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Business Process Management: Terms, Trends and Models

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***Abstract*—Understanding the Business Process Management (BPM) subject is a complex and multifaceted task, which is why the goal of this study is to explore the scientific production concerning BPM in its many dimensions. In order to do so, the proposed methodology is quantitative, bibliometric and longitudinal, and uses the Semantic Network Analyses as a way to explore a large set of scientific documents. The foundation for this research included 765 articles about BPM. This study managed to limit the subject of BPM to the fields of Business Administration and Information Technology and estimate research trends in both fields. The quantitative method employed in this research study is considered to be a limiting factor, because it does permit large volumes of data to be analyzed, albeit with little depth. The achieved results allow IT and Business Administration to understand the dynamics of the scientific production network about BPM, in addition to identifying research trends in its field of study. Analysis of the BPM dimensions is innovatively achieved from the standpoint of semantic networks.**

I. Introduction

BUSINESS Process Management (BPM) has the potential to support organizational changes, since it shifts the focus from managing functional areas (departments) to business processes. This paradigmatic shift can allow managers to organize efforts around tasks, flows and people in order to improve client delivery. BPM, under a technical and pragmatic perspective, can serve as a tool to adjust the organization towards its managerial strategy.

BPM most likely has its roots in Total Quality Management (TQM), a Japanese quality model developed in post-war 1940s. According to Capote [1], the most evident principle of TQM was the need to establish a shared organizational consciousness about the importance of high quality managerial and productive processes involving external elements to the original control mechanisms of the organization, such as the relationship between suppliers and the remaining parties involved in developing the business. Thus, TQM incorporated the need to understand processes as a set of tasks, implemented by machines or people, with the potential of improving continuously.

Due to its characteristics, BPM provides organizational control at the level of processes, tasks, activities and individuals. In this sense, organizations that implement it seek control of their processes, which makes process modeling an important predictor of government policies and accountability. BPM represents the shift from a vertical and hierarchical hegemonic paradigm to a horizontal paradigm that integrates multiple business functions. This fact has justified the increased interest of researchers and consultants regarding the topic, which can be noted from the growing number of scientific articles and academic studies regarding BPM.

In order to have an idea of the increase in publications about the topic, when one types "business process management" in Google Scholar, approximately 139,000 results are found. When searching the same term in the Web of Science database, approximately 2,435 documents are found. If the growth of scientific publications in the Web of Science database is analyzed, one verifies that only two articles existed in 1994; 45 in 2004; 208 in 2014 and 283 in 2016; which confirms the increase in scholarly production in the field [2].

The plurality of viewpoints, in addition to the interdisciplinary nature of BPM discussions, broadens the complexity involved in the subject, thus rendering it harder to comprehend. When searching for the term "business process management" in the Web of Science database, many "categories" are displayed, such as computer science information systems; computer science artificial intelligence; computer science theory method; computer science interdisciplinary applications; computer science software engineering; management; business.

Besides the categories employed, others were also present, such as: engineering; economics; operations research, among others, which corroborates with the interdisciplinary nature of the topic in various study areas. For the purpose of this research, categories presented by the Web of Science database were simplified and, for this reason, IT and Management categories were restricted to two fields of knowledge (Management and Information Technology).

Due to the increase in the volume of worldwide scholarly production regarding BPM, we observed that the traditional research methods that involve reading, indexation and manual analysis of scientific documents have not been

sufficient to deal with the subject's growing complexity. On the other hand, advances in computer technology, especially with algorithms that allow data mining and semantic text analysis, may support researchers in the task of dealing with extensive worldwide scientific production, thus optimizing research resources.

Therefore, the objective of this study is to analyze scientific production in BPM in its various dimensions and, more specifically, understand the existing relations between the fields of Information Technology and Management, moreover to establish models and estimate trends in these fields. From a methodological viewpoint, this research has a bibliographical quality, with a quantitative, bibliometric, and longitudinal approach. The data used are from secondary sources from studies extracted in the Web of Science database and semantic relationships are analyzed among the articles selected by means of the Semantic Network analysis method.

II.2 Theoretical Reference

The foundation for this research requires a discussion of BPM in two fields related to the present study: Management and Information Technology.

