

■ Research Article

Research Opportunities in Business Process Management and Performance Measurement from a Constructivist View

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This research paper aims to discover research opportunities in business process management and performance measurement from a constructivist view. The nature of this research is exploratory and descriptive, and the research method was performed in a qualitative way. The process narrowed down 2142 articles, gathered from a search of scientific databases, and identified 16 articles that were relevant to the research and highly cited. The analysis found that most of the articles follow the realistic approach, and there is a need to analyse the decision-making process in an individual manner. The measurement criteria are identified by searching the scientific literature, in most cases using an ordinal scale without any integration process to present the results to the decision-maker. Regarding the management aspects, most of the articles do not follow a structured process to measure the current situation and generate improvement opportunities. Copyright © 2015 John Wiley & Sons, Ltd.

INTRODUCTION

Business process management (BPM) allows a company to organize its resources and capabilities in a way that contributes systematically and continuously to the determined goals of its managers (Benner and Veloso, 2008; Lee and Ahn, 2008), besides being a determinant factor of the capacity of an organization to adapt and respond to the threats and emergent opportunities (Bititci *et al.*, 2011).

The success of BPM implementation demands the involvement of its partners to discuss, redraw and implement the new processes, eliminating and reducing the activities that add little value and rework. It is an initiative that requires, besides the involvement of the senior management, a strong alignment with the strategic goals of the company (Dangayach and Deshmukh, 2001; Rosemann and de Bruin, 2005; Trkman, 2010).

This need to align the execution of the company's processes with its corporate strategy is a consequence of the managers' need to understand the company's business processes to manage them correctly (Tan *et al.*, 2007, 2008).

In this way, it is necessary that, together with the process management, the company can rely on some elements aiding the decision that expand the decision-makers' understanding of how the processes contribute to the achievement of its strategic goals: in other words, the final results targeted by its managers. This knowledge-building activity is known as business measurement from a constructivist view (Bana e Costa *et al.*, 1999; De Moraes *et al.*, 2010; Lacerda *et al.*, 2011, 2014b; da Rosa *et al.*, 2012; Ensslin *et al.*, 2013).

That delimitation of the research subject refers to the need to analyse the topic from the perspective of its measurement, generating a second focus research, the focus of performance measurement, in which the particularities of each organization must be known and considered.

In this research paper, the literature review on BPM will be performed according to the following definition of performance measurement:

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Performance measurement is the process of building knowledge in the decision-maker regarding the specific context in which he or she proposes to evaluate, from the perception of the decision-maker, through activities that identify, organize, measure ordinally and cardinally, integrate and allow the researcher to visualize the impact of his/her actions and their management. (Lacerda et al., 2014a)

From the selection and analysis of the bibliographic portfolio of this research, research opportunities related to the performance measurement in BPM implementations were identified.

To answer these research questions, this paper aims to build the knowledge necessary for guiding researchers to the opportunities that exist in the literature on the subject that they want to investigate and afterwards to continue this research with a systemic analysis to identify the opportunities (gaps) in the topic of their interest.

To achieve these objectives, this study adopted the process Knowledge Development Process-Constructivist (ProKnow-C) (Tasca et al., 2010; da Rosa et al., 2012; de Azevedo et al., 2012; Lacerda et al., 2014a), which is a structured process to guide researchers in selecting the most relevant articles from the academic standpoint within the context of the area of research that they intend to study, building a theoretical framework that allows them to justify their choices by means of qualified literature (Tasca et al., 2010).

The observable parameters are the selected articles, their references and the number of citations, authors and journals (Tasca et al., 2010).

From a scientific standpoint, this work aims to understand how the subject has been studied in the academic field, providing other researchers with a knowledge base concerning the most prominent articles, authors and journals on the subject, because, regardless of the scientific method adopted, the search for a theoretical framework in the literature is critical to the achievement of results (Bertrand and Fransoo, 2002; Forza, 2002; Voss et al., 2002). A point that should be emphasized in this research and that distinguishes ProKnow-C from other processes is its purpose. ProKnow-C's focus is on developing researchers' knowledge in a constructivist and singular way, to provide researchers with the elements to establish their 'research question' and 'objectives' for their scientific work on a factual basis. The process is constructivist because it requires researchers to interact with the data, gain different understandings of the subject and continuously choose the articles containing the subject that is most aligned with their desire. In so doing, they expand and consolidate their knowledge about the subject that they would like to investigate. As a result of that process, the final portfolio of the most relevant articles is completely individual, not only because of the particular focus on the

subject given by the researcher but also because of the delimitations placed on it. Thus, it should be emphasized that the final findings can be used solely by the researcher who generated them; the process, however, can be used by all researchers to find a 'research question' and 'objectives' with a factual basis for their scientific work. These are the practical and theoretical values of this research.

In the next section, the theoretical framing is exposed. Next, the methodological framing is presented. To achieve the objectives of this study, an intervention instrument is employed to execute a systemic analysis. Finally, the article presents the implications of the systemic analysis and the conclusions of this work as well as the opportunities for further research in the last two sections.

THEORETICAL FRAMING

Business process management is a process to create and maintain a competitive advantage in contemporary organizations. However, BPM has been conceptualized in various ways, as have the aims and methodologies associated with this practice (Antonucci and Goeke, 2011).

This denotes a field of knowledge undergoing development in terms of scientific research and the understanding of how managers can take advantage of this approach to achieve their strategic objectives (Hernaus et al., 2012).

In this developing field, this research presents opportunities for research regarding the contribution of the field of knowledge of performance measurement for BPM practices.

Performance management is a fundamental part of BPM, particularly translating strategy into operational results, organizational diagnosis and the creation of plans of actions, monitoring, providing feedback, communicating and motivating people through performance-based rewards (Armistead et al., 1999; Hernaus et al., 2012; Ensslin et al., 2013). To summarize these purposes, performance measurement is considered as an important management tool, because it provides information for decision-making. However, the literature does not adequately address performance measurement to aid decisions in BPM contexts (Hernaus et al., 2012). In addition, some authors cite inadequate measurement to be the key contributing factor to the misgivings regarding BPM (Choong, 2013).

