The role of Key Performance Indicators as a performance management tool in implementing corporate strategies: A critical review of the literature

Ivo Hristov[*], Antonio Chirico[*], Riccardo Camilli[*]

Abstract

Over recent decades, organizations have moved into highly competitive markets that force companies to implement Performance Management Systems (PMSs) to keep monitoring strategy alignment and activities. In this context, this paper provides a Systematic Literature Review (SLR) on the use of Key Performance Indicators (KPIs) in PMSs. Relevant and useful papers have been selected for the analysis and the final 60-paper sample has been studied by means of content analysis and descriptive statistics. The relevant findings have been reported across categories (i.e. value drivers, practices and measures, contextual drivers, and critical issues), such as increasing the use of KPIs supporting sustainable developments and a dichotomy between qualitative and quantitative indicators. In particular, authors revealed the need for a KPI strategical formulation and for a cultural factor aimed at ensuring the effective integration of quantitative, qualitative and sustainable development indicators. Therefore, a conceptual model was developed in order to guide managers through the criticalities and the recently reported requirements. This review addresses the KPIs' implementation from both a systemic and critical point of view; these aspects made our study really useful for practitioners of all application sectors.

Keywords: KPIs, Performance Management System, Performance measurement, Systematic literature review.

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[*] Department of Management and Law – Tor Vergata University of Rome.

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1. Introduction

It is well known that "*performance*" is an ambiguous term, and it is not easy to define (Ferreira and Otley, 2009). Generally, we presume that a company that is performing well can reach its objectives; in other terms, one that is following its strategy perfectly. Capitalism and open market economy, over time, have generated economic and business implications worldwide, such as multinational organization diffusion, highly competitive markets, and many others. In this context, it was even harder to keep organizational efficiency and effectiveness. Thus, it has rapidly increased companies' need to identify key activities, measure performances and align them with strategic objectives. KPIs represent suitable tools to satisfy these rising organizational needs (Hristov and Chirico, 2020).

In its implementation phase, a PMS sets KPIs based on its relevance with respect to the company's mission, which is usually expressed by Critical Success Factors (CSFs), conciseness, and readability. The implementation of a suitable KPI system in the PMS helps companies to obtain several desired objectives throughout sectors of application and, due to the endemic flexibility of these indicators, it is even possible to reach more targets at the same time. Therefore, many cases report differentiated advantages for KPIs' implementation, on both sides of performance measurement (Grigoroudis et al., 2012; Simberova et al., 2012) and strategy-implementation (Micheli and Mura, 2017; Wang et al., 2011). Moreover, KPIs' implementation can be stated as homogeneously developed across all application contexts.

Nevertheless, some researchers signaled critical issues in the KPIs' implementation phase. Besides well-known criticalities, such as quantitative indicators limitation (Cole and Cooper, 2005), rather new ones arose. Indeed, cultural obstacles (Lowe and Jones, 2004), the need for risk integration (Taylor and Ahmed-Kristensen, 2018), the identification of the qualitative value drivers in the strategy implementation (Hristov et al., 2021), KPIs' relationships and prioritization (Cao et al., 2015) still look like challenges to be completely won by KPIs' implementers.

Literature on PMSs has frequently claimed a need for research to be based on more coherent and inclusive theoretical foundations; meanwhile, blame was apportioned on a compartmentalized approach that is driven by empirical research (Chapman, 1997; Chenhall, 2003; Covaleski et al., 2003; Malmi and Brown, 2008). Ferreira and Otley (2009) found the answer by proposing the unique PMS framework.

In the design of a PMS, Franco-Santos and Otley (2018) suggest carefully checking the state of goal-alignment and goal-uncertainty to reduce unintended consequences. It sounds like interfacing accounting and strategy (Dent, 1990), getting closer and closer to the need for a contingency approach that considers specific and changing directions of the organizations. Common to all contingency approaches is the proposition that performance is a consequence of the fit between several factors: structure, people, technology, strategy, and culture (Tosi Jr and Slocum, 1984). For example, a contingency theory, presented by Taylor and Taylor (2014), helps managers to recognize that practices enabling PMS implementation in large firms are not necessarily the most relevant 'levers' in SMEs and vice versa.

To summarize, by reviewing the existing literature, we can perceive a lack of clarity and some critical issues connected to the KPIs' implementation, as a strategic tool to support managers. Accordingly, the mixed results discussed in the literature leads to further analysis. A clear picture on the role covered by the KPIs in the PMS, as a tool to implement corporate strategy, is strongly required. With the objective of filling this gap, this paper included two more specific purposes: 1) to clearly identify the role of the KPIs in the PMS; and 2) to identify challenges for future research to provide a suitable way to integrate KPIs into the strategy, as a managerial tool.

Thus, the research problem and origin of the paper clearly emerge, which aim to contribute to overcoming the existing gap in the literature and managerial practices.

In our minds, a new, comprehensive, specific and flexible contingent framework should be based on KPIs. It is mainly due to their ability to be broken down inside the PMS, to express a company's activity (Silvi and Bartolini, 2011), to their informative power (Dainelli et al., 2013).

Considering these premises and the need to offer a clear and comprehensive picture of KPIs' role in PMSs, the authors focused on two research questions:

1. *(Rq1) What are the main trends in the management accounting literature on the relationships among the KPIs' implementation and the PMS?*
2. *(Rq2) What are the challenges for an integrated approach based on the KPIs, to be structured and implemented into a company's business models and practice?*

To answer these research questions, a SLR based upon 60 high quality papers was conducted. Relevant literature on the research topic has highlighted interesting issues for the scientific community and practice. In particular, the authors answered the first research question (Rq1) by providing an overview of the KPIs' use in the PMS. We concentrated on highlighting

drivers, criticalities, practices and measures connected to the indicators in order to establish a unique approach that is conscious on both theoretical and practical sides. This contributes to the existing literature by drawing on the *state-of-art* in KPIs' implementation so far and analyzing the indicators from several perspectives (value drivers for their implementation, practices and measures, contextual drivers, critical issues), providing a clear picture on the role covered by the KPIs in the corporate strategy implementation. This helped to contribute to the existing literature by clearly delineating the main value drivers and the critical issues, which need to be studied mostly from a management accounting point of view. With regard to the second research question (Rq2), the authors analyzed the outputs of the review by considering the main challenges and trends that emerged to provide an integrated approach, based on a KPI system, to support the decision-making process. The theoretical framework offers critical perspectives and updated suggestions on the whole KPIs' implementation process.

Limitations and possible future research are proposed at the end of the article. The framework developed in this paper will represent a relevant tool for practitioners in both the planning and implementation phases of selected indicators. At the same time, researchers will find these observations particularly useful in drawing limitations of KPIs that emerged in their models, theories, and surveys.

The paper is organized as follows: Section 1 includes the introduction to the research, research gap, research questions, and research proposal; Section 2 presents the theoretical elements used in this paper; Section 3 shows the research methodology; Section 4 reports the descriptive statistics of the sample considered; Section 5 summarizes the literature; Section 6 presents the content analysis; Section 7 is aimed at describing the theoretical framework proposed and implications of it; Section 8 contains the discussion of the findings; lastly, Section 9 gives conclusions, limitations and suggestions for further research.