A. BPM in the Field of Management

Business Process Management, understood as a management theme, comprehends several dimensions, such as: organization culture; organization performance; organization conduct; corporate governance; and competitive advantage. Thus, it is crucial to present basic concepts concerning these dimensions.

BPM and organization culture: Culture can be defined as a set of shared values within a group, manifested through ideas, attitudes, rituals, technologies, products and institutions. These values can vary from group to group or from institution to institution and are defined as ideas that influence the group's behavior and organize the group's model [3]. For Schein [4], group culture may be defined as a pattern of assumptions that have been instituted by a given group, in the sense that it solves the problems of adaptation and internal integration, which worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think about and feel regarding these problems. In regard to business management, Vukšić et al. [5] state that organizational culture can be understood as an organizational style that reveals the personality of the organization and determines the actions and behavior of collaborators. The study by vom Brocke and Sinnl [6] presents three associations between the terms "culture" and "BPM", as follows: a) culture as an independent factor that influences BPM; b) culture as a dependent factor influenced by BPM; and c) culture as equivalent to BPM culture. According to Santos [7], BPM practices involve a deep analysis of the organization and changes in its organizational structure. Some organizations have a culture that may be incompatible with the desire to organize itself around the client and, consequently, of business process management. Therefore, methodological support should be conducted to continuously improve it business processes, coordinate activities, define precisely the responsibilities of each person involved, and create a process office. Changing the culture of a function-centered organization to a process-centered culture is a big challenge for BPM initiatives to gain space in the organizational context and to produce the expected results and performance [8]. For Baumöl [9], one of the critical factors of success in company transformation by means of process changes is the receptivity of people and its commitment to new forms of doing things.

BPM as support to organization conduct: A line of studies on BPM highlights the impact of process management in organizational strategies. In this context, the result of organizational conduct tends to present strategic gains through the rationalization of organizational processes. However, research studies highlight the complexity involved in developing mechanisms that provide an alignment between BPM strategies and the result of organizational conduct, given the complexity associated with multi-criteria evaluation structures of stakeholder indicators. Chang [10] highlights that BPM was originally a process-oriented organizational approach used to project, analyze and perfect business processes for managing and improving organizational conduct more efficiently. The positive relationship between BPM practices and the result of organizational conduct is a recurrent affirmation in a set of research studies in different strategic business models [11-12-13- 14-15]. The relationship between BPM and the result of organizational conduct is so deep that authors Dijkman et al. [13] emphasize that BPM maturity tends to improve sustainability of organizational conduct in the long run.

BPM and Organization Performance: The performance evaluation methodologies based on organizational processes could give support to BPM propagation within organizations, creating visible commercial processes by measuring intermediary and final results. The benefits of having a measuring system will decrease with time if they do not reflect the changes in organizational processes. If there is a lack of focus and update in business processes, the decision-makers and the main interested parties will find it hard to determine if the company is achieving continuous progress towards its strategic goals [14]. A measuring system is crucial in management processes for providing assessment and spreading success stories for motivational purposes, evaluating progress, allocating and redistributing resources, and instilling a continuous improvement system for the ES life cycle [17]. The performance measured in an organization can change rapidly (a typical example would be a drastic change in a bank's results before/during a financial crisis) and, therefore, the performance at the organizational level is not a good proxy for measuring BPM success. Besides, the success of a BPM is hard to define depending on the specific goals of each project and no single document has provided a wide-ranging definition [18]. Finally, Bititci et al. [19] state that any performance assessment system should be balanced and integrated.

BPM as a tool for supporting corporate governance: Contemporary organizations are encouraged to adopt strategies that implement positive differentiation in segments in which they work if they wish to maintain itself and survive in the market. Factors such as elevated competitiveness between companies, as well as fast and constant changes in the type of client that is increasingly close to organizational limits, render the business environment even more complex. This scenario leads businesses to adopt new management techniques, the most relevant one being Business Process Management (BPM). According to Jesus et al. [20], the main advantages of BPM are: process autonomy, improvement of performance monitoring, redefinition of organizational structure, and implementation of reference models. Governance is inserted in the BPM context as an efficient approach in its implementation, aligned with process management branches of organizations, because it helps to migrate isolated BPM initiatives to integrated and synergic initiatives. This integrative idea of business process modelling demonstrates the importance of creating structures of process implementations based on governance, with the perspective of providing greater involvement of the participants and transparency throughout all the processes. The concept of process governance is associated with the creation of relevance and transparency in relation to responsibility, decision making and reward system in order to guide actions [21]. BPM governance is articulated with goals, principles, and organograms that reveal who is allowed to make decisions, as well as policies and norms that define what managers will do [22]. There is a need to adapt governance to what BPM demands. This is the foundation for adding value by means of agility and scalability.