The field of knowledge of performance evaluation, as well as BPM, has several purposes and approaches to building performance indicators. Roy (1993) categorizes three ways to deal with decision-making problems: (i) the path of realism; (ii) the axiomatic (prescriptive) path; and (iii) the method of constructivism.

These approaches and their work assumptions are world views that act as filters in the eyes of

researchers and consultants, enabling them to see specific things and ignore others in the context in which they are operating (Melão and Pidd, 2000; Ensslin *et al.*, 2012). According to Melão and Pidd (2000), the world view is a perspective on how to understand process management.

The realism approach relies on the existence of (previously performed) universal mathematical or economic models to explain which processes should be managed, assuming that the decision-maker is a rational human being and trusts the model to represent the reality (Roy, 1993; Tsoukias, 2008; Lacerda *et al.*, 2014b).

In contrast, the axiomatic and constructivist approaches draw on managers' perceptions of the decision problem to build the fundamental points of view required to take their individual context into account. The axiomatic method aims to generate knowledge for facilitators to understand the situation and prescribe solutions. The constructivist approach aims to generate knowledge for decision-makers, so that they can understand the consequences for the strategic objectives caused by their decisions (Roy, 1993; Tsoukias, 2008; Lacerda *et al.*, 2014b). Some authors cite the importance of the need to expand decision-makers' understanding of the process management context (Lindsay *et al.*, 2003; Sirmon *et al.*, 2007; Peng *et al.*, 2008).

Accordingly, this research is affiliated with the constructivist approach, in which the definition of performance measurement is conceptualized by Lacerda *et al.* (2014b) as a process to construct knowledge for a manager within a specific context with the purpose of evaluation according to his or her own perception. This knowledge is built through the accomplishment of activities that identify, organize, measure and integrate the relevant aspects that will be evaluated and make evident the current performance in the context and the possible impact of the actions supporting the management activity (Lacerda *et al.*, 2014a, 2014b).

From this definition emerge the variables of analysis used to identify opportunities for research studies involving BPM with performance measurement as the evaluation approach. In addition to the approaches to performance measurement, another relevant variable used to identify research opportunities is the use of the uniqueness of the context.

What a company can do and where it can go are limited by its resources and the paths that its managers have chosen throughout its history (Teece *et al.*, 1997; de Azevedo *et al.*, 2012). However, these constraints are specific to each decision context and are dependent on the following: (i) the decision-makers in question; (ii) the resources owned by them; and (iii) the knowledge present at the moment of the decision.

Besides the lack of a theoretical explanation in the literature to justify the generalization of models that are successful in some contexts to other contexts, researchers report that if a set of practices is also

adopted for a particular competitive segment, these 'best practices' may not provide the adopting companies with lasting results or universal benefits (Skinner, 1986; Benner and Veloso, 2008; Trkman, 2010).

This finding highlights the important role of the uniqueness of the resources and business processes of a firm to generate a sustainable competitive advantage (Barney, 1991). The manager's role in this context of process management is to design processes in a unique and personalized way (Hung, 2006; Sirmon *et al.*, 2007; Benner and Veloso, 2008; Trkman, 2010; Antonucci and Goeke, 2011; Hernaus *et al.*, 2012; Minonne and Turner, 2012).

This process of constructing knowledge about the context culminates in a set of criteria and performance indicators deemed to be necessary and sufficient for managers to explain their strategic objectives (Lacerda *et al.*, 2011). Thus, a system of performance measurement becomes crucial for the generation of a sustainable competitive advantage through process management (Trkman, 2010).

Measure selection and development are important to ensure a reliable analysis of the predicted process performance (Lee and Ahn, 2008) and the suitable deployment of strategic intentions (Minonne and Turner, 2012), but Elzinga *et al.* (1995) reported that these are difficult, especially if the value of the process is derived from intangibles. In sum, suitable measures are critical to BPM success (Minonne and Turner, 2012), and the ways to choose them are explored in this paper with the variables 'identifying the evaluation criteria' and 'measurement'.

Regarding its essence, BPM is focused on the continuous measurement and improvement of operational processes in a holistic and end-to-end way (Ravesteyn and Batenburg, 2010; Antonucci and Goeke, 2011). However, when analysed from the perspective of more operational activities, management models tend to focus on efficiency (exploitation) by the recombination of existing knowledge and capabilities. In this approach, the organizational activity validates the existing knowledge but provides no new information to allow the creation of knowledge (Peng *et al.*, 2008).

When analysed on the basis of their purposes, processes can act as an instrument to explain how the resources of an organization can be used to achieve a sustainable competitive advantage (exploration) (Adler *et al.*, 2009). One possible way to manage this problem is to adopt a process of integration of the criteria to be taken into account during process improvement.

Despite the use of performance indicators for process improvements for most of the business community, most organizations are still working with ordinal indicators with no form of integration between the criteria to enable a decision on the improvement of organizational processes (Vergidis *et al.*, 2008; Marafon *et al.*, in press), respecting the notion of strategic trade-offs and assuming that the

company cannot achieve everything (Armistead *et al.*, 1999).

This integration allows managers to create and sort the actions undertaken in process management (Armistead and Machin, 1997) to ensure the alignment of the processes (Hung, 2006; Choong, 2013) with the performance indicators and the strategy established. This is the sixth variable in this paper: management.

METHODOLOGICAL FRAMING

The choice of the methodology to be used for scientific research must be related to the object of study (Morgan and Smircich, 1980; Triviños, 1987). Misalignment between the methodology and the problem to be researched is referred to as indiscipline (Triviños, 1987) and may lead researchers to mix the authors, citations and methodologies of currents of thought and thus impair their understanding of the foundations of scientific knowledge and the problem focus of the study.

