)	TQM strengthens knowledge management processes, which in turn improve innovation performance.
Jannah et al. (2020)	Manufacturing - Indonesia	Structural equation modeling (SEM)	The three ISO standards (ISO 9001, ISO 45001, ISO 14000) positively influence the financial performance.
Seth & Tripathi (2006)	Manufacturing - India	Statistical analysis	Combined TQM and TPM implementation produces significantly greater improvements than either approach applied in isolation (synergy effect).
Padma et al. (2008)	Manufacturing - India	ANOVA, Bonferroni post-hoc test, one-sample t-test, descriptive statistics, reliability test	- ISO 9001:2000 certification produces a significant positive change across all critical factors and performance indicators; - Firms favor soft factors (top-management commitment, customer focus) over methods and procedures.
Demirbag, et al. (2006)	Textile and clothing - Turkey	Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), Structural equation modeling (SEM)	Strong positive relationship between TQM implementation and organizational performance.

Authors	Application context	Analysis method	Main outcomes
Spasojevic et al. (2012)	Mechanical and aerospace industry - Serbia	Factor analysis, stepwise regression	- Groups of quality tools relate differently to performance measures; - Positive effects depend on the type of tool used.
Liu et al. (2021)	Manufacturing - China	Event-study / longitudinal methodology	Cumulative positive effects of quality awards and associated practices on firm performance over time.
Mahmood et al. (2014)	Aerospace manufacturing - Pakistan	Statistical analysis	Standardized TQM factors are applicable and relevant for measuring performance.
Jain & Ahuja (2012)	Manufacturing - India	Correlation analysis, statistical tools	ISO 9000 success factors (management commitment, continuous improvement) contribute significantly to manufacturing performance.
Olaleye et al. (2021)	Manufacturing (SMEs) - Nigeria	Structural equation modeling (SEM)	- Positive link between TQM and performance; - Entrepreneurial orientation mediates the relationship.
Iyer et al. (2011)	Automotive components - India	Comparative analysis	QMS and TQM implementation improves productivity, based on a before/after certification comparison.
Adedeji (2025)	Food and consumer goods - Nigeria	Multiple linear regression	Significant combined effect of ISO standards (9001, 45001, 14001, 31000) on operational performance.
Abdi et al. (2022)	Automotive engineering - Ethiopia	Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), Structural equation modeling (SEM)	Significant positive effect of TQM practices on non-financial performance.
Saleem et al. (2011)	Manufacturing (SMEs) - Pakistan	Statistical analysis	ISO 9000 series certification has a measurable positive impact on the organizational performance.
Parvadavardini et al. (2016)	Manufacturing - India	Structural equation modeling (SEM)	QMP improve both quality performance and financial performance.
Yusuf et al. (2007)	Manufacturing - China	Comparative analysis	- TQM positively impacts performance; - Firms implementing TQM outperform those that do not.
Shrivastava et al. (2006)	Manufacturing - India	Factor analysis, multiple regression	Significant links exist between TQM factors and organizational performance.
Adam et al. (2001)	Manufacturing - Mexico and United States	Correlation, regression	Quality-improvement practices affect firm performance, with notable differences between the two countries.
Phan et al. (2011)	Manufacturing - Japan	Structural equation modeling (SEM)	- Japanese companies use quality management practices as a strategic lever; - Positive relationship between QMP and competitive performance.
Merino-Díaz de Cerio (2003)	Multi-sector manufacturing - Spain	Logit models, multiple regression	Certain quality management practices, particularly prevention, are positively related to operational performance.
Ul Hassan et al. (2013)	Manufacturing - Pakistan	correlation/regression	- Positive relationship between TQM elements and performance; - Customer focus emerges as the dominant practice.
Shafiq et al. (2017)	Textile industry - Pakistan	Structural equation modeling (SEM)	Significant positive effect of TQM on organizational performance.
Adem & Viridi (2021)	Manufacturing - Ethiopia	Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA),	Only supplier quality management, continuous improvement, and process management have a significant effect on operational performance.