BPM as a tool for competitive advantage: The main objective of BPM, in this perspective, is to create competitive advantage to the company, thus guaranteeing quality of products and services, satisfying the customer with delivery that is superior to the competition. In this sense, it acts as a tool for competitive advantage, in a continuous effort towards process improvement [16]. In order for the company to achieve competitive advantage over its competitors, Barney [23], Dierickx and Cool [24] and Dyer [25] state that they will have to be able to accumulate resources and abilities that are valuable, non-replaceable and hard to emulate. Concerning sustainable competitive advantage, Brito and Vasconcelos [26] state that organizational resources should be rare (not easily available to other companies), difficult to emulate, and the company should possess organizational conditions to explore resources. In this sense, Molardi and Pontes [27] show that business process management may generate competitive advantage for the organization, since they directly affect management and add value to the product or service delivered to the client. In that light, BPM can dynamize and guarantee efficiency of organizational resources, thus proving to be an important tool in seeking sustainable competitive advantage.

B. BPM in the field of Information Technology

When analyzing business process management as an IT discipline, other dimensions and categories appear as a differential when compared to BPM discussions in the field of business management. In this sense, it is necessary to present differences.

IT management has become an increasingly important issue in organizations and in the academic-scientific realm. In this sense, process management emerges as a management strategy that meets the needs of IT, as it originates from an effort to manage organizations through their business processes. In this sense, several perspectives arise when associating IT with BPM. The main function of information technology, in this perspective, is to enable the performance of an organization's business processes in order to create value for customers and shareholders. It is also observed that virtually all process improvement initiatives rely on IT support [28]. For Rahimi et al. [29] the association between business process management and IT management, based on the analysis of academic literature about business processes and IT capabilities, is found to be under-explored. BPM can thus collaborate to fill an existing gap between business fields and Information Technology fields.

A key concept to address this gap is governance. According to Haes and Van Grembergen [30] IT governance is a priority in the agenda and several organizations are implementing IT governance practices in day-to-day operations. The authors suggest that organizations are beginning to implement IT governance in order to achieve better alignment between business and IT.

According to Spanyi [28], in order to optimize and maintain organizational performance improvements, some form of governance is needed to create appropriate structures, measures, roles, and responsibilities to assess and manage end-to-end business process performance. The author adds that one of the roles of governance is to ensure that IT investments are closely associated with the organization's business strategy and that IT investment offsets come from specific improvements in business process performance. Other authors, such as Reijers [31] and Ramesh et al. [32] study BPM from the perspective of business process management system (BPMS) implementation. For them, the success of BPM deployment strategies is closely related to the technologies involved in this process and with the aim of predicting the success of BPMS implementation based on the maturity of the level of understanding of processes within an organization.

Dumas and Kohlborn [33], in turn, bring the concept of service-oriented architecture (SOA) in the context of BPM, presenting a method to analyze a process so it can be executed in the context of an application. The authors bring SOA as a computational paradigm in order to use distributed capabilities. It is important to highlight that the sense of capabilities, in this context, refers to both the capabilities offered by the business and those offered by specific application systems.

III METHODOLOGICAL PROCEDURES

The methodology proposed for this study is bibliographical, with a quantitative, bibliometric and longitudinal approach. The data used are from secondary research sources extracted from the Web of Science database. The semantic relationships among 661 articles were analyzed through the Semantic Network analysis method.

According to Lopes [34] a database search strategy can be defined as a set of rules and techniques that make it possible to find the desired information stored in a database. The author points out that, in order to achieve the desired response by the researcher, it is necessary to perform logical operations, by restricting the results achieved or by expanding them to obtain information that may be relevant to the research.