2. Basic concepts used in this review

2.1. KPI as a tool to measure and implement strategy

The first key issue considered in this paper is the KPI, defined as "a financial or non-financial measure used at different levels in organizations to evaluate success in achieving their objectives, KSFs, strategies and plans, and thus satisfying the expectations of different stakeholders" (Ferreira and

Otley, 2009:271). It can be used to monitor a specific process as well as to implement a preset strategy. In short, a company declares a mission and vision for a take-over and, therefore, CSFs are carried out to choose the most appropriate KPIs. An indicator may face quantitative or qualitative issues in the business, despite that the expressions used in practice are mostly numerical. A KPI is essentially characterized by its relevance (with respect to the strategy) and its conciseness; these are both crucial to be a helpful tool for managers (Kaplan and Norton, 1996). The need for indicators is mainly due to their accessibility over time, different to financial reporting information that is formal and reported a few times. Sharing the desired level of specific KPIs throughout the organization means communicating strategical objectives that reach departments and/or functions. Since different KPIs coexist in the same organization, which may be made up of departments, plants, sites and functions, there is the need for an effective and efficient integration of them in a comprehensive PMS system.

2.2. Performance management implementation

The second key issue considered in the paper is the PMS. Aguinis (2009) defines it as "a continuous process of identifying, measuring and developing the performance of people and groups and aligning these performances with the strategic objectives of the organization". The PMS is based on different phases to allow its integration (Ferreira and Otley, 2009) and to integrate desired outcomes by itself (Asiaei and Bontis, 2019). First, mission and vision setting is essential for the whole system's development. Then, CSFs' definition represents a means to translate general strategy into specific objectives to be reached. KPIs are set after having properly depicted the company structure since the PMS is mainly an integration tool. Besides KPIs, to monitor results and get corrective actions, desired targets are established. Final performance evaluation and the reward system close the circle. The circular approach is aimed at being continuously developed based on contextual changes.

3. Research methodology

Our paper is, firstly, aimed at providing a critical analysis on the relationship between KPIs and the PMS (Rq1). To answer the first research question, we started by performing a SLR (Tranfield et al., 2003) of existing studies

on the topic; this is essential as it provides data needed for the next analyses to be performed (descriptive statistics, summary of literature, content analysis). A SLR is useful because of its depth, providing concise analysis of all the emerging issues, and also for its reproducible design (Fink, 2019). Our search protocol is defined step-by-step to clearly understand how it led us to the results.

3.1. Search strategy

Defining borders to contextualize our research, it is the first step of a systematic process aimed to provide a clear picture of the topic discussed (Seuring and Müller, 2008). Our search strategy, as described in Table 1, followed a protocol made up of collection and selection steps.

Table 1 – Search strategy

Steps	Description
1. **Database**	Scopus
2. **Search field**	Title, Abstract and Keywords
3. **Keywords**	KPI* OR "Key Performance Indicators" OR Report* (title) OR Measure* (title) AND "Performance Management" OR "Performance Measurement" OR "Balanced Scorecard" OR BSC OR PMS OR Strategy (title).
4. **Inclusion criteria**	a) Subject area filter: Business, Management and Accounting b) Document type filter: article c) Publication stage filter: final d) Language filter: English e) Focus on KPIs' implementation, at the very least. **Elimination of duplicates**
5. **Exclusion criteria**	f) Ranking: articles not published in journals 3/4/4* star (ABS 2018)
6. **Final selection**	Full paper analysis

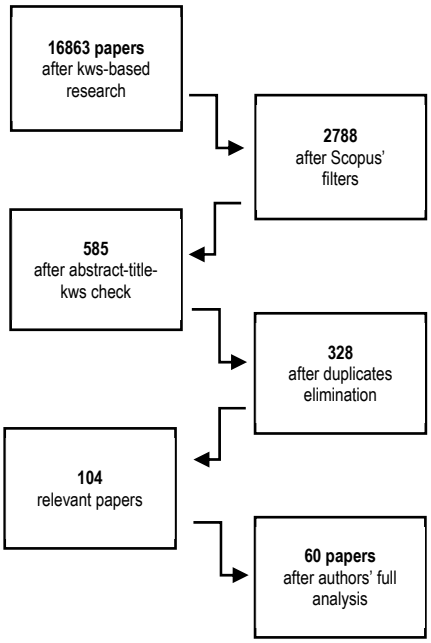
A collection sample was driven using Scopus, while the selection sample was guided by its filters and our conceptual analysis of the papers. No time range was considered since evaluating KPIs' use over time was one of the aims of our review. A wide selection of keywords was chosen to obtain the most representative collection. The keywords used (in the article title, ab-

stract and keywords) for the sample collection were: KPI* OR "Key Performance Indicators" OR Report* (title) OR Measure* (title) AND "Performance Management" OR "Performance Measurement" OR "Balanced Scorecard" OR BSC OR PMS OR Strategy (title). Asterisks were used in the Boolean search as a root word for all keywords derived. Some keywords included only the "title" to concentrate the huge amount of papers obtained. Quotation marks were used for composed words, which is a requirement for searches in Scopus.

3.2. Sample selection for the analysis

The initial keywords' setting, to find abstract-title-keywords in Scopus, obtained a total of 16863 papers. Due to the huge number and the need for a proper focus on strategy-aligned elements, the number of papers was reduced to 2788 after applying the Scopus filters (Table 1): With Business, Management and Accounting as the subject area, we considered only article type document, only final stage of article publication, and only articles written in English. The authors then read the papers' abstracts-title-keywords to understand whether use of KPIs was touched or not, which resulted in 585 articles to be considered. Eliminating duplicates allowed us to focus on 328 elements, which were then evaluated for their relevance. In order to guarantee an outstanding and reliable review, it was found that 104 papers were published in 3, 4 or 4* star journals (according to ABS 2018). The choice of authoritative ranking is based on the purpose of maintaining a convenient trade-off between width and relevance of the review. An exception was the *Journal of Cleaner Production* as a trans-disciplinary journal; it is not listed in the ABS but is particularly relevant for the number of papers selected (17). These were the ones the authors carefully read by evaluating whether their content addressed KPIs' implementation in the PMS, while our research questions guided us to exclude papers that were not relevant for our analysis. In addition, each paper was read independently by the authors, ensuring the validity of the selection. After a composite process, illustrated in Figure 1, the final (coherent, relevant and accessible) sample was made up of 60 papers.

Figure 1 – Search strategy map



3.3. Research objectivity and validity

Following the approach identified by Seuring and Müller (2008), measures for ensuring rigor and objectivity were adopted. Firstly, continuous interaction among the authors throughout the steps has been stressed to validate reciprocal work and, eventually, figure out the criticalities as soon as possible. Despite some procedural parts of the review having been performed by one person, all the authors had the final read of the papers and reported their impressions individually. Step-by-step validation of the work has been ensured by comparison to other structures, both from within as well as from outside the specific area.

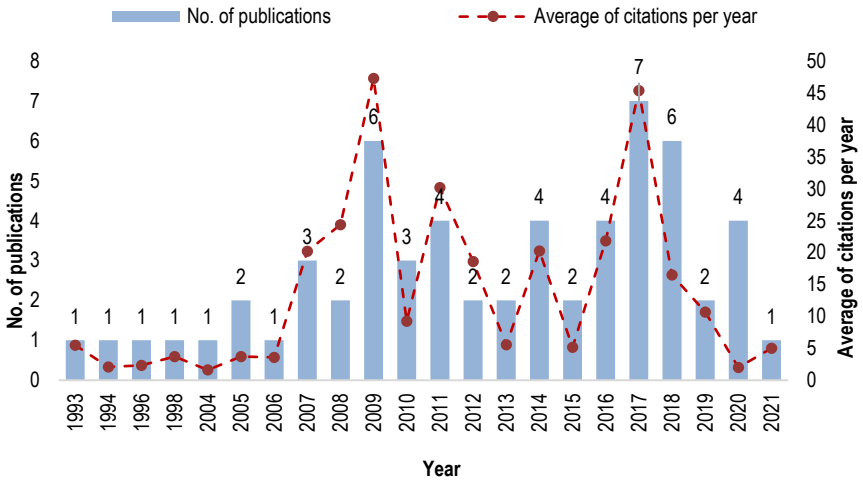
4. Descriptive analysis

In order to turn the review process into quantitative expressions (Harwood and Garry, 2003), we performed a descriptive analysis of the final 60-paper sample analyzed, focusing on understanding literature trends on KPIs' implementation into the PMS (Rq1). According to the aims of the review, some aspects drove the statistics presented below: publications and citations across years, journal, journal area, type of research methodology, type of study, and keywords of the paper.