Authors	Application context	Analysis method	Main outcomes
		Structural equation modeling (SEM)	
Gambi et al. (2020)	Manufacturing - Brazil	Structural equation modeling (SEM)	• Soft QM affects both hard QM and innovation performance; • Only soft QM influences innovation practices.
Ahmad et al. (2018)	Industrial SMEs - Malaysia	Descriptive statistics, correlation	• TQM tools are used at a moderate-to-high level and are positively related to the organizational performance.
Modgil & Sharma (2016)	Pharmaceutical industry - India	Factor analysis, Structural equation modeling (SEM)	• TPM and TQM both positively affect operational performance; • Their interrelation reinforces the combined effect.
Malik et al. (2010)	Manufacturing (SMEs) - Pakistan	Comparative statistical analysis	• Supplier relations, benchmarking, management commitment, and customer focus have a positive impact on the performance; • ISO-certified SMEs outperform non-certified ones.
Sohail & Hoong (2003)	Manufacturing (SMEs) - Malaysia	Mean-difference tests	• Differences in TQM implementation and performance are found between ISO 9000-certified and non-certified SMEs.
Sharma & Modgil (2020)	Pharmaceutical industry - India	Structural equation modeling (SEM)	• TQM has a direct impact on operational performance and also influences supply chain management practices.
Yahia-Berrouiguet, et al. (2015)	Cement industry - Algeria	Qualitative/perceptual case analysis	• ISO 9001 certification has a positive impact overall; • Marketing-related benefits dominate, while HR-related benefits are the weakest.
Danyen & Callychurn (2015)	Food industry - Mauritius	Exploratory Factor Analysis (EFA), Structural equation modeling (SEM)	• Most relationships are significant and positive, except for TQM and business performance and quality and business performance.
Flynn et al. (1995)	Manufacturing - United States	Path analysis, multiple regression	• Core practices and infrastructure practices both support quality performance, which is a source of competitive advantage.
Kaynak (2003)	Multi-sector manufacturing - United States	Structural equation modeling (SEM)	• The structural model confirms direct and indirect effects of TQM practices on multiple levels of performance.
Singh (2008)	Manufacturing - Australia	Structural equation modeling (SEM)	• ISO 9000-related management practices are positively related to the expected performance outcomes.
Fotopoulos & Psomas (2010)	Food industry - Greece	Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), Structural equation modeling (SEM)	• TQM factors significantly affect both internal-procedure performance and market/financial performance.
Baird et al. (2011)	Manufacturing - Australia	Structural equation modeling (SEM)	• Organizational culture (teamwork/respect) fosters TQM use, which directly and indirectly improves operational performance.
Prajogo et al. (2012)	Manufacturing - Australia	Structural equation modeling (SEM)	• Advanced ISO 9000 implementation is positively related to three supply-chain-management activities, which in turn improve operational performance.
Ataseven et al. (2014)	Manufacturing - International	Structural equation modeling (SEM)	• ISO 9000 benefits flow through the development of human/organizational capital and process improvement.
Anil & Satish (2019)	Manufacturing - India	Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), Structural equation modeling (SEM)	• TQM practices impact quality performance and customer satisfaction; • Quality performance mediates the TQM and satisfaction relationship.

Authors	Application context	Analysis method	Main outcomes
York & Miree (2004)	Manufacturing - United States	Matched comparison, causation/covariation analysis	• TQM firms show better financial performance, but partly because high-performing firms are more likely to adopt TQM (covariation effect).
Lima et al.(2000)	Manufacturing - Brazil	Certified group vs. control group comparison	• No clearly discernible performance difference between certified and non-certified firms across the indicators examined.
Feng et al. (2008)	Manufacturing and services - Australia / New Zealand	Factor analysis, multiple regression	• Positive and significant relationship between ISO 9001:2000 certification practices and operational performance; • Weaker link with business performance.
Shafer & Moeller (2012)	Manufacturing - United States	Event study, longitudinal analysis	• Six Sigma adoption is associated with improved corporate performance, mainly through asset and labor efficiency gains.
Tanninen et al. (2010)	Wood and paper industry - Finland	Linear regression on panel data	• TQM has positive effects on profitability, productivity, and customer satisfaction at the business-unit level.
Durakovic et al. (2014)	Mechanical and process industry - Bosnia and Herzegovina / international	Multiple regression, correlation analysis	• Positive relationships exist between certain quality practices and innovation performance; • Quality is necessary but not sufficient.