The following research restriction was considered for this article: (Topic: ("business process management")); refined by types of document: (article) and categories from Web of Science: (computer science information systems or computer science artificial intelligence or management or computer science theory methods or computer science software engineering or business or operations research management science or computer science interdisciplinary applications); and estimated period: all years with indexes: sci-expanded, ssci, a&hci, cpci-s, cpci-ssh, esci.

A Text mining

In the data mining and cleaning phase, the CASOS institute's AutoMap software was used. The research database was divided in two; the former presented articles that shared more relevance to Business Management, and the latter contained articles that were more associated with Information Technology. Both databases were subsequently submitted to text mining processes using the Automap software.

As for the summary of the mining steps, the Perform All Cleaning and Perform All Preparation algorithms were first executed, then numbers, pronouns, prepositions, punctuation and symbols were deleted and the text was converted to upper case. Then, a list of concepts was generated that created another list of eliminations, in order to exclude concepts that did not appear in at least three articles. The next step was to create a list of bigrams using the TF-IDF metric. One hundred bigrams with the highest numbers were selected for this metric. After the bigrams were chosen, all other concepts were excluded from the analysis and the networks were generated. Finally, the networks were analyzed in the ORA software and the following reports were analyzed: Network Comparison and All Measures by Category

B. Analysis of semantic networks

An aspect of Social Network Analysis that has been highlighted in the academic community in recent years is the Semantic Network Analysis. According to Atteveldt [35], it is possible to define Semantic Network Analyses as the analysis of a thematic content in which the messages are deconstructed into semantic units that, in turn, are diluted into one or more variables, which are then recomposed through combination and aggregation techniques.

Semantic networks, according to Sowa [36], are considered to be structures of knowledge representation that are formed by vertices and edges. One can understand a semantic network as one in which its nodes present semantic content, or "meaning". Lee et al. [37] considers the semantic network as a concept graph. The Semantic Network Analysis (SeNA) can be considered an extension of social network analysis (SNA) that explores relationships among meanings shared in linguistic and social configurations. In order to understand the importance of a unit of meaning in a semantic network, metrics are employed.

According to Gloor et al. [38], the SeNA conducts a time-based calculation of network centrality measures, social network visualizations, as well as semantic process of text mining, cleaning and analysis. Back to Lee et al. [37], a semantic network analysis is a part of network analysis that explores the relationships between meanings shared in linguistic settings. The analysis of semantic networks can, like social network analysis, be executed by several metrics, such as: network density, degree of centrality, centrality betweenness, eigenvector centrality, path length, among others.

C. Metrics

This article will use centrality metrics, which roughly identifies the relative importance of nodes in a network. Thus, the greater the centrality metric, the greater the importance of this node in the network. It is possible to define centrality as the property of a node or a group of nodes that relate to its position in a network [39]. For the authors, thinking in terms of centrality means trying to understand the contribution that a node or a set of nodes offer to the structure of this network; in other words, centrality is the degree of structural importance of a node in relation to the network. In order to estimate the time trends in networks, the Betweenness Centrality Newman [40] metric is a measure of the centrality of a node in a network usually calculated as the fraction of shorter paths between pairs of nodes passing through the node of interest. The metric betweenness centrality, for Chen et al. [41], can be defined individually for each network node, as measured in the degree to which the node is in the middle of the path that connects it to the other vertices of this network.

IV. RESULTS AND DISCUSSIONS

In this section, the collected data are presented and discussed.

A. Comparison between Management and Information Technology networks

By means of the algorithms outputs "Network Comparison" of the ORA software, the relationships are identified between the two networks which concern this study.

Table 01 and 02 summarize pieces of information about the two networks and their relationships. It should also be noted that the Management Network has a total of 148 texts and 95 concepts, while the Information Technology presents 513 texts and 97 concepts.

The Management and IT network density levels shows that the Management network density is 0.066. For Valente [42], low-density networks (R>0.100) can have limited efficacy regarding the concept flow. Table 1 presents the proximity of semantic content consolidated in analyses.

The measure demonstrates the closeness of semantic content (represented by network nodes) and its links. All identified values present numbers higher than 90%.