4.1. Publications and citations across years

First, the authors focused on the time distribution of papers, and their citations, on KPIs' implementation. With this aim, Figure 2 shows some research papers published earlier than 2000 that evolved, despite ups and downs, producing a positive macro-trend to date (most recent papers cannot be fully reported in the sample). Moreover, the average of citations per year follows a similar trend to the former. As remarked at beginning of the paper, highly competitive markets force companies to keep organizations' efficiency and effectiveness, to survive. Therefore, objectives-alignment and performance measurement required a PMS including useful KPIs.

Figure 2 – Publications and citations across years

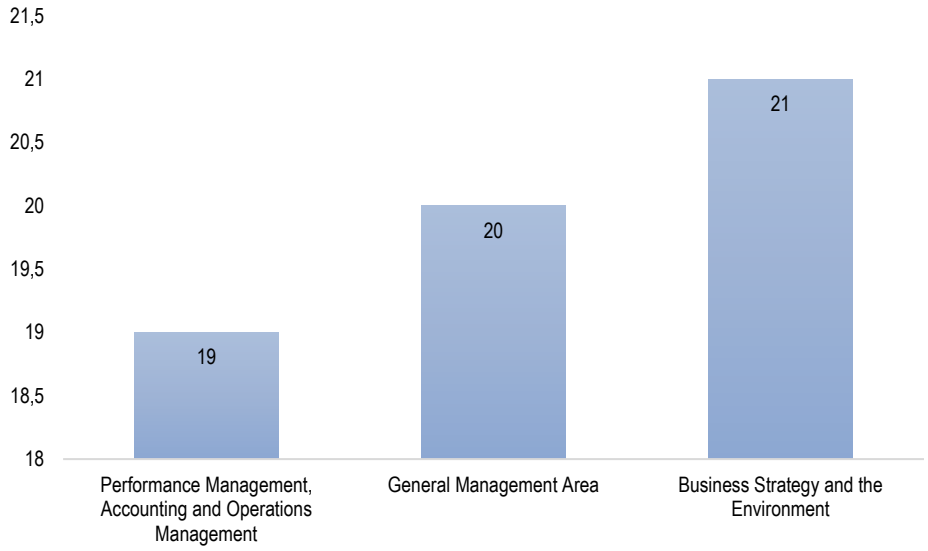


Publications across journals

Aiming to give a clear picture of all the material analyzed in the review, in Figure 3 we provide a list of journals that published the 60 selected papers; Figure 4 describes the journals' research areas covering (1) Sustainability and Environment, (2) Performance Management, Accounting and Operations Management, and (3) General Management (Cheng et al., 2018). The Journal of Cleaner Production has the most frequent appearances, which is likely due to the rising importance of sustainability issues integrated into the PMS (Hristov et al., 2021). Also, because of the need for an efficient use of resources, a massive use of KPIs' implementation research is driven in the Performance Management, Accounting and Operations Management area, especially in the case of journals specifically focused on supply chain, production and planning.

Figure 3 – Publications across journals

Figure 4 – Publications' scientific areas



4.2. Research and study types

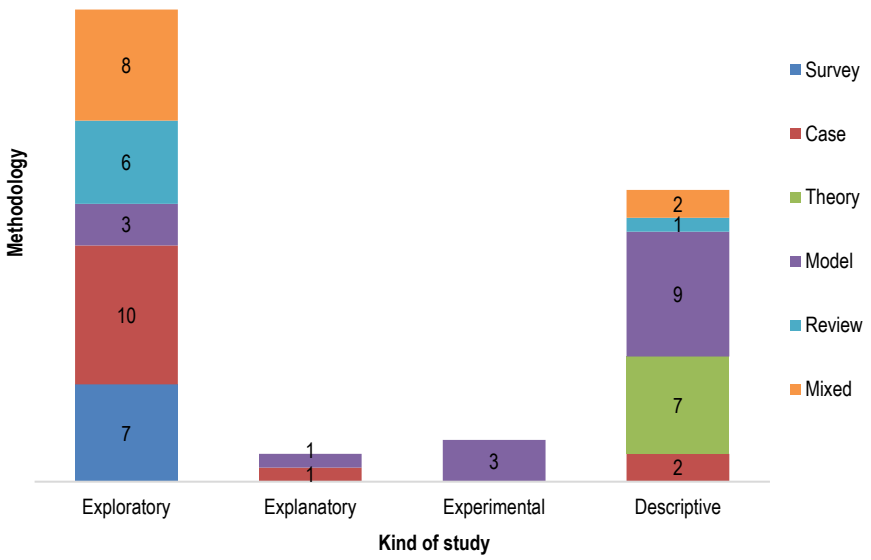
A literature review includes the most differentiated range of papers. Figure 5 quantifies the kinds of research methodology we encountered. Some presented KPIs' implementation cases in several ways and contexts, and many hypothesized models or theories. A widespread kind of research that may be defined as "mixed", as a blend of methodologies, is used, such as cases to test frameworks proposed or reviews ending up in generalizing theories.

Beside a research methodology, a paper may be characterized by several kinds of study performed. To deepen our systematic literature review, in Figure 5 we report the studies of papers selected following Scapens' (1990) renewed classification. Exploratory studies, which are mostly used to check measures or systems implemented, are prevalent as well as descriptive ones, which contain descriptions of models or theories proposed. Explanatory and experimental studies, on the other hand, are much less used considering this specific topic being addressed.

Additionally, the authors present Figure 5 to show the research methodologies and types of study used jointly in the same papers. Thus, to identify

the most fitting research technique to the study undertaken, the specific topic of KPIs' implementation was chosen. Empirical results describe logical dynamics for the analyses reviewed, therefore our observations are validated. Descriptive studies draw on newly introduced models (expressed in terms of numerical relationships) and theories (through conceptual frameworks). Exploring the papers used a wide range of research methodologies. Analyses were aimed at explaining concepts by exploiting cases (to demonstrate how to practically implement practices and measures) and models (to describe their aims, reasons and validity). Finally, experimental solutions are theorized by means of empirical models only.

Figure 5 – Research methodologies and studies in the papers selected

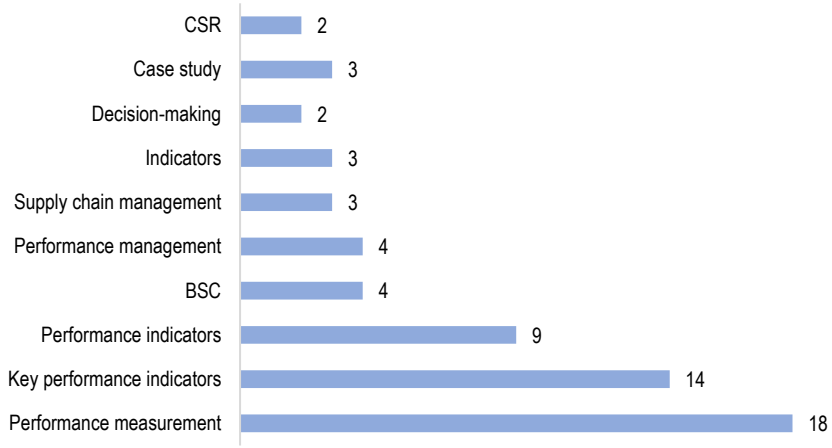


4.3. Keywords

With the aim of summing up the topics arising from the review, and thus providing rapid insight, Figure 6 reports the most-used keywords in the 60 papers selected. Despite the existence of some frequently considered sub-

jects, such as those reported in section 3.2 (supply chain management, construction, planning and production), the keywords' mechanism used in scientific papers is really strict. This is the reason why, aside from supply chain management and CSR, keywords focus on generally performance instead of specific sectorial ones. Therefore, the nature of this review is fully respected, and considers the dominance of the most representative keywords of this analysis fits with the papers selected.