Thus, this section aims to describe the methodological framing used in this research from the planning stage to the final results, as shown in Table 1.

Finally, the intervention instrument adopted is ProKnow-C (Tasca *et al.*, 2010; Lacerda *et al.*, 2014a), which has the capacity to promote actors' knowledge concerning the context that they intend to improve according to the researchers' boundaries.

INTERVENTION INSTRUMENT— KNOWLEDGE DEVELOPMENT PROCESS- CONSTRUCTIVIST

The intervention instrument adopted by this study, ProKnow-C (Tasca *et al.*, 2010; Bortoluzzi *et al.*, 2011),

was developed by the Multicriteria Decision Aid Methodology Laboratory (LabMCDA) in the Department of Production Engineering and Systems at the Federal University of Santa Catarina.

This process has been developed by the LabMCDA since 2005, when, motivated by the need to build a tool to identify articles aligned with the theme of performance measurement to aid decision contexts, process formalization began with a controlled search amplitude and a structured selection process defined based on the researchers' understanding of the topic.

In 2008, the first publications around the theme appeared, and adjustments were made in response to the editors' suggestions and criticism, allowing the first international publication of the so-called ProKnow-C process in 2010.

Some improvements, to optimize the operational aspects questioned by the scientific society, have been incorporated in a systematic way by the LabMCDA researchers, leading to the 11th version of the process (Tasca *et al.*, 2010; da Rosa *et al.*, 2012; de Azevedo *et al.*, 2012) being recognized as a tool to help establish the state of the art of a subject, according to the boundaries, perceptions of the theme and motivations of the researchers.

Among the macro steps of the ProKnow-C process, only two will be applied in this work: the systemic analysis and the discovery of research opportunities in the field.

Theoretical framework selection

The selection of the theoretical framework starts with the identification of the keywords related to the research topic and the previous selection of the scientific databases. As a limitation of this study, the choice of databases is restricted to those

Table 1 Methodological framework

Item	Framing	Description
Objective nature	Exploratory	Aims to build knowledge in the researcher through the selection and analysis of scientific articles (Vieira, 2002)
	Descriptive	Describes specific characteristics of the theoretical framework selected from a critical analysis of what has been published on the research theme (Gil, 1999)
Article nature	Theoretical	Selects a portfolio of articles based on the analysis of the research theme and application of a structured process of literature review (Ferreira and Yoshida, 2004)
Research logic	Inductive	Aims to generate knowledge previously nonexistent on a particular research topic by identifying the articles more aligned, according to the researcher, and, after analysis, the research opportunities identified
Research process Problem Approach	Primary data	Considers boundaries imposed by the researcher
	Secondary data	Uses information gathered from scientific publications
	Qualitative	By selecting the theoretical framework according to the researcher's values and preferences (Richardson and de Sousa Peres, 1999)
Research result	Applied	Due to the immediate use of the knowledge generated (Lakatos and Marconi, 2006)
Technical procedures	Bibliographical research	Research prepared on the basis of material already published in scientific journals (Gil, 1999)
	Research action	Researcher interacts throughout the process with the object of research (Gil, 1999)

available through Coordination for the Improvement of Higher Education Personnel of Brazil–CAPES (CAPES, 2011).

To drive the search for the keywords (PC) used to identify the subject being researched, two axes were established for this research: ‘business process management’ and ‘performance measurement’. The keywords defined for the first axis were ‘business process’ and ‘process management’. For the second axis, the keywords selected were ‘measurement’, ‘appraisal’, ‘evaluation’ and ‘assessment’.

The criteria used by the researchers to perform the database selection, during April 2012, were as follows: (i) being included in the CAPES portal (CAPES, 2011); (ii) belonging to one of three major areas of CAPES (applied social sciences, engineering and multidisciplinary); and (iii) using search engines with Boolean expressions that allow simultaneous searching for the keywords of each axis using the filters ‘title’, ‘summary’ and ‘keyword’. Thus, the databases chosen were EBSCO, Engineering Village, IEEE, ISI–Web of Science, Science Direct and Scopus. These databases were used because of the following: (i) when accessed with the keywords, they provide more than 85% of the articles; and (ii) other databases, if they contain relevant articles on the subject, appear in the references of the selected portfolio and will be incorporated into it.

The article selection was performed using a string search defined by taking the predefined keywords from the first and second axes and making combinations using filters to select only English articles published in the last 10 years, as shown in

Table 2 Example of string search used in databases

String search
(TITLE-ABS-KEY("Measurement") AND TITLE-ABS-KEY("Process Management")) AND DOCTYPE(ar) AND PUBYEAR AFT 2002
(TITLE-ABS-KEY("Assessment") AND TITLE-ABS-KEY("Process Management")) AND DOCTYPE(ar) AND PUBYEAR AFT 2002
(TITLE-ABS-KEY("Evaluation") AND TITLE-ABS-KEY("Process Management")) AND DOCTYPE(ar) AND PUBYEAR AFT 2002
(TITLE-ABS-KEY("Appraisal") AND TITLE-ABS-KEY("Process Management")) AND DOCTYPE(ar) AND PUBYEAR AFT 2002
(TITLE-ABS-KEY("Measurement") AND TITLE-ABS-KEY("Business Process")) AND DOCTYPE(ar) AND PUBYEAR AFT 2002
(TITLE-ABS-KEY("Assessment") AND TITLE-ABS-KEY("Business Process")) AND DOCTYPE(ar) AND PUBYEAR AFT 2002
(TITLE-ABS-KEY("Evaluation") AND TITLE-ABS-KEY("Business Process")) AND DOCTYPE(ar) AND PUBYEAR AFT 2002
(TITLE-ABS-KEY("Appraisal") AND TITLE-ABS-KEY("Business Process")) AND DOCTYPE(ar) AND PUBYEAR AFT 2002

Table 2. The search string was adapted to each database.

