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Organizational Performance and Indicators: Trends and Opportunities

Fernanda Antunes da Silva[a]*, Milton Borsato[a]

[a]Graduate School of Mechanical Engineering and Materials – Federal University of Technology - Paraná, Av. Sete de Setembro, 3165, Curitiba-PR, 80230-901, Brazil

Abstract

Given the current competition into markets, it's necessary for companies to monitor their practices and results in order to ensure competitiveness. To survive these challenges and compete successfully, organizations need to monitor processes through key performance indicators (KPIs). Currently, indicators are analyzed in an isolated way within the organizations. Therefore, it's important that companies use a harmonization approach both in the creation and monitoring process of indicators. Based on it, this article carries out a research to find the state of the art and the research opportunities. To do that, a bibliographic portfolio was constructed and bibliometric and systemic analyzes were performed.

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Keywords: Organization, Supply Chain, Domain, Knowledge, Indicator, Measurement

1. Introduction

The competitive market has become increasingly dynamic, driving companies to react with the same speed, making the necessary adaptations and changes. This race for market participation requires companies to closely monitor performance indicators so that it is possible to assess whether processes and activities are being performed

* Corresponding author.
E-mail address: fernanda.a.silva89@gmail.com

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satisfactorily to the point of passing on as an advantage over competitors, which has a major impact on the profitability of the companies.

In order to measure this performance, organizations are focused on creating performance indicators for each business area, which are designed and used in isolation. Thus, it is perceived that there is no alignment between the Key Performance Indicators (KPIs), and it is often possible that they are even conflicting with each other. In this context, authors affirm that knowledge management has a strong relation with the alignment between internal and even external resources, since corporate knowledge can be explained, exchanged and shared among participants [1]. Lawson and Potter [1] emphasize that the domain of knowledge derived from inter-organizational relationships can serve as a competitive advantage, thus explaining the importance of information sharing. Similar to knowledge management, [2] indicate the relevance of Supply Chain Management (SCM), since this includes the integration of the company's main internal functional groups, such as purchasing, manufacturing and sales.

In this context, one of the major challenges currently encountered by companies is to ensure that the indicators are monitored in an integrated way, deserving special attention. Therefore, this article presents a literature review in order to identify the state of the art and the existing research opportunities on the problems described above. Also, the following question should be answered: Is there an opportunity to research the alignment of KPIs in organizations?

The present article is structured as follows: section 2 presents the methodological aspects of the work. Section 3 presents the detailed development of the research, based on ProKnow-C and, finally, section 4 presents the results and conclusions of this study.

2. Methodological Aspects

With regard to the methodological procedure adopted, this research is classified as exploratory, descriptive and bibliographic. As for the purpose of the study, it is considered exploratory because it aims to provide the researcher with a greater familiarity with the problem to be studied, and will be used since it is intended to define the problem with greater precision and to identify relevant courses of action or to obtain additional data before starting a new approach [3]. As the main features of the articles that make up the Bibliographic Portfolio (BP) are described here, it can be classified as descriptive [3]. And as for the procedure adopted, as it implies in an ordered set of procedures that search in already published materials, it fits as bibliographical [4].

Given the large amount of scientific material available in the national and international literature, scientific research can become very complex [4]. In this context, for the structured construction of the bibliographic reference framework, it was used the revision process called ProKnow-C which was developed by the Laboratory of Methodology and Multicriteria in Decision Support (LabMCDA) of the Department of Production Engineering and Systems of the Federal University of Santa Catarina in Brazil [3]. This instrument is composed of four steps: i) selection of a portfolio of articles on the subject to be studied; ii) bibliometric analysis of the portfolio; iii) portfolio analysis; iv) definition of the research question and objective.