Figure 6 – Keywords in the papers



5. Summary of the literature

Once the general features of the selected papers are described, the contents are reported to generate conceptual observations on KPIs' implementation into the PMS (Rq1). With this aim, contents that emerged from the papers are divided into four categories: *value drivers, practices and measures, contextual drivers, and critical issues,* as seen in Table 2 below. Some articles show different themes, which are noticeable by being signaled in more than one category at the same time. Moreover, to have a fast and practical application procedure, the value drivers category is segmented into contents, key dimension, analysis, and main KPIs used.

Table 2 – Summary of the literature

Categories	Description			
	Contents	***Key dimension***	***Analysis***	***Main KPIs used***
Value drivers	Quantitative	*profitability*	Financial reporting	Income statement ratios (EBIT, EBITDA); Financial analysis indexes (ROI; ROA; ROE; ROS); Cost analysis indexes (break-even point; Contribution margin; Cost)
	Qualitative	*organizational motivational cultural stakeholders' perception*	Internal reports (we found a lack of qualitative analysis reports; future studies should face this important topic urgently by focusing on the qualitative KPIs)	Customers' satisfaction rate; Business integration rate; Employees' satisfaction rate; Stakeholders' acceptance of decision making
	Sustainable development	*environmental social economic cultural*	Sustainable report (future studies should face cultural change drivers urgently)	GHG emission rate; Equality rate (male to female); Production with certifications (%); Employees' knowledge of strategy (%)
Practices and measures	BSC; EMS; ECES; SBSC; IR; GRI; SCOR; EIPIs; CSFs; ME; EMPs; ISO 50001; ISO 9001; ISO 14001.			
Contextual drivers	Healthcare; Supply chain management; Construction industry; Sustainability; Hospitality; Maintenance.			
Critical issues	Uncountability; Qualitative-measures subordination; Process-measures subordination; Loss of autonomy; Rational behavior alteration; Inconsistency; PMS dynamism; KPIs' prioritization and relationships; Need for strategy architecture; Cultural factors, Subjectivity; Need for risk integration.			

5.1. Value drivers

A value driver is widely meant as a motivation for taking over a certain activity. In our case, it is about KPIs' implementation in a PMS. A noticeable number (30%) of papers described relevant value drivers, to implement KPIs as part of a PMS, which the authors summarized according to their contents, key dimensions, analyses, and main KPIs used.

It is really common to use KPIs to assess margins and improve management practices' effectiveness and efficiency (Grigoroudis et al., 2012). In all kinds of organizations, profitability and organizational dimensions are jointly monitored through quantitative KPIs (ROI, EBIT, etc.) and qualitative ones such as those related to customers relationship management (Currie et al., 2007; Kim and Kim, 2009).

In order to deal with structural and behavioral biases, some research (Baldo et al., 2009) proposes performance indicator models. Rigorous and methodologically reliable KPIs, to figure out vagueness of certain objectives and uncertainty of measures, especially in qualitative dimensions, are implemented.

As already underlined in this paper, the relevance of KPIs is in supporting strategy and its corporate alignment. Company cases reported the importance of sharing corporate information (Bititci et al., 2016) aimed at improving targeted motivation, such as in learning processes (Wang et al., 2011). Therefore, indicators can set objective targets aimed at sharing the information flow to attain a common motivation (Business integration rate).

Hristov et al. (2021) reviewed and confirmed the increasing use of the PMS to manage the sustainable dimension of company business. Practices about improving environmental sustainability (Hermann et al., 2007; McIntyre et al., 1998; Sharma et al., 2017) of products and services, which may improve performance as well (Huang et al., 2014), need to exploit a variety of KPIs such as Greenhouse Gases' emission rate (Lo-Iacono-Ferreira et al., 2018; Sprengel and Busch, 2011). Beyond environmental matters, social, economic and cultural dimensions contribute to sustainable development of an organization. Indeed, specific KPIs (Equality rate between male and female; Production with certifications in percentage, Employees' knowledge of strategy as a percentage) are able to translate the strategy and monitor its outcomes as well.

Quantitative contents are measured in both financial and internal reporting, mainly heading toward assessing general profitability. Qualitative issues are perceived as crucial, as well as their need for an objective measurement; therefore numerical measures and reports assume a definitive relevance. Sustainable development is drawn from the Triple Bottom Line, plus the cultural dimension, all included in a single report since the strategic connection of all these initiatives aims for corporate goal-achievement. Finally, across all the value drivers observed, it is still possible to notice general and usual twofold KPIs' utilization: measuring activities and tools, and implementing and sharing corporate strategies.

5.2. Practices and measures

This category includes structured practices and measures that emerged in KPI systems, which have been satisfactorily described in articles of the sample selected. Indeed, qualitative and quantitative indicators are often jointly implemented in complex frameworks.

Therefore, research (Caniato et al., 2014; Osman et al., 2020) has selected and analyzed a wide set of combined qualitative and quantitative KPIs that measure activities in categories such as time, costs, quality, innovation, and communication. Indicators sometimes followed a structural guide to ensure a systematic approach. For example, the BSC structure, despite discussions (Hristov and Chirico, 2020), still proves to be a helpful guide for researchers and managers to develop the whole KPI system, both at company and department levels (Cao et al., 2015; Cooper and Ezzamel, 2013). Moreover, for operational matters, SCOR is followed and considered a reliable scheme to implement proper KPIs (Bai and Sarkis, 2014; Cai et al., 2009; Chae, 2009). Sustainable practices and measures emerged in the most recent papers as: quantitative and qualitative indicators divided into an Environmental Management System (EMS) (Azzone et al., 1996); 30 Eco-Innovation Performance Indicators (EIPI) (García-Granero et al., 2018); advanced quantitative indicators to assess Circular Economy (CE) initiatives (Rincon-Moreno et al., 2021); sets of quantitative and qualitative process-oriented indicators to implement the best Ecodesign Management Practices (EMPs) (Rodrigues et al., 2017); a performance indicators' matrix (Teixeira et al., 2016) based on the application of the activities from integrated management systems, and the integrated management energy (ISO 50001), quality (ISO 9001) and environment (ISO 14001) systems.

Many practices and measures reported an abundance of tools for assessing the sustainability of processes. In the meantime, the use of the BSC is still relevant for strategic alignment and SCOR in the supply chain context.

5.3. Contextual drivers

KPIs are implemented throughout business sectors and, here, the papers reported specific contexts regarding use. The authors considered sustainability as a stand-alone industrial sector since it had assumed major relevance during the review process.

Indeed, despite using KPIs throughout different PMSs, it is firstly important to notice their massive presence in PMSs focused on sustainability (20 papers out of the 60 selected). All sectors have been slightly impacted with particular concentration on maintenance (Muchiri et al., 2010; 2011), supply chain management (Chae, 2009; Chandra and Kumar, 2021; Hofmann and Locker, 2020), and healthcare (Grigoroudis et al., 2012; Jahangirian et al., 2017).