The Common Focus report (Software ORA) presented the following bigrams: bpm-capability, business-environment, business-process, business-system, competitive-advantage decision-make management-bpm, management-system, maturity-model performance-measurement, process-description, process-design, process-execution, process-improvement, process-knowledge, process-management, process-mine, process-model, process-monitor service oriented-architecture, social-software web-service, workflow-process

B. Management Network

The analysis of the network allows a glance at the BPM / Management network concepts and the existing links between them, as well as the elements that are external to the network that are the concepts of less centrality. The network is composed of 148 article abstracts, has 95 nodes, a density of 0.043 and 588 links.

Table 1 presents the evolution of the 16 bigrams with the largest Betweenness Centrality in the network from 1995 to 2018 compared to previous periods. Note that positive, negative, neutral trends and new perspectives have been identified.

Table 1. Evolution of Betweenness Centrality for BPM terms - business management.

Concepts/Period/ Centrality-Betweenness	1st Period: 2006-1995	2nd Period: 2010-1995	3rd Period: 2014-1995	4th Period: 2018 - 1995	Trends
business-process	0.92	0.839	0.611	0.354	Negative
management-bpm	0.009	0.108	0.213	0.243	Positive
process-management	0.054	0.139	0.051	0.042	Neutral
process-performance	x	x	0.044	0.041	Positive
decision-make	0.114	0.02	0.034	0.04	Negative
organizational-performance	0	0.02	0.081	0.034	Positive
supply-chain	0.059	0.04	0.03	0.033	Neutral
management-system	0.114	0.078	0.013	0.028	Negative
knowledge-management	x	0	0.043	0.026	Positive
process-model	0.059	0.041	0.038	0.025	Negative
business-environment	0.06	0.055	0.049	0.023	Negative
operation-management	0	0	0.003	0.023	Positive
managerial-system	x	x	0.056	0.023	Negative
traditional-bpm	x	x	x	0.023	New perspective
process-improvement	x	0.019	0.013	0.018	Neutral
maturity-model	x	x	7.23E-04	0.016	Neutral

Source: Research Data

The term "New perspective" describe bigrams that only appeared in the network in the last period: conceptual-model and traditional-bpm. Positive trends in the Management network identified the following concepts: management-bpm; process-performance; organizational-performance; knowledge-management; operation-management. Neutral trends are represented by the following concepts: process-management; supply chain; process-improvement; maturity-model; bpm-initiative.

C. Information Technology Network

The construction of the IT network was based on a set of 513 article abstracts from the database found in Web of Science. It presented 97 nodes, a density of 0.037 and 950 links.

Table 2 presents the 16 main network concepts according to the metric Betweenness Centrality and its development over time. As positive trends in the Information Technology network, the methodology used presented the concepts: business-process, erp-system, decision-make, management-system, business-environment, process-model, serviceoriented-architecture and web-service. The new perspectives presented were: quality-management, process-

logic, continuous-improvement, process-orientation, supply-chain, and process-quality.

V. FINAL CONSIDERATIONS

In a global context in which there is a massive production of scientific papers, traditional methods of analysis, which require reading and cognitive interpretation of scientific production, are not sufficient for analyzing large volumes of documents with limited research resources. As an alternative to traditional methods, new ways of analyzing complex world production arise with the aid of text mining and semantic content analysis software. In this sense, this study offers to analyze the scientific production of BPM articles in the fields of Management and Information Technology, in their specificities and in their commonalities. Regarding the comparative analysis between the Management and Information Technology networks, no significant differences were verified, as seen in Tables 1. As a common focus between the two networks, the analyses have led to the following concepts: bpm-capability, business-environment, business-process, business-system, competitive-advantage decision-make management-bpm, management-system, maturity-model performance-measurement , process-description, process-design, process-execution, process-improvement, process-knowledge, process-management, process-mine, process-model, process-monitor service-oriented-architecture, social-software web-service, workflow-process .

Regarding the networks' singularities, the analyses demonstrate key concepts for being understood. In the Management network, one can observe these concepts through Figure 1, which presents the result of an algorithm that brings the three metrics with the highest value per concept, and Table 2, which presents a ranking of the 16 largest values for the Betweenness metric Centrality.