The selection of the theoretical framework is a singular process, restricted to the researchers’ limitations and boundaries, according to the theme that they want to study. The limitations of this process are as follows: (i) the keyword selection and search string definition made by the researchers; (ii) the identification of the number of citations per article through Google Scholar; and (iii) the analysis of the article’s title, summary and full text, according to the researchers’ preferences.

A summary of the process and the quantity of articles found after each step are represented in Figure 1.

The framework selection started with 2142 articles, and as result of the article-filtering steps, 16 articles were identified to compose the theoretical framework of this study (Sarkis and Talluri, 2002; Chan and Qi, 2003; Attaran, 2004; Kumar and Harms, 2004; Adesola and Baines, 2005; Balasubramanian and Gupta, 2005; Jaklic *et al.*, 2006; Jallow *et al.*, 2007; Tan *et al.*, 2007; Lu *et al.*, 2008; Škrinjar *et al.*, 2008; McCormack *et al.*, 2009; Aghdasi *et al.*, 2010; Cho and Lee, 2011; Jochem *et al.*, 2011; Rohloff, 2011). This portfolio as a whole represents the publications that contain the boundaries of the theme that the researchers want to investigate and the scientific knowledge available to handle it. Thus, it will be used to identify the opportunities to investigate and formulate the ‘research question’.

Systemic analysis

The scientific process followed to analyse representative articles from a sample regarding a specific research topic aimed to show, through its lenses, the highlights and opportunities (needs) of knowledge found in the articles of this sample (Chaves *et al.*, 2013).

• Articles found after use of keywords in selected databases	2142
• Duplicate publications were removed	944
• Alignment by article's title	156
• Most cited articles aligned with the researcher delimitations	17
• Newer articles (<2years) and aligned with researcher delimitations	04
• Articles (>2anos) written by wellcited authors and aligned with Researcher delimitations	01
• Articles with no full text access in the databases were removed	02
• Articles with full text alignment were identified	14
• Articles from references well cited and aligned with researcher delimitation	02
• Final theoretical framework	16

Figure 1 Main steps for theoretical framework selection

To accomplish this analysis, the research lenses shown in Table 3 are considered.

This research is restricted to the purpose of building the knowledge necessary for guiding researchers to the identification of opportunities in the existing literature regarding the subject that they want to investigate—presented in this paper as BPM from the standpoint of its results—to allow them to establish a ‘research question’ and ‘objectives’ with a factual basis for their scientific work. The process is constructivist and particular to the researchers’ interest and world view.

Considerations about Aspect 1: approaching

Through this lens, it is observed how the articles from the bibliographic portfolio address the matter of performance measurement and how they guide its application.

The topic can be approached in four different ways, according to the decision-maker’s participation and the structuring of the assessment criteria of the evaluated performance: (i) normativist; (ii) descriptivist; (iii) prescriptivist; and (iv) constructivist (Roy, 1993).

Normativist approaches search for great solutions to the patterns, selecting pre-existent theoretical models. Descriptivists seek to understand the successful decisions from the past, replicating the patterns of behaviour to other environments. These approaches are known as realist, and the participation of the decision-maker in both is absent or very little (Roy, 1993).

The prescriptivist and constructivist approaches incorporate the values and preferences of the decision-maker into the model, differently from the realistic approaches. In the prescriptivist approaches, the facilitator searches for coherence between the decision-maker’s speech and the proposed pattern, having as a focus the knowledge generation of the facilitator about the known environment. In the constructivist approaches, the incoherence between the speech and the pattern

provides opportunities for the knowledge production of the decision-maker (Roy, 1993).

In the selected portfolio, the major part of the articles (Sarkis and Talluri, 2002; Chan and Qi, 2003; Attaran, 2004; Adesola and Baines, 2005; Balasubramanian and Gupta, 2005; Jaklic *et al.*, 2006; Jallow *et al.*, 2007; Tan *et al.*, 2007; Lu *et al.*, 2008; Cho and Lee, 2011; Jochem *et al.*, 2011) follows the normativist approach. Four articles (Škrinjar *et al.*, 2008; McCormack *et al.*, 2009; Aghdasi *et al.*, 2010; Rohloff, 2011) use the descriptivist approach, and only one (Kumar and Harms, 2004) adopts the prescriptivist approach.

Regarding the application of the model, it is possible to divide the articles into two big groups: those in which the application is generic, in other words, the model can be administered in any environment, with contexts and distinct social entities, and those with individual application, in which the model is built to be administered in a specific environment.

Of the articles chosen, 14 (Sarkis and Talluri, 2002; Chan and Qi, 2003; Attaran, 2004; Adesola and Baines, 2005; Balasubramanian and Gupta, 2005; Jallow *et al.*, 2007; Tan *et al.*, 2007; Lu *et al.*, 2008; Škrinjar *et al.*, 2008; McCormack *et al.*, 2009; Aghdasi *et al.*, 2010; Cho and Lee, 2011; Jochem *et al.*, 2011; Rohloff, 2011) defend the use of their model by other companies and environments, characterizing the generic application. Only two articles (Kumar and Harms, 2004; Jaklic *et al.*, 2006) take into account the uniqueness of the context, drawing the model and carrying out its application in a specific environment.

In this way, an opportunity is detected in building a constructive model that takes into account the values and preferences of a certain decision-maker and that is applied to the known environment to support his or her strategic decisions.

Considerations about Aspect 2: individuality

Through this lens, it is possible to detect how the selected articles about the performance measurement

Table 3 Aspects for systemic analysis

Aspects for analysis	Description
1—Approaching	1.1—Does it harmonize the building model (approaching and data) with its application?
2—Singularity	2.1—Does it recognize that the problem is unique (actors, context and moment)?
3—Identifying the evaluation criteria	3.1—How does the identifying process of the goals from the article deal with the limits of the manager’s knowledge? 3.2—How do the values and preferences of the manager interfere on the identification of the objectives?
4—Measurement	4.1—Do the scales (descriptives, nominals, ordinals and cardinals) used assist the measurement theory?
5—Scale integration	5.1—When talking about the determination of the integration constants, how are they presented to the decision-maker?
6—Management	6.1—Does it allow diagnosis (get to know the strong and weak points) of the present situation? 6.2—Does it provide the process with generating improvement actions?

in initiatives about BPM approach unique aspects of the decision context and its actors; in other words, the model is developed and applied to only one organization, and it makes explicit the actors of the context, mainly the decision-maker, for whom the model is intended.