3. Bibliometric and Systemic Analysis

3.1. Bibliographic portfolio selection

Starting from the problem about non-alignment between the KPIs, some premisses were defined before starting the portfolio selection stage. It was decided first to work only with papers published in scientific journals, covering the period from 2011 to 2016. Then the databases to be searched were determined according to the alignment as to the areas of interest (Engineering and Multidisciplinary): Emerald, Engineering Village, Science Direct, Scopus, and Web of Science. The searches were conducted in November 2016.

3.1.1. Selecting the article bank

In order to perform searches in the databases using the pre-established constraints, it was necessary to first identify what the research axes would be, and within each axis what would be the keywords to be used. Based on the

problem of this study, the following research axes were defined: (i) Manufacturing; (ii) Integration; (iii) Performance. That is, manufacturing, integration and performance are lines of research for the theme proposed in this study, i.e. integration of performance measures within organizations. Based on this same reasoning, keywords that make explicit each axis of the research. (Table 1).

Table 1. Axis of research versus keywords

Axis	Manufacturing	Integration	Performance
Keywords	Enterprise Supply Chain Extended Enterprise Organization	Disciplinar Domain Knowledge Boundary	KPI Indicator Metric Key Performance Indicator Quality

Based on the information available on keywords and databases, it was possible to conduct searches. But, it is worth clarifying that keywords can be organized using the boolean operators (AND, OR and NOT), which are terms that allow restrictive combinations (AND), additive (OR), and exclusion (NOT).

3.1.2. Article bank filtering

All the articles found in the database were imported into the EndNote X7 software, a reference manager. Among the several functions provided by EndNote it was possible to eliminate duplicate references within the final sample resulting from the search. Thus, among the 1,076 articles imported into EndNote, 86 of them were duplicate, resulting 990 articles. From these references, the titles were read in order to confirm if they were aligned with the research theme. This new filter resulted in the exclusion of 572 articles, with 418 non-duplicate references remaining in line with the theme.

The next stage of filtering was composed by the analysis of the scientific recognition of the articles. For this, all references were exported to Microsoft Excel and through queries in Google Scholar, the number of citations of each article was computed allowing the references to be sorted in descending order. During this check, 15 full-text articles were not found. Thus, when this stage was completed, there were 403 articles to proceed for the next analysis step. Given the number of citations of each article, it was necessary to establish a cut-off criterion to identify the most relevant ones, for this the Pareto principle was used. During the calculation, the citations of all articles were summed, totalizing 5,679 citations. Thus, articles that individually obtained 17 or more quotations represented 4,507 quotations, that is, 80% of all quotations from the 403 articles selected up to that time. It was concluded, therefore, that references with 17 or more citations represented 80% of citations.

This portion of 80%, consisting of 102 articles, was considered to be part of a reference database called ‘Repository K’, which consist of singular references with aligned and scientific recognition title. The remaining 301 articles were automatically directed to the database named ‘Repository P’, since they did not have enough citations. Because there is a possibility that some articles in Repository P do not have a significant amount of citations, since they are recent publications, an additional search was made for the authors of articles in Repository K that might have had some publication in Repository P. After the search, 21 articles were moved from the Repository P to Repository K. Once the total number of articles with scientific recognition was determined, the abstracts were read to confirm if these references were really aligned with the research topic. From this evaluation 87 articles were excluded because they were not aligned and 36 were selected and defined to compose the bibliographic reference.

3.2. Bibliometric portfolio analysis

With the BP set, ProKnow-C proposes that a bibliometric analysis is carried out to quantitatively show the statistics of the BP [3]. For this, this research considered 6 aspects to be analyzed and interpreted: (i) relevance of the periodicals; (ii) journal impact factor; (iii) scientific recognition of articles; (iv) more prominent authors; (v) most used keywords; e (vi) analysis of the evolution of the theme.

3.2.1. Relevance of journals

The first analysis sought to identify, based on articles in the BP, which journals contained the largest number of publications. Among the 36 portfolio publications, the *Journal of Knowledge Management* stands out, with 5 publications, followed by the *International Journal of Operations & Production Management* with 3 publications.