Therefore, the rising importance of KPIs related to sustainability issues integrated into the PMS is very noticeable (Hristov et al., 2021). Moreover, the presence of papers focused on supply chain (Akkermans et al., 2019; May et al., 2014), production and planning is quite remarkable.

5.4. Critical issues

This last category gathers criticalities encountered during KPIs' implementation; numerous papers collected (nearly 50% of the sample) talk about them. Critical issue is intended as any possible phenomenon hindering KPIs' implementation at any phase of the process (Ferreira and Otley, 2009).

One of the most critical aspects of indicators in managerial sciences is their frequent inability to gather qualitative aspects (Cole and Cooper, 2005), as a relevant driver of performance that reflects the subjective nature and properties of the value creation system, such as employees' motivation, cultural change, flexibility and integration, which cannot be directly obtained from quantitative data (Jahangirian et al., 2017; Parker, 2012). Therefore, KPIs need to be structured and implemented in order to address the key qualitative value drivers of the performance. Some research observed a heavy imbalance between outcome-oriented indicators, which were overly considered with regard to process-oriented ones (Rodrigues et al., 2016; Røge and Lennon, 2018; Smith, 1993). On the other hand, Hofmann and Locker (2009) remind us of the crucial importance around financial indicators. As they still represent the key indicators that investors and shareholders' decisions are based on, they described how to integrate non-financial measures with financial ones. Therefore, different indicators' integration has not been reached yet; it still seems open to contention between: qualitative and quantitative measures, process-oriented and outcome-oriented, financial and non-financial. Coram et al. (2011) reported asymmetric attention paid to financial and non-financial indicators when implemented jointly.

Some other technical criticalities emerged from the review. Methodologies often arose with lagging and complex indicators (Kravchenko et al., 2019). Moreover, Muchiri et al. (2010) showed that few companies have a high percentage of decisions and changes triggered by KPIs' use; indeed, results report a kind of ineffectiveness of performance measurement systems in driving performance improvement in industries. For these reasons, Perotto

et al. (2008) stress the role of the uncertainty of measurements should be taken into account.

A substantial part of the issues signaled derives from behavioral matters related to workers, stakeholders (Bryde, 2005) and managers' attitudes. Adaptations for different geographical regions and cultures (Adams and Frost, 2008) and lack of common knowledge emerged as potentially critical to face. Due to KPIs' introduction, loss of autonomy (Lowe and Jones, 2004) or alteration in rational behavior (Franceschini et al., 2014) could arise among organizational members. Länsiluoto et al. (2013) remind us of the existence of conflicts of interest among stakeholders while designing a PMS, which are well explained by existing theories such as resource-dependency theory (RDT). Additionally, cognitive abilities play a crucial role in setting PIs (Rajan and Reichelstein, 2006) as well as getting them aligned (Stricker et al., 2017). Therefore, human needs and limitations are essential considerations while thinking of any organization.

Research on KPIs often recalls their measuring function as well as strategy-supporting function, and anyway, the latter seems harder to exploit. Gelders et al. (1994) highlighted the lack of consistency between business strategy, performance measurement systems, and improvement actions. As KPIs are implemented into a unique PMS, matters regarding their relationship and prioritization could emerge (Cai et al., 2009; Li et al., 2018). One can even observe managers' lack of a cause-effect explanation in the case of a missed objective; they just rely on the associated single KPI, thus the need arises to identify relationships among different indicators (Rodriguez-Rodriguez et al., 2010), even those belonging to different departments (Cao et al., 2015). Especially for sustainable actions, strategies in place are unable to respond to current legal requirements (Villalba, 2020). This research demonstrates the existence of the need for integration following both horizontal and vertical dimensions. Recent trends highlighted the need for a new area of integration between indicators and risk management. Taylor and Ahmed-Kristensen (2018) show key risks and their role on performance, a key issue to make managers and researchers work on preventive measures. One final critical aspect deserves to be addressed: PMS dynamism. Henri (2010) found that a high degree of PMS revisions could be harmful in a pretty stable environment in terms of internal and external change, while it may be useful in a highly changing context.

To sum up, it is possible to record a wide range of criticalities connected to KPIs' implementation. Nevertheless, the usual dichotomy between the

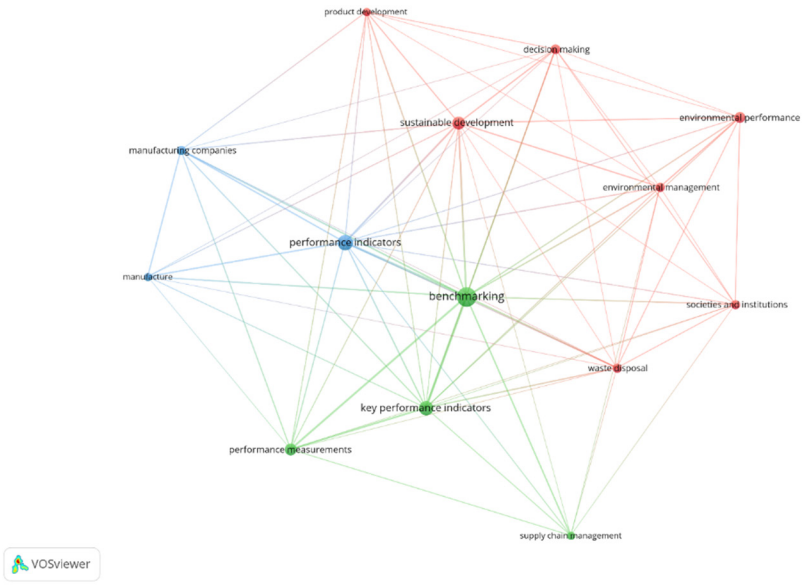
quantitative measure and the qualitative one is also observed, where the latter is too often subordinated to the former. Moreover, weak strategical architectures for proper applications have been noticed as well.

6. Content analysis

The authors felt the need for a content analysis to turn the collected theoretical concepts into empirical values (Harwood and Garry, 2003; Williamson et al., 2013), in order to produce more valuable observations in the context of Rq1. A computer-based content analysis was chosen following drivers reported by Li (2010): the large sample considerably allows improving the generalizability of results; future research may strengthen the analysis thanks to its replicability; and the usefulness of information that could remain hidden otherwise. We used VOS viewer, a software tool for constructing and visualizing bibliometric networks. Once the final selection of the 60-paper sample was made, the authors turned the Scopus bibliography into an Excel file, which was readable through the software. A careful explanation, aimed at the replicability of results, is provided before each textual study step performed (Loughran and McDonald, 2016).

The analysis of co-occurrences allows studying the associations between words, identifying those words that appear the most and are close to one another. As a unit of analysis, we chose Index keywords. These are different from Author Keywords as they are manually added by a team of Scopus professional indexers based on several vocabularies and not chosen by these authors, at their discretion (Campedelli, 2020). We then set 5 as a minimum number of occurrences of a keyword that were reported on the conceptual map: 14 items and 74 links came up. The content map, provided below as Figure 7, presents results about co-occurring keywords in the analysis; it displays dots giving the names of concepts emerging from the texts. Frequency of a specific concept, among the 60 papers selected, is given by its dot size. Similarly, the most frequent connections are indicated by streams connecting dots, the larger the streams the more the connections. The most frequent concepts and connections have been considered, even though others might exist.