In the chosen portfolio, two articles (Kumar and Harms, 2004; Jaklic *et al.*, 2006) carry out a case study in which the suggested solution takes into consideration the companies' peculiarities. Kumar and Harms (2004) present the advantages of process mapping to eliminate activities that do not add any value, focusing on a specific problem of the company involved. Jaklic *et al.* (2006) associate the performance of the processes of a supply chain with its maturity. Although the concepts of business process integration among the companies participating in the Supply Chain Management (SCM) chain are generic, the application of the case study is specific.

The majority of the articles in the portfolio for this research (Sarkis and Talluri, 2002; Chan and Qi, 2003; Attaran, 2004; Adesola and Baines, 2005; Balasubramanian and Gupta, 2005; Jallow *et al.*, 2007; Tan *et al.*, 2007; Lu *et al.*, 2008; Škrinjar *et al.*, 2008; McCormack *et al.*, 2009; Aghdasi *et al.*, 2010; Cho and Lee, 2011; Jochem *et al.*, 2011; Rohloff, 2011) develop models that can be applied in several environments; as such, they do not recognize the paradigm of the individuality of the context. Those articles establish generic criteria for the performance measurement from the pre-existent models, scientific literature reviews or benchmarking with other companies.

However, even though they do not recognize the individuality of the context and the actors, some authors (Sarkis and Talluri, 2002; Tan *et al.*, 2007) recognize in their task the importance of the participation of the companies' managers, taking into account their values and preferences when validating their models or attributing importance to the alternatives. Three studies (Balasubramanian and Gupta, 2005; Cho and Lee, 2011; Rohloff, 2011) recognize that the implementation of the criteria should be specific, according to the strategic goals of the company, even though they are not conducted in this way. Likewise, however, the authors of the present research believe that the decisive process should take into account the perception of the decision-maker and recognize that the criteria of performance measurement should be specific to the decision-maker within his or her context.

It is concluded that the performance measurement models of this portfolio worry about building generic references, which are intended for a large number of companies that want to improve the performance of their initiatives in process management. The approach from generic references does not allow the building of evaluation models for restricted contexts in a specific management scenario, because it assumes little or no participation of managers

who need to control their environments and who will use the performance measurement model.

With that, the opportunity emerges to build a model from the perception of the decision-maker with his or her worries, values and preferences, which can be used as a customized unique instrument for aiding decisions in a constructivist approach, focused exclusively on the decision-maker.

Considerations about Aspect 3: identification of the assessment criteria

The articles from the bibliographic portfolio, when evaluated regarding the way in which they identify the necessary criteria to carry out the performance measurement, can be classified into five groups: articles that use benchmarking with other projects and organizations, literary reviews, consulting specialists, questionnaires answered by managers and articles that do not detail how they identify the criteria used.

Among the chosen articles, five (Chan and Qi, 2003; Attaran, 2004; Kumar and Harms, 2004; Tan *et al.*, 2007; Lu *et al.*, 2008) do not specify how they identify the criteria used.

Among the ways to identify measurement criteria, searching the available scientific literature stands out as the most frequently mentioned activity (Sarkis and Talluri, 2002; Adesola and Baines, 2005; Balasubramanian and Gupta, 2005; Jallow *et al.*, 2007; Škrinjar *et al.*, 2008; Jochem *et al.*, 2011). Of these, one article frames the measurement criteria identified in five levels of maturity proposed by the classical Capability Maturity Model (CMM)/Capability Maturity Model Integration (CMMI) model (Jochem *et al.*, 2011) to detect the maturity level of the company evaluated. Škrinjar (2008) distinguishes the evaluation criteria to evaluate business process orientation from the literature and uses the four perspectives from the balanced scorecard (BSC) method to detect the organizational performance criteria. Cho and Lee's (2011) article also employs the four BSC perspectives to identify the criteria for performance measurement.

Jaklic *et al.* (2006) identify the evaluation criteria based on the characteristics of the business concerned. Reducing costs in the inventory and in oil transportation is the main criteria to be improved with the process integration of the companies' SCM. The improvements arising from the business process integration are evaluated, taking into account the levels of maturity of the processes following CMM patterns.

Another way to detect evaluation criteria is to look for critical success factors in organizations and projects that implement BPM, referred to in this research as benchmarking (Aghdasi *et al.*, 2010). The criteria are selected through the study and analysis of past projects' characteristics and their contribution to the success of the implementation. Another group of authors who use information from companies is McCormack *et al.* (2009), who collect data

using a questionnaire carried out with managers and define their maturity model on four different levels based on the CMM/CMMI concepts.

Concluding the sample, it is possible to observe an article that uses information from interviews with specialists and consultants (Rohloff, 2011). This article is based on the CMM/CMMI maturity model to evaluate each of the nine criteria identified as relevant to the success of a BPM implementation. The author affirms that an organization should aim for a specific maturity level, according to its organizational strategy, to address improvement actions. The authors of this research understand that the organizational strategy is driven by people who have the power to decide, in this way expressing their values and preferences. Thus, a model to aid decisions must identify the fundamental criteria, based on the values and preferences of the decision-maker, to manage the context (Ensslin *et al.*, 2013).

Analysing the articles in relation to the involvement of the decision-makers in the identification of the norms for the performance measurement, four articles (Sarkis and Talluri, 2002; Kumar and Harms, 2004; Tan *et al.*, 2007; Cho and Lee, 2011) seek to legitimize the norms with the decision-maker; however, they do not present the process that intends to expand their understanding of the context. Thus, this legitimation does not guarantee that the values and preferences of the decision-maker are incorporated into the model, making it possible to induce monitoring of the environment and decision-making, taking into account the norms that they did not come to know.