In order to meet the goal of tracing research trends in semantic networks, the 16 concepts with the greatest centrality in the period from 2008 to 2015 were analyzed in relation to the Betweenness Centrality metric in relation to the previous periods, according to Table 2. This analysis brought the following concepts with positive trends: management-bpm; process-performance; organizational-performance; knowledge-management; operation-management.

In the Information Technology network, Figure 2 presents the most important concepts according to an algorithm of the ORA software. Furthermore, Table 3 presents the 16 concepts with the highest Betweenness Centrality metric to the IT network. As for the positive trends in the IT network, there are the following concepts: business-process, erp-system, decision-make, management-system, business-environment, process-model, service-oriented-architecture and web-service.

The IT network also presented six new perspectives represented by the following concepts: quality-management [46][47], process-logic [48][49][50], continuous-improvement [51][52][53], process-orientation [54][55], supply-chain [15][56][57], and process-quality [58][59]. For management, only the traditional-bpm concept was represented [43][44][45].

As a methodological contribution, this study structures an efficient way to analyze a large number of scientific documents in any area of knowledge. However, considering the research limitations, it is observed that the method used to analyze a large number of scientific articles does so with little depth and thus should be used in association with traditional research methods. In this sense, a suggestion for future research is to conduct a traditional bibliographical study of the new perspectives and positive trends found in the analyses. Furthermore, conducting this study with other foundations is also recommended.

Finally, it is important to emphasize the relevance of studies such as this one, which synthesizes a large set of data about the field, which can be used by researchers and industry for reflections on BPM in the fields of Management and IT, leading to the emergence of trends in these fields.

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REFERENCES

[1]. Capote G (2012) BPM para todos: uma visão geral abrangente, objetiva e esclarecedora sobre gerenciamento de processos de negócio [BPM for Everyone: A Comprehensive, Objective, and Enlightening Overview of Business Process Management]. Gart Capote, Rio de Janeiro. Portuguese.

[2]. Web of Science (2018) Web of Science Core Collection Home. https://webofknowledge.com

[3]. Schmiedel T, vom Brocke J, Recker J (2014) Development and validation of an instrument to measure organizational cultures support of Business Process Management. Information & Management 51(1):43-56. doi:10.1016/j.im.2013.08.005

[4]. Schein EH (2004) Organizational culture and leadership (3rd ed.) John Wiley & Sons, San Francisco

[5]. Vukšić VB, Vugec DS, Lovrić A (2017) Social business process management: croatian it company case study. Business Systems Research Journal 8(1):60-70. doi:10.1515/bsrj-2017-0006

[6]. vom Brocke J, Sinnl T (2011) Culture in business process management: a literature review. Business Process Management Journal 17(2):357-378. doi:10.1108/14637151111122383

[7]. Santos HRM (2012) Fatores críticos de sucesso das iniciativas de BPM no setor público [Critical success factors of BPM initiatives in the public sector] [master's thesis]. Recife (PE): Universidade Federal de Pernambuco. Portuguese. https://repositorio.ufpe.br/handle/123456789/10877

[8]. Soso FA (2016) Fatores que caracterizam a adoção do Business Process Management (BPM) pelas organizações [Factors that characterize the adoption of Business Process Management (BPM) by organizations] [master's thesis]. São Leopoldo (RS): Universidade do Vale do Rio Sinos. Portugese. http://www.repositorio.jesuita.org.br/handle/UNISINOS/5592

[9]. Baumöl U (2013) Mudança cultural na gestão de processos. In: vom Brocke J. Roseman M (eds) Manual de BPM: gestão de processos de negócio [BPM Handbook: Business Process

Management]. Bookman Editora, Porto Alegre, pp 331-358. Portuguese.