Figure 7 – Co-occurring keywords



The content map depicted above offers several discussion points for the authors, whose aims, in this section, are to turn map insights into concepts. It is essential to notice the main concepts as well as their colored clusters ("benchmarking" in green, "performance indicators" in blue, and "sustainable development" in red). Connection among blue and red clusters was explained (Table 2) as "sustainable development", representing the main value driver for "performance indicators'" implementation. "Benchmarking" may be considered as a managerial practice, found to be universally used, which is connected to a large variety of aims.

The green cluster underlines the widespread use of "benchmarking" both for setting "KPIs" and for comparing measures that emerged. This section of the map is essentially based on these general tools used across different sectors; nevertheless, the dot of "supply chain management" is cited in several works (Cai et al., 2009; Chae, 2009; Graça and Camarinha-Matos, 2017).

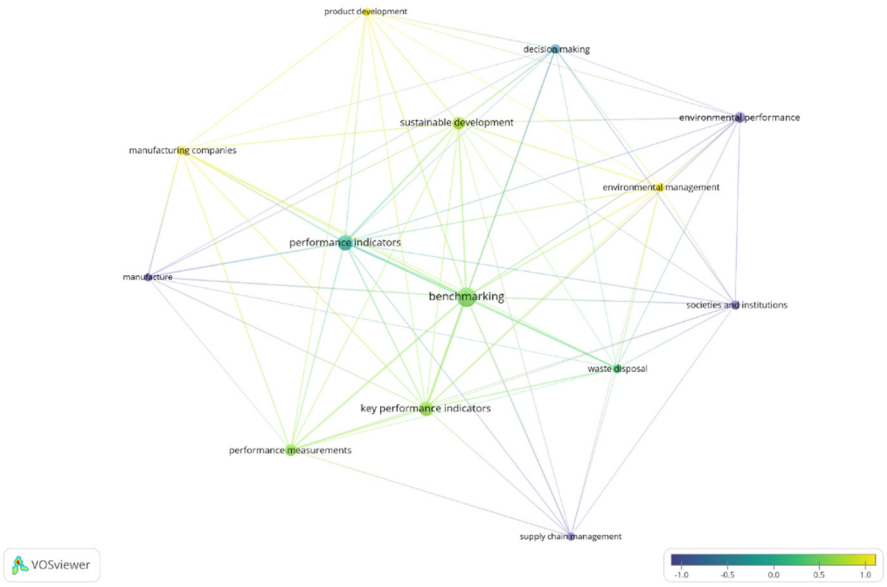
The blue cluster shows "performance indicators'" connection to the manufacturing context ("manufacture" and "manufacturing companies"). Indeed,

it seems easy to understand since a large group of businesses that was considered (Cao et al., 2015; Gelders et al., 1994; Kravchenko et al., 2019; Shahbazi et al., 2018) falls into manufacturing activities.

The red cluster includes keywords on sustainability, which is the most popular theme, which is likely due to the choice of including the *Journal of Cleaner Production* papers. It is interesting to notice the connections of the specific topic "waste disposal" to the green keywords "key performance indicators" and "benchmarking" (Villalba, 2020), considered as essential managerial tools.

In addition, with the same data and settings, the authors wanted to get a temporal overview of the topics studied. Therefore, an "Overlay visualization" of chronological analysis of co-occurring keywords is offered in Figure 8. In order to obtain more significant outcomes (values from -1 to +1), we set "average publications per year" as scores and normalized them, by first subtracting from each score the mean score of all items, and then dividing by the standard deviation of the scores of all items.

Figure 8 – Overlay visualization of chronological analysis of co-occurring keywords



The temporal transition starts from traditional topics faced in performance management, depicted in blue on the external part of the figure, such as “supply chain management” (McIntyre et al., 1998), “societies and institutions”, “manufacture”, and “environmental performance”.

The yellow cluster shows the recent trends (“environmental management”, “product development”, “manufacturing companies”), which can be effectively explained by the recent use of KPIs as a tool to develop sustainable products (Askham et al., 2012; Karavanas et al., 2009; Moktadir et al., 2020; Pilouk and Koottatep, 2017; Rodrigues et al., 2016; Stricker et al., 2017; Taylor and Ahmed-Kristensen, 2018; Tolonen et al., 2015).

The green cluster in the middle essentially includes managerial tools such as “benchmarking”, “key performance indicators”, and “performance measurements”. Those may be exploited for several studies, balanced between past and recent ones.

The whole content analysis of keywords confirms results already presented in the paper, as it reports the major role played by KPIs in sustainability, nowadays especially related to product development. Moreover, a strong use of benchmarking practice emerges among the papers reviewed, and it is clearly adaptable to different performance management systems in several contexts.

7. Theoretical development

Considering the first research question (Rq1), a clear vision on the role covered by the KPI system, and connected value drivers, in the PMS has been added to the existing knowledge. Accordingly, their implementation into PMSs was reviewed and identified across several categories. All critical issues were discussed, suggesting a path for future research. In addition, the authors found that KPIs, used as a strategic tool, need to be structured by incorporating three main dimensions (quantitative, qualitative and sustainable development) in order to support strategy implementation. On the bases of the contexts, drivers, criticalities, practices and measures reported, the authors provide a conceptual framework below. This is a comprehensive model aimed at acting as a theoretical guide to implement KPIs, using a critical approach (Rq2).

Following PMS implementation phases (Ferreira and Otley, 2009), in Figure 9, each step is associated to the main, specific criticality that is potentially encounterable in KPIs’ implementation, or due to it. First, and a crucial

matter for an organization, is vision and mission setting but, from the start, conflicts of interest could arise when addressing company activity and the next objectives (Länsiluoto et al., 2013). CSFs are then chosen according to the most important aspects to evaluate, therefore matters about their relationship and prioritization could emerge (Cai et al., 2009). It is especially noticed in multi-department companies, which need a clear strategy to coordinate the complex architecture. This paper reports the highest number of critical issues while setting KPIs, and is explained in several ways. For instance, frequent inability to gather certain qualitative aspects (Cole and Cooper, 2005; Jahangirian et al., 2017), and imbalance between outcome-oriented indicators that are considered too much against process-oriented ones (Rodrigues et al., 2016; Røge and Lennon, 2018; Smith, 1993). Turning conceptual goals of the organization into measurable targets is a complex process. Managers, at this point, quantify and prioritize their minds and, therefore, a certain degree of subjectivity affects the process. Introducing KPIs to evaluate performance, especially of single employees, often generates loss of autonomy (Lowe and Jones, 2004) together with alteration in rational behavior (Franceschini et al., 2014). It seems clear that managers should take care about the evaluation measures they provide to the organization and the way to do it. An eventual reward system, linked to positively assessed performances, could generate conflicts of interest among departments and people. An effective integration system and a win-win strategy may be studied by managers.