A premise of this research is that managers need a process to expand their knowledge about the environment and the consequences of their decisions. The uncertainty related to the values of the decision-makers and their judgement about the performance measurement, when a determined situation is lacking, offers the decision-makers the necessary knowledge to describe the behaviour of their environment. A lack of involvement with the values and preferences of the decision-maker results, according to Roy (1993), in inaccurate reference to the management reality, the difference between the decision-makers' expectations and the model that they receive constituting a disappointment.

In this way, the opportunity emerges to build an decision aiding model that tries to identify clarify and legitimize the norms to manage the determined context in accordance with the values and preferences of a specific decision-maker.

Considerations about Aspect 4: measurement

The analysis process of measurement methods tries to identify how scales are built and used by the chosen portfolio articles. It is observed that most of the articles use ordinal scales in the process of measurement (Sarkis and Talluri, 2002; Kumar and Harms, 2004;

Balasubramanian and Gupta, 2005; Jallow *et al.*, 2007; Škrinjar *et al.*, 2008; McCormack *et al.*, 2009; Aghdasi *et al.*, 2010; Cho and Lee, 2011; Jochem *et al.*, 2011; Rohloff, 2011). On an ordinal scale, the levels are arranged hierarchically, indicating the order of attractiveness of the levels for a measured objective. The statistics produced by this scale are mode, frequency, counting and medium.

Among the articles that use an ordinal scale, four present a process to convert it into a cardinal one (Sarkis and Talluri, 2002; Škrinjar *et al.*, 2008; Aghdasi *et al.*, 2010; Cho and Lee, 2011). This conversion tries to clarify the differences in attractiveness among the performance levels from the same indicator. Two articles (Sarkis and Talluri, 2002; Cho and Lee, 2011) use the Analytic Hierarchy Process (AHP) process to carry out such ordinal-scale and cardinal-scale transformations, while Aghdasi *et al.*, (2010) and Škrinjar *et al.*, (2008) employ the statistic value and mathematical formulations.

Among the other articles containing ordinal scales, four use them to measure the level of maturity of the companies in relation to the management processes (Jaklic *et al.*, 2006; McCormack *et al.*, 2009; Jochem *et al.*, 2011; Rohloff, 2011), based on the CMM/CMMI models. In that case, to reach the determined level of maturity, all the norms of each maturity level should have been evaluated positively, bearing in mind that the scales used have only two measurement points, positive and negative.

Five authors do not tackle the topic (Chan and Qi, 2003; Attaran, 2004; Adesola and Baines, 2005; Tan *et al.*, 2007; Lu *et al.*, 2008).

An objective of the measurement process is to provide valid and viable information about the performance of a context. Accordingly, the indicators built must be capable of measuring all the possible consequences of what will be measured related with the measurement theory to provide scientific support, for example,

- (i) Measurability—this means measuring exactly what the decision-maker wants to improve in the determined aspect.
- (ii) Intelligibility (or lack of ambiguity)—the indicator must contain enough information to allow all the actors involved to obtain the same measurement and interpretation.
- (iii) Workability—it must be physically possible to implement the scale.
- (iv) Homogeneity—homogeneity assures that, when carrying out a measurement, all the levels are measured, the same properties being represented by the performance indicator.
- (v) It allows the differentiation of the best and worst performance: the scale must inform the decision-makers what must be performed to improve the performance on each level.
- (vi) Property of the ordinal scales: ordinal scales establish only an order according to the values

and preferences of the decision-maker. In this way, only the countable mathematical, frequency, mode and median operations are allowed.

It can be seen that the opportunity to build ordinal scales, respecting the measurement theory, allows the aspects considered relevant by the decision-maker to be measured in a precise way, to provide the necessary information to visualize the environment performance. Besides, there must be a process that transforms ordinal scales into cardinal ones to clarify the difference in attractiveness between the performance levels, according to the values and preferences of the decision-maker.

Considerations about Aspect 5: scale integration

Through this lens, the study analyses whether the articles carry out scale integration or not and how they present the questions to the decision-maker.

The articles can be divided into three different groups: ones that carry out numeric integration, ones that undertake descriptive integration and ones that do not approach the theme or do not carry out integration.

Five articles conduct numeric integration (Sarkis and Talluri, 2002; Tan *et al.*, 2007; Škrinjar *et al.*, 2008; Aghdasi *et al.*, 2010; Cho and Lee, 2011). Škrinjar (2008) uses statistical analysis to evaluate the perception of the managers about the relation between the business process orientation levels and the company's performance to propose a model. Lu *et al.*, (2008) and Tan *et al.*, (2007) use mathematical formulations. Aghdasi *et al.*, (2010) lists 21 capabilities according to the value created before or during improvement implementation in the process. The capabilities are gathered, and the groups receive direct punctuation from the decision-maker using the Likert scale. Two authors use the AHP method (Sarkis and Talluri, 2002; Cho and Lee, 2011), in which, after clarifying the importance of the evaluation norms and the characteristics of each alternative, the alternatives, and their successors, are positioned to present the best option for reaching the determined goal. The limitations of this method appear when evaluating only the alternatives that are already known, ignoring the exploration of other options that could meet the decision-maker's needs better. Another limitation to the use of this method arises when an alternative is introduced that is not better than the ones presented or when dividing the original problem into smaller ones, whereby the ordination of the alternatives can change and create conflicts, which is known as rank reversal ordering (Sarkis, 2003).