3.2.2. Scientific recognition of articles

As for the articles that make up the BP, [5-7] were the most cited with 188, 158 and 129 citations each in this same order.

3.2.3. Periodic impact factor

After analyzing which journals were the most important, the impact factor of journals in the scientific community was also analyzed. This indicator reports the average number of citations of articles published in journals over two years. The information on the impact factor of the journals was based on the Journal Citation Report (JCR), with reference to the year of 2015. *Knowledge-Based Systems* and *Resources, Conservation and Recycling* are the journals with the highest JCRs having 3,325 and 3,280 impact factors each in this same order. It should be noted that the journals with the greatest relevance regarding the number of publications in the portfolio are not among the journals with the greatest impact factors. Another relevant observation to be considered is that it was not possible to find the JCRs for 5 journals.

3.2.4. Most prominent authors

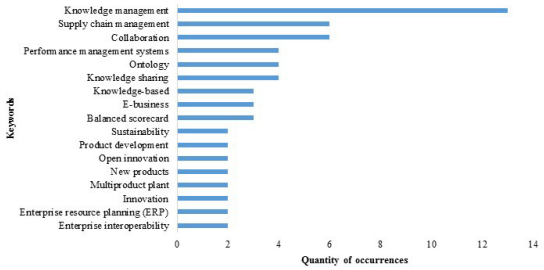
Within the portfolio under study, the authors of greater prominence were determined among the 90 that compose the portfolio of 36 articles. It was observed that more than 76% of the authors contributed with only one publication within the portfolio. Only Maria J. Martin-Bautista and Hsiu-Fen Lin, stand out with two publications.

3.2.5. Most used keywords

Another relevant aspect that evidences the effectiveness of the process of mapping a theme through Proknow-C, is the set of keywords. A total of 118 keywords were used by the authors of the portfolio. Among these, Knowledge Management was highlighted, appearing in 13 articles of the 36 that compose the portfolio. Graph 1 shows the other words that were mostly used.

3.2.6. Analysis of the evolution of the theme

Considering that the portfolio reference searches focused on published studies from 2011 to 2015, it was noted that 2011 as the year with the highest number of publications, with 11 articles published. In 2013 the theme of the present research had only 3 publications. However, it's noted that as of 2013, there is a tendency to increase the number of studies related to the problem of this research.



Graph 1. List of most used keywords

3.3. Systemic portfolio analysis

This stage consists of reading the articles that compose the BP for evaluating each article's representativeness. This analysis evidence the most frequent lines of research and remaining opportunities [3].

For the reading of the articles selected in the BP, it was first necessary to search the full texts of 36 articles. From searches in Google Scholar and in the journal websites, 32 full-text articles were found (4 articles were automatically excluded because full-texts were not available). Thus, there were 32 articles to be read. The process of systemic analysis used in this research used the structure proposed by the authors as a reference. Thus, the complete reading of the articles had the purpose of identifying the following information: (i) objective; (ii) methodology; (iii) main results; (iv) future recommendations; (v) research opportunity identified by the author; and (vi) research opportunities found from the researcher's critical analysis.

From the complete reading of the articles and the tabulation of the information mentioned above, it was possible to identify which problems were most cited by the authors, which proposals were made to solve them and, finally, which were the opportunities that remained for future research.

3.3.1. Research problems identified

Based on the reading of the articles, it was possible to identify the main research problems mentioned by the authors:

- **Poor management of the supply chain:** due to the existing competition between companies, it is increasingly necessary to respond quickly to customer requests ensuring quality, price and continually worrying about production cost reductions, as pointed out by [8]. Srinivasan, Singh and Kumar [9] explain that the supply chain involves a number of activities from different areas (i.e. with different formats and sources of information), but that all of these activities aim at the same goal: maximizing company profitability. For this reason, SCM becomes complex and challenging. In this sense, [6] reinforce that many organizations have failed in this sense due to the lack of capacity to develop performance indicators necessary for the integration of the supply chain to other sectors and consequently the measurement of their performance.
- **Inefficient knowledge management:** knowledge, as an asset of the companies, allows performance to be leveraged from good management practices [10]. For [11], developing and maintaining management knowledge is vital for a company to remain in the market an also these authors believes that knowledge management efforts are no longer merely an option, but rather a real need for organizations to stay competitive. As pointed out by [12], one of the toughest challenges in companies is to guarantee, in an efficient manner, the sharing of knowledge and information. Therefore, it is necessary to create management systems that allow the integration of the information to be shared, in a single platform. Additionally, [13] emphasize that within companies, knowledge is not organized semantically and therefore its meaning depends on the understanding of the specialists involved. In addition, there is high fragmentation and

distribution of knowledge along the production chain. As pointed out by [14], knowledge management requires infrastructure (i.e., technology, culture and structure) and appropriate process architecture.

- **Lack of integration between different domains:** Within organizations it is common for people, departments and partners to be geographically distant. Faced with this situation, it is essential that the information be consulted and shared [15]. Integration of business functions and processes requires seamless integration of information [16]. As reinforced by [17], the availability of integrated information and high quality is a prerequisite for support decision making.
- **Low quality of data available:** Due to the large amount of data available, some management decisions are made without the certainty of the reliability of these data [18]. But the need to make their semantics explicit is one of today's great challenges [15].

3.3.2. Objectives and proposed resources

Given the identified problems, the authors of the article portfolio presented proposals that involved - methods, approaches, frameworks, systems and tools. A synthesis of these objectives and proposals is presented below.

The results found in the approach proposed by [19] justify that some EB applications (e-business - i.e. the internet and web-based technologies) are capable of positively impacting supply chain collaboration. The same conclusion was found by [20], adding only the caveat that a full Balanced Scorecard (BSC) implementation enables the effective use of Business Intelligence (BI) tools. In order to improve the performance of SCM through the successful use of Enterprise Resource Planning (ERP) systems, [21] affirm that it is possible to integrate internal processes, improve and integrate the flow of information within the company, from the effective use of ERP systems. A survey made by [8] concluded that engagement in Collaborative Knowledge Management Practices (CKMP) can lead to better integration between supply chain partners.

As for the quality of the data available, [18] propose a method of statistical process control capable of monitoring and controlling data quality in the supply chain. On the other hand, [22] introduce a performance management analysis with the extensive use of data and analytical methods to effectively control key performance drivers and to significantly increase company results.

In [17], the authors present the use of an ontology capable of representing several problems of programming, reaching the integration of different areas and supporting the decision-making process. Similarly, [23] develop a method called SMOL (Semantic Methodology for Ontology Learning) that allows the integration of knowledge. Srinivasan, Singh and Kumar [9] propose a conceptual framework capable of establishing synergy between the areas, allowing simpler and faster decision making, since it gives more autonomy, mobility and collaboration between the areas. Still within the context of integration of different areas, [16] present experimental results, based on simulations of the MICSS-LAN system, which indicate an increase in profit and organizational performance thanks to the sharing of information and knowledge.

Based on the KIPS, [24] demonstrate how knowledge can be quantitatively analyzed within the context of product development. Facing the challenge of sharing and reusing knowledge within organizations, a system is proposed by [13], based on the PFMEA (Potential Failure Modes and Effects Analysis) method and the use of an ontology. Faced with this same challenge, [15] develops a framework based on the Zachman framework, able to track and share information throughout the life cycle phases of a product. Another solution with the same purpose is developed by [25], in which the proposed method aims to share the results of the Web @ IDSS (Web Integration Decision Support System) in AIF format (Argument Interchange Format), in order to present a solution for the integration of information and knowledge throughout a given company for smart decision-making. With the intention of highlighting the relevance of this problem, both [10] find that knowledge management contributes positively to the strategic orientation and performance of companies.