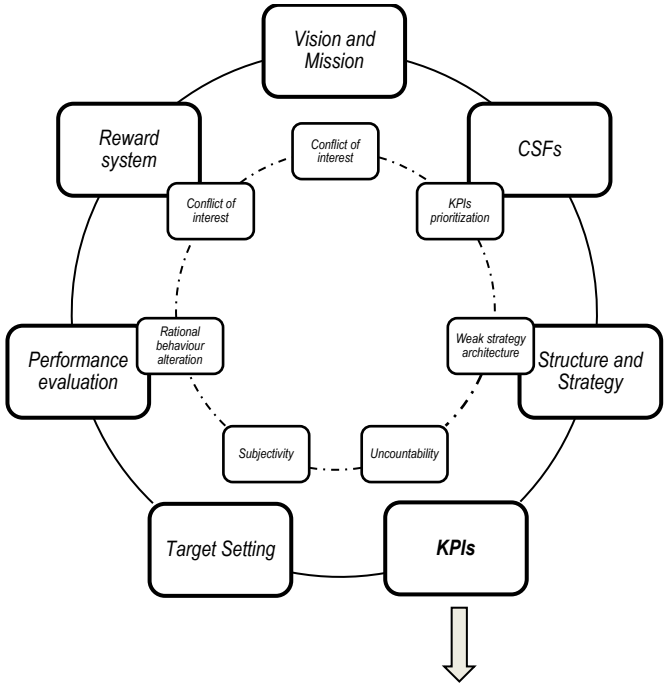
Once the context of KPIs' implementation is depicted, appropriate characteristics of indicators are discussed. As described in the literature summary, main KPI contents are synthetized: quantitative, qualitative and sustainable development. Quantitative indicators were noted to be evenly used to assess general company profitability, through goal-achievement effectiveness and efficiency of resources invested. Qualitative ones are exploited to monitor an internal perspective, essentially based on the motivation of employees and the organization among themselves, and an external perspective, mostly focused on building a desirable outcome in stakeholders' minds that affect firm performance (Vaitoonkiat and Charoensukmongkol, 2020). KPIs, even in sustainable development contents, may be divided into internal and external perspectives. Internally, sustainable actions are taken by the organization, and monitored through the indicators, in order to guarantee its long-term economic survival. Externally, engagements for environment and social matters, mostly expressed in CSR activities (Camarinha-Matos and Abreu, 2007; Searcy et al., 2016), can offer the company a leverage to increase its outputs. Despite that sustainable development indicators may have a quantitative or qualitative expression, the rationality behind considering these

KPIs, apart from qualitative and quantitative ones, is threefold. Firstly, we consider sustainable development KPIs as those used to measure company activities connected to Sustainable Development Goals fixed in the 2030 Agenda, thus excluding quantitative and qualitative indicators not associated to such specific aims. Secondly, due to their strategic relevance, they are practically assumed in PMSs; as reported in section 5.3, we suppose that an autonomous category is merited (Hristov et al., 2021). Thirdly, the technical specificities needed to develop some of the sustainable development indicators (GHG emission rate, EIPI, CE) call for a separate information flow into the PMS. Finally, these three, highlighted drivers, supporting the distinction between quantitative, qualitative and sustainable development indicators, are mostly aimed at simplifying different KPIs' implementation in managerial practice. Anyway, a unique framework to consider and systematically integrate the three dimensions of indicators has not been provided yet in literature.

The dotted arrows depict the required cultural factor to successfully implement quantitative, qualitative and sustainable contents into the same PMS. An organization's culture is defined as its unwritten rules and procedures. In the case of sustainable development integration, ISO certifications used, as reported in the summary, can help to positively address common and proactive practices. Nevertheless, a common cultural factor is strictly needed to integrate all the indicators into the same PMS to solve the criticalities reported in the upper part of the figure.

Our framework provides managers with a series of criticalities widely discussed by practitioners and researchers and gathered together in this review. Relevant issues are reported for each PMS phase, and these criticalities are associated to KPIs' implementation as ex-ante and ex-post effects of it. However, it is particularly important that KPIs are formulated from the first strategical phase and include the wider use of qualitative indicators. The rising need for sustainable development indicators calls for an adaptive cultural factor; nevertheless, it could be driven by both official standards and reputational outcomes.

Figure 9 – Conceptual model of KPIs' implementation



	QUANTITATIVE		QUALITATIVE		SUSTAINABLE DEVELOPMENT	
Cultural factor	GOAL	KPI	GOAL	KPI	GOAL	KPI
	Improving effectiveness		Strategic alignment among employees (internal perspective)		Corporate activity sustainability (internal perspective)	
	Improving efficiency		Strategic alignment with stakeholders (external perspective)		Sustainable reputation leverage (external perspective)	

KPIs' critical issues cycle
PMS Cycle

8. Discussion of the findings

In this section, we discuss the results found throughout the analyses performed in this paper, which outlines the final theoretical framework. Below, however, new concepts are reported after the well-known ones, together with practically-driven discussions.

As expected, a consolidated practice, over the years, of implementing KPIs has been possible thanks to the differentiated contexts of application and not being strictly related to accounting activities. Across all sectors, companies massively use indicators to evaluate and implement sustainable processes, which have been especially focused on product development in recent times. Organizations aim to integrate the sustainable development dimension into their business: (1) to build a competitive reputation in the market, and (2) to maintain their own sustainability in economic and social terms. However, managers unavoidably report quantitative KPIs in external reports to assess and communicate profitability and, in the meantime, the qualitative ones are often implemented to capture internal matters, such as employees' perceptions within the organization.

Nevertheless, an unexpected number of critical issues occur in implementing KPIs. Managers still have difficulties in integrating qualitative indicators alongside the quantitative ones, which still represent a more intuitive solution for them. Similarly, another resistance to evolve is witnessed by the supremacy of measurement function with respect to the strategy-implementation function of KPIs. As there is a long list of human distortions associated with each KPI implementation step, relevant literature on such criticalities should be added in the near future. Due to these criticalities, the whole implementation process could even worsen organizational performances, such as rational behavior alteration connected to loss of autonomy.

At the same time, innovative and well-known elements were integrated by means of a unique theoretical framework to guide managerial practices. In particular, alerts on effectiveness and prioritization of KPIs will be crucial for future implementations, as well as the cultural factor that will guide any kind of transition.

9. Conclusions

In this study, the authors performed a SLR of papers about KPIs' implementation into the PMS. This widely inclusive approach allowed us to con-

tribute to the research area by answering the two research questions: analyzing the main trends in management accounting literature on the relationships between KPIs and the PMS, and proposing a theoretical framework for an integrated approach based on KPIs ranging among the challenges identified in the literature.

9.1 Contribution of the study

The legacy of this paper is extricated through the research questions posed at the beginning.

In answering the first research question (Rq1), the SLR produced a sample of 60 papers, which highlighted value drivers for implementing KPIs, specific practices and measures used, context of application, and critical issues arising during the implementation process. The KPIs observed were mainly divided into quantitative, qualitative and sustainable development. Qualitative indicators, despite consistent studies, still seem harder to implement due to their uncountable nature. Moreover, we indicate a lack of proper cultural alignment that strictly calls for the development of a comprehensive implementation of KPIs, especially those related to sustainable development, which are now taking center stage.

Answering the second research question (Rq2) allowed us to conceptualize and draw a theoretical model, which was aimed at filling the gap found during the SLR. Remarking on the PMS's cycle (Ferreira and Otley, 2009), the authors found that KPIs' formulation needs to be strategically proved from the beginning of the whole process to figure out the criticalities that are reported. Indeed, matters about KPIs' prioritization, as well as conflicts of interest about evaluations and rewards throughout the organizational structure, cannot be addressed without a specific mission and vision being set that can be spread widely within the organization. In this direction, the specific function of the cultural factor was designed, and is essential, to successfully integrate quantitative, qualitative and sustainable development indicators.

9.2. Implications of the study

Applications of the study in this paper may be divided into contributions for academics and for professionals.

The SLR performed draws on the *state-of-art* in KPIs' implementation; therefore, it may work as a conceptual starting point for research in the field.

In addition, the descriptive statistics illustrated may be useful as they provide academics with empirical information on the theme. The theoretical model proposed may represent food for thought in terms of confirmations, revisions and criticisms as well.

Managerial accountants may find the framework proposed particularly useful in several senses. First, it warns KPIs need to being formulated from the strategical phase because of the reasons previously discussed. Secondly, a list of criticalities, associated to each PMS cycle phase, may facilitate managers' task in focusing on the most critical obstacles. Third, thanks to this study, professionals become familiar with several KPIs' utilization and classification while understanding recent trends, especially those in sustainable development. Finally, managers may find a way to conceptualize the cultural factor in their own organization, and head toward the successful integration within their PMS.