Five articles involve descriptive or graphic integration (Kumar and Harms, 2004; Jaklic *et al.*, 2006; Jallow *et al.*, 2007; McCormack *et al.*, 2009; Jochem *et al.*, 2011; Rohloff, 2011). Jallow *et al.*, (2007) presents the probability estimates and the impact of a certain mapped risk graphically, based on historical

information or information from specialists. Kumar and Harms (2004) present the improvements to the managers through process mapping. Jaklic *et al.*, (2006), Jochem *et al.*, (2011), McCormack (2009) and Rohloff (2011) provide models to evaluate the maturity of the business processes and present the results according to the maturity level reached by the organization. In these models, to reach the determined level of maturity, it is necessary for the company or evaluated area to present all the requirements listed during the performance measurement. Non-compliance with one of the levels culminates in failure to reach the next level of maturity, in this way not allowing scales that determine a good or neutral performance between the maturity levels.

Four levels (Chan and Qi, 2003; Attaran, 2004; Adesola and Baines, 2005; Balasubramanian and Gupta, 2005) do not consider the topic or do not perform integration.

The scale integration stage is essential to expand the decision-maker's knowledge about the context, facilitating the visualization of the global performance and allowing the creation of actions for improvement in a systemic way. Therefore, the authors suggest the following: (i) developing a performance measurement model that helps the decision-maker to understand the contribution of each criterion to the global performance in the system; (ii) measuring the goals considered to be necessary and sufficient by the decision-maker to carry out the performance measurement instead of organizing the known alternatives; and (iii) presenting reference levels on which it is possible to compare each of the indicators.

Considerations about Aspect 6: management

Through this lens, it is possible to analyse how the articles make the diagnosis of their present situation and propose actions for their improvement. The results are presented next.

How to evaluate the present situation of the context

Of the articles analysed, the majority makes a diagnosis of the present situation in the context evaluated, but five articles (Chan and Qi, 2003; Attaran, 2004; Adesola and Baines, 2005; Balasubramanian and Gupta, 2005; Škrinjar *et al.*, 2008) do not evaluate or do not clarify how they evaluate the environment. However, it is possible to conclude that Adesola and Baines (2005) and Škrinjar *et al.*, (2008) recognize the importance of this performance measurement. Škrinjar *et al.*, (2008) confirms that the managers should come to know their environment to be able to make decisions according to their organizational strategy, while Adesola and Baines, (2005) presents a methodology with step-by-step and management tools that address actions to

improve the process that is understood that part of the diagnosis is intended to improve.

Among the articles that make a diagnosis of the present situation, four (Sarkis and Talluri, 2002; Chan and Qi, 2003; Aghdasi *et al.*, 2010; Rohloff, 2011) present the result of their analysis numerically, using mathematical/statistical formulations or graphics. The other six articles (Kumar and Harms, 2004; Jaklic *et al.*, 2006; Jallow *et al.*, 2007; Lu *et al.*, 2008; McCormack *et al.*, 2009; Jochem *et al.*, 2011) present their diagnoses in a descriptive way, starting with the feedback, graphics and after-audit reports.

To continue to analyse the ways in which some articles carry out their diagnoses, in five articles (Kumar and Harms, 2004; Tan *et al.*, 2007; McCormack *et al.*, 2009; Jochem *et al.*, 2011; Rohloff, 2011), it is possible to identify the strong and weak points of the present situation. Of these, Jochem *et al.*, (2011) and Rohloff (2011) base their evaluation norms on five maturity levels from the CMM/CMMI model. Rohloff (2011) presents the diagnosis of the present situation with comparisons between units and regions. However, Jochem *et al.*, (2011) presents an after-audit report, which clarifies the gap between the present situation and the target established. Tan *et al.*, (2007) reports, through the processes, data and simulation, which sequence of rules is beneficial to reducing the process time, for example. Kumar and Harms, (2004) describes how he carries out the present process mapping and eliminates activities that do not add any value through the kaizen.

The other five articles (Sarkis and Talluri, 2002; Jaklic *et al.*, 2006; Lu *et al.*, 2008; Aghdasi *et al.*, 2010; Cho and Lee, 2011) do not present strong and weak points of the present situation; Cho and Lee (2011) and Sarkis and Talluri (2002) use the AHP method to organize better and worse options from a list of pre-agreed alternatives. The limitations of this method lie in the assumption that all the possible alternatives are listed and that identifying the best option is necessary and sufficient to satisfy all the management needs of a decision-maker in a determined context. It is worth highlighting that both articles have AHP scales that can evaluate the present situation as long as one of the evaluated alternatives is used.

Improvement actions

The last classification of the management lens aims to check how the articles present ways to improve the context, once the present situation has been diagnosed.

Despite the majority of the articles making a diagnosis of the present situation, only four of them (Kumar and Harms, 2004; McCormack *et al.*, 2009; Jochem *et al.*, 2011; Rohloff, 2011) present ways to

create improvement actions from the after-audit feedback or the employed methodology, which provides a roadmap of actions to be considered to improve the environment performance.

The other 12 articles (Sarkis and Talluri, 2002; Chan and Qi, 2003; Attaran, 2004; Adesola and Baines, 2005; Balasubramanian and Gupta, 2005; Jaklic *et al.*, 2006; Jallow *et al.*, 2007; Tan *et al.*, 2007; Lu *et al.*, 2008; Škrinjar *et al.*, 2008; Aghdasi *et al.*, 2010; Cho and Lee, 2011) do not place or do not find elements in the text that clarify the process in which improvement actions are proposed.

In this way, an opportunity is available to offer the decision-makers instruments with which they can build knowledge about their context, realizing the strong points and weaknesses of the performance, besides highlighting a process of opportunity production in which the decision-makers are able to see the strategic consequences of their actions.

IMPLICATIONS OF THE SYSTEMIC ANALYSIS

Regarding the first analysis, evaluation approach and individuality, an opportunity is observed to research the thinking and reflection on the purposes of BPM and the contribution of performance measurement to this area.

It is apparent that most of the papers, selected for their relevance, focus on performance measurement in a normative way; that is, they involve models that seek what their managers have to undertake exogenously to the organization. This fact can be explained by the intensive use of BPM as a way for organizations to reduce costs and standardize operational processes for a given strategy, a focus given to this field of knowledge through quality management and the strategic school from an industrial organization's view (Porter, 1980).