3.3.3. Identification of existing opportunities

After identifying the main problems related to the research theme and the solutions proposed by the authors, it is possible to indicate some research opportunities, as listed below:

- **Supply chain performance assessment:** despite the large number of research works on supply chain metrics, only a few are focused on the development of integrated tools and structures, as pointed out by [26]. And yet, what exists today is not something aligned with the company's strategy, customer-focused and holistic vision. Some authors suggest lines of research that may contribute to the development of indicators capable of monitoring supply chain, e.g. for [19] the selection of EB (e-business) tools / applications and [8] CKMP (Collaborative Knowledge Management Practices).
- **Integration of different domains:** Ouertani, Baina, Gzara e Morel [15] highlight the need for integration between design and manufacturing perspectives in order to test the traceability tool proposed in the study. The impact of interaction and integration of different areas on organizational performance is something that can contribute to supply chain related research [19].
- **Data Interoperability:** it is of the utmost importance that there are integrated applications within organizations so that data can be processed and transmitted both internally and externally [19]. Given the quality tools currently available, there is no tool capable of controlling data quality, and there is no framework to induce continuous improvement in the data production process [18]. With regard to this subject, few researches were found in the portfolio of articles analyzed.

4. Conclusion

This article presents a review of the literature with the main objective of identifying the state of art regarding the correlation of performance indicators in organizations. The selection of the portfolio was completed from the search for references in databases using the the method called ProKnow-C.

Of the 1,076 articles surveyed, only 36 were considered significant to form the bibliographic portfolio of this research. The performance of the bibliometric analysis allowed some characteristics of these 36 articles to be mapped, such as: (i) relevance of the periodicals; (ii) periodic impact factor; (iii) scientific recognition of articles; (iv) more prominent authors; (v) most commonly used keywords; and (vi) analysis of the evolution of the theme. Among the relevant journals are the *Journal of Knowledge Management* and the *International Journal of Operations & Production Management*. Regarding the impact factor, these journals were not the most outstanding, since they presented JCR equal to 1.689 and 2.252 respectively, while the best-evaluated (*Knowledge Based Systems*) obtained JCR of 3.325. Of the articles that compose the BP, [5-7] were the ones that presented the greatest quantity of citations. In a similar way, it can be seen that the authors Maria J. Martin-Bautista and Hsiu-Fen Lin were the only ones who had more than one publication in BP. It was also observed that *Knowledge management* was considered as a keyword in 13 articles of BP, thus representing an alignment between the material that makes up the BP and the theme of this research. Finally, we also analyzed the behavior of the theme over the last few years, allowing us to conclude that despite the drop in 2013, research related to this subject has shown a tendency to increase in the number of publications.

The systemic analysis allowed the content of the BP references to be analysed in detail. The 32 articles were read in full and characteristics such as the main problems pointed out, ways of solving them and research opportunities were identified and described. Regarding the problem pointed out by the authors in BP, it was identified as more recurrent: (i) lack of supply chain management; (ii) inefficiency in knowledge management; (iii) lack of integration among different domains; (iv) poor quality of the available data. The proposed solutions to solve such problems converged to methods, approaches, frameworks, systems and tools. From the mapping of the main problems and the solutions found, it was possible to identify the opportunities for new studies on the subject. These are: (i) evaluation of the performance of the supply chain; (ii) integration of different domains; (iii) data interoperability. Thus, the hypothesis mentioned at the beginning of this article has materialized since there is a research opportunity related to the alignment of KPIS.

For all of this, it is possible to affirm that the ProKnow-C methodological procedure was of great importance and usefulness for the accomplishment of this research. It ensures that the BP really represents references aligned with the theme and allows the author to evaluate the content that composes this portfolio quantitatively. But it is necessary to point out that this method requires a lot of time and dedication on the researcher's end, since reading, interpretation and data tabulation activities are essential for carrying out this type of research. As a recommendation for future work it is suggested that the filtering stage of the article database be repeated, due to the fact that in the

bibliometric analysis only 2 authors with more than one article published within the BP were identified.

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