9.3. Limitations and future directions

From a methodological point of view, the SLR is based only on 3, 4, and 4*ABS-ranked papers (plus the *Journal of Cleaner Production*). As discussed above, to end up with the desired output, the authors chose to focus only on highly influential sources.

Our research objective was to systematically review studies in the field and provide a unique model, which has been guided by a holistic approach. Therefore, this study does not differentiate its proposal among industries by applications, size of organizations, or geographical locations. Due to the limitations of this research, considering the specific organizations in specific contexts, and the recent trends shown in this paper, future works may propose sets of suitable KPIs, including quantitative and qualitative targets associated to them.

In addition, basing on the research findings, we modeled and motivated three dimensions of KPIs: quantitative, qualitative and sustainable development. Sustainable development indicators, in particular, are taking a central role in the current management practice (in view of the Agenda 2030), thus a definitive way for their integration into PMSs is needed. Future research needs furtherly investigate the results provided, exploring the multidimensional and interrelated nature of the dimensions discussed in order to support scholars and managerial practices in the value creation process; real case studies would be welcome to practically test this system of indicators, especially in their interrelations.

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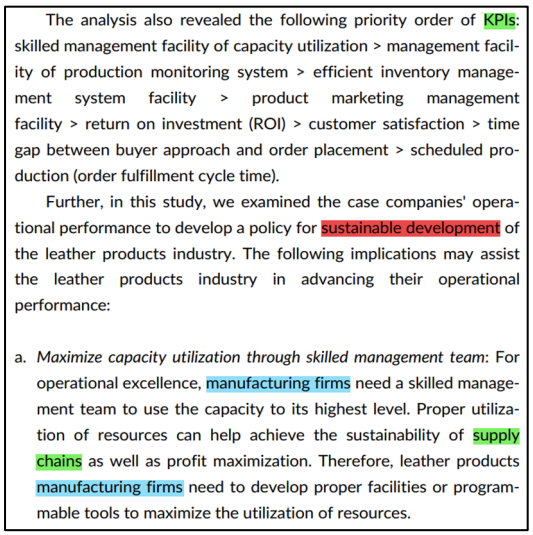
Appendix A. Snapshots of co-occurrences, found in the papers reviewed, as evidence of the content analysis performed

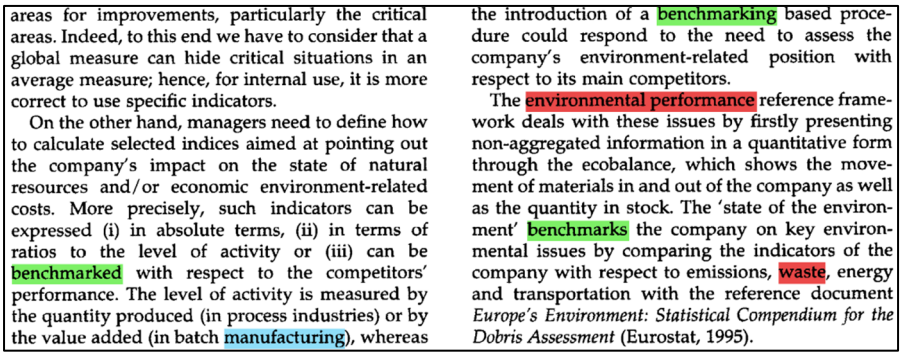


The analysis also revealed the following priority order of KPIs: skilled management facility of capacity utilization > management facility of production monitoring system > efficient inventory management system facility > product marketing management facility > return on investment (ROI) > customer satisfaction > time gap between buyer approach and order placement > scheduled production (order fulfillment cycle time).

Further, in this study, we examined the case companies' operational performance to develop a policy for sustainable development of the leather products industry. The following implications may assist the leather products industry in advancing their operational performance:

a. *Maximize capacity utilization through skilled management team*: For operational excellence, manufacturing firms need a skilled management team to use the capacity to its highest level. Proper utilization of resources can help achieve the sustainability of supply chains as well as profit maximization. Therefore, leather products manufacturing firms need to develop proper facilities or programmable tools to maximize the utilization of resources.

Moktadir *et al*. (2020: 17)

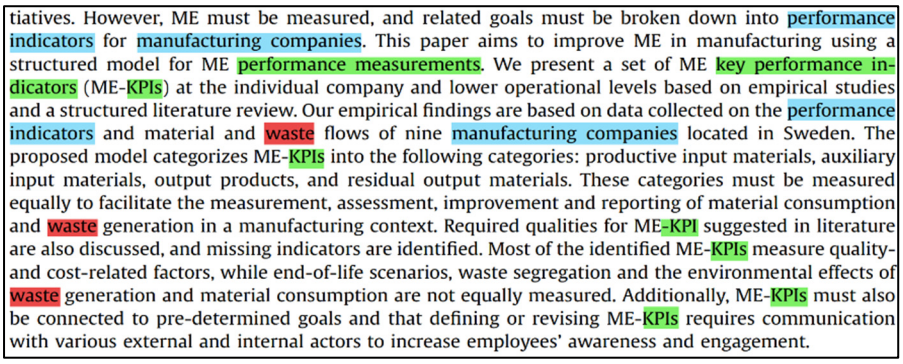


areas for improvements, particularly the critical areas. Indeed, to this end we have to consider that a global measure can hide critical situations in an average measure; hence, for internal use, it is more correct to use specific indicators.

On the other hand, managers need to define how to calculate selected indices aimed at pointing out the company's impact on the state of natural resources and/or economic environment-related costs. More precisely, such indicators can be expressed (i) in absolute terms, (ii) in terms of ratios to the level of activity or (iii) can be benchmarked with respect to the competitors' performance. The level of activity is measured by the quantity produced (in process industries) or by the value added (in batch manufacturing), whereas the introduction of a benchmarking based procedure could respond to the need to assess the company's environment-related position with respect to its main competitors.

The environmental performance reference framework deals with these issues by firstly presenting non-aggregated information in a quantitative form through the ecobalance, which shows the movement of materials in and out of the company as well as the quantity in stock. The 'state of the environment' benchmarks the company on key environmental issues by comparing the indicators of the company with respect to emissions, waste, energy and transportation with the reference document *Europe's Environment: Statistical Compendium for the Dobris Assessment* (Eurostat, 1995).

Azzone *et al*. (1996: 78)



tiatives. However, ME must be measured, and related goals must be broken down into performance indicators for manufacturing companies. This paper aims to improve ME in manufacturing using a structured model for ME performance measurements. We present a set of ME key performance indicators (ME-KPIs) at the individual company and lower operational levels based on empirical studies and a structured literature review. Our empirical findings are based on data collected on the performance indicators and material and waste flows of nine manufacturing companies located in Sweden. The proposed model categorizes ME-KPIs into the following categories: productive input materials, auxiliary input materials, output products, and residual output materials. These categories must be measured equally to facilitate the measurement, assessment, improvement and reporting of material consumption and waste generation in a manufacturing context. Required qualities for ME-KPI suggested in literature are also discussed, and missing indicators are identified. Most of the identified ME-KPIs measure quality- and cost-related factors, while end-of-life scenarios, waste segregation and the environmental effects of waste generation and material consumption are not equally measured. Additionally, ME-KPIs must also be connected to pre-determined goals and that defining or revising ME-KPIs requires communication with various external and internal actors to increase employees' awareness and engagement.

Shahbazi *et al*. (2018: 17)