However, as noted in the literature review in this paper, it creates the expectation that BPM can exceed operational strategies. One of the points that emerges is the benefit of BPM as a dynamic capability or element of knowledge management and innovation to foster the continuous combination of the internal resources and competencies of the organization and promote new forms of competition (Barney, 1991; Teece *et al.*, 1997). For this to occur, research should be encouraged that is linked to performance measurement methodologies that emphasize cognitive techniques to expand the understanding of specific managers. This will contribute to BPM's position as a promoter of sustainable competitive advantage through the use of firm-specific resources and capabilities (Lindsay *et al.*, 2003; Sirmon *et al.*, 2007; Peng *et al.*, 2008).

This trend of building performance measurement models using concepts from outside the

organization is also evidenced by the fact that most of the selected articles seek the evaluation criteria in the literature. This way of building models can be positive for companies that are competing in markets for cost reduction or operational quality improvement. In markets in which innovation, agility and flexibility are required to create and maintain competitive advantages, the evaluation criteria should focus on the organization's managers. It is in the perception and knowledge of these actors that the company's management will find unique ways to reach their strategic objectives, delight their customers and outperform their competitors.

Regarding the analysis of the measurement scales, we observe that most articles use only ordinal scales. Despite ordinal scales being extremely important for the evaluation of context management, a limitation emerges when performance measurement models compare ordinal scales and assign 'weights' without reference levels. For these to be used properly and in a scientifically correct manner, the reference levels for each ordinal scale must be determined, and subsequently the ordinal scales transformed into cardinal scales. Thus, managers can understand their priorities, taking into account their current situation and the reference levels that determine normal performance on each scale (Bana e Costa and Vansnick, 1994; De Moraes *et al.*, 2010; Lacerda *et al.*, 2011, 2014a).

The last analysis shows a synthesis of the previous findings. There are opportunities for research in performance measurement and BPM areas, which involve the recognition of performance measurement as a feedforward tool to create and sort process management projects and not only its use as a feedback tool (Grafton *et al.*, 2010).

CONCLUSION

This study has been carried out to build the knowledge that researchers require to start their study with prominent articles related to the research topic. The ProKnow-C process was used as an intervention instrument because of its capability to improve researchers' understanding of the subject that they desire to investigate as well as its capacity to guide researchers in selecting the most relevant among the aligned articles in the process of portfolio selection in a constructivist and individual way. Next, ProKnow-C suggests that the variables for the bibliometric analyses should be investigated to provide researchers with information on who and where the publishing research on the subject that they are interested in and which major keywords are used. Subsequently, ProKnow-C undertakes what it calls 'systematic analyses' to reveal the strengths and weaknesses of the approaches used when viewing the problem of 'management of business processes from the standpoint of its results' through the lens

of performance measurement. This knowledge provides researchers with the elements to establish their 'research question' and 'objectives' for their scientific work on a factual and original basis.

The ProKnow-C process started with the definition of the axes that explain the subject 'management of business processes from the standpoint of their results' as 'business process management' and 'performance measurement'. The keywords defined for the first axis were 'business process' and 'process management', and for the second axis, the keywords selected were 'measurement', 'appraisal', 'evaluation' and 'assessment'. The keywords used were a combination of the keywords of the two axes.

The process started with 2142 articles, gathered after a search of scientific databases, and identified 16 articles, published in the last 10 years, that were relevant to the research and highly cited.

From the data of the portfolio articles, the process led to the following results: (i) the most prominent journal was the *Business Process Management Journal*, with four articles of the framework published in this journal; (ii) the most prominent article, with 151 citations in Google Scholar, was 'Exploring the relationship between information technology and business process reengineering', published in 2004 by M. Attaran; (iii) the most prominent author was M. I. Štemberger, with three articles in the framework; and (iv) the most used keywords were 'business process re-engineering', 'business process management', 'maturity models' and 'process management'.

The bibliometric analysis of the articles in the references of the framework led to the following results: (i) the most prominent journal was the *International Journal of Production Economics*, with eight articles in the references, and (ii) the most prominent author was K. McCormack, with four articles in the framework references.

Finally, cross-checking the results from the two data sources (framework articles and their references), the following were observed: (i) the *Business Process Management Journal* was the most prominent journal among the framework articles, also regarding its references; (ii) the most conspicuous article written by prominent authors was 'Feasibility of performance measurement system for supply chain: a process-based approach and measures' (Chan and Qi, 2003); and (iii) the most prominent author among the framework articles and their references was M. I. Štemberger.

The systemic analysis led to a list of six opportunities identified through the analysis of each lens presented in the previous sections. These opportunities led to the following research question: 'How can the decision-aiding process be supported in a BPM implementation, building on the decision-makers' necessary knowledge about its context to facilitate the identification of improvement actions to enhance the performance of their environment in accordance with their values and preferences?' From

these findings, researchers are able to establish the 'research question' and 'objectives' for their scientific work on a factual basis. The process is constructivist because researchers, during the interaction of the process, have the chance to review their understanding and develop a comprehension of the most prominent journals, articles and authors in the subject 'management of business processes from the standpoint of its results' using their world view. These findings can be used solely in the context of this investigation; the process, however, can be used by all researchers who want to find a 'research question' and 'objectives' with a factual basis for their scientific work. These are the practical and theoretical values and contribution of this research to the scientific society. The contribution to researchers is the generation of elements to identify the area to which they can contribute in an original and reasoned manner.

The limitations of this research are as follows: (i) the search for scientific articles in English that are available free of charge in the CAPES portal; (ii) articles published in international journals; (iii) articles published from 2002 to 2012; and (iv) the selection of the articles about BPM, which was performed according to the perception of the researchers. Finally, as a recommendation for future work, it is suggested that a model could be built to evaluate the performance of a BPM implementation according to the opportunities gathered in this research.

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