[10]. Chang JF (2006) Business process management systems: strategy and implementation. Auerbach Publications, New York

[11]. Kumar V, Smart PA, Maddern H, Maull RS (2008) Alternative perspectives on service quality and customer satisfaction: the role of BPM. International Journal of Service Industry Management 19(2):176-187. doi:10.1108/09564230810869720

[12]. Smart PA, Maddern H, Maull RS (2009) Understanding business process management: implications for theory and practice. British Journal of Management 20(4):491-507. doi:10.1111/j.1467-8551.2008.00594.x

[13]. Dijkman R, Lammers SV, Jong A (2015) Properties that influence business process management maturity and its effect on organizational performance. Information Systems Frontiers 18(4):717-734. doi:10.1007/s10796-015-9554-5

[14]. Pádua SID, Jabbour CJC (2015) Promotion and evolution of sustainability performance measurement systems from a perspective of business process management. Business Process Management Journal 21(2):403-418. doi:10.1108/bpmj-10-2013-0139

[15]. Pradabwong J, Braziotis C, Tannock JDT, Pawar KS (2017) Business process management and supply chain collaboration: effects on performance and competitiveness. Supply Chain Management: An International Journal 22(2):107-121. doi:10.1108/scm-01-2017-0008

[16]. Trkman P (2010) The critical success factors of business process management. International Journal of Information Management 30(2):125-134. doi:10.1016/j.ijinfomgt.2009.07.003

[17]. Al-Mudimigh AS (2007) The role and impact of business process management in enterprise systems implementation. Business Process Management Journal 13(6):866-874. doi:10.1108/14637150710834604

[18]. Škrinjar R, Trkman P (2013) Increasing process orientation with business process management: Critical practices. International Journal of Information Management 33(1):48-60. doi:10.1016/j.ijinfomgt.2012.05.011

[19]. Bititci U, Cavalieri S, Cieminski G (2005) Implementation of performance measurement systems: private and public sectors. Production Planning and Control 16(2):99-100. doi:10.1080/09537280512331333002

[20]. Jesus L, Macieira A, Karrer D, Caulliraux H (2013) Escritório de processos: estudo de caso sobre uma empresa Brasileira. In: vom Brocke J. Roseman M (eds) Manual de BPM: gestão de processos de negócio [BPM Handbook: Business Process Management]. Bookman Editora, Porto Alegre, pp 307-328. Portuguese.

[21]. Richardson C (2006) Process governance best pactices: building a BPM center of excellence. Business Process Trends, 1-6. https://www.bptrends.com/bpt/wp-content/publicationfiles/09-06-ART-ProcessGovernanceBestPractices-Richardson1.pdf

[22]. Harmon P (2007) Business process change: a guide for business managers and BPM and Six sigma professionals. Morgan Kaufmann, Boston. doi:10.1016/b978-012374152-3/50043-4

[23]. Barney J (1991) Firm resources and sustained competitive advantage. Journal of Management 17(1):99-120. doi:10.1177/014920639101700108

[24]. Dierickx I, Cool K (1989) Asset stock accumulation and sustainability of advantage. Management Science 35(12):1514-1514. doi:10.1287/mnsc.35.12.1514

[25]. Dyer, JH (1996) Specialized supplier networks as a source of competitive advantage: evidence from the auto industry. Strategic Entrepreneurship Journal 17(4):271-291. doi: 10.1002/(sici)1097-0266(199604)

[26]. Brito LAL, Vasconcelos FC (2004) A Heterogeneidade do desempenho, suas causas e o conceito de vantagem competitiva: proposta de uma métrica [Heterogeneity of performance, its causes and the concept of competitive advantage: proposal of a metric]. Revista de Administração Contemporânea 8(spe):107-129. Portuguese. doi:10.1590/s1415-65552004000500007

[27]. Molardi RM, Pontes AT (2017) Fatores críticos de sucesso em iniciativas de BPM na administração pública [Critical Success Factors in BPM Initiatives in Public Administration]. In: Proceedings of the 20th Seminário em Administração da Universidade de São Paulo-FEA/USP. SemeAd, São Paulo, pp 1-17. Portuguese. http://login.semead.com.br/20semead/arquivos/1460.pdf

[28]. Spanyi A (2013) Governança de BPL. In: vom Brocke J. Roseman M (eds) Manual de BPM: gestão de processos de negócio [BPM Handbook: Business Process Management]. Bookman Editora, Porto Alegre, pp 261-277. Portuguese.

[29]. Rahimi F, Møller C, Hvam L (2016) Business process management and IT management: the missing integration. International Journal of Information Management 36(1):142-54. doi:10.1016/j.ijinfomgt.2015.10.004

[30]. De Haes S, Van Grembergen, W (2009) An exploratory study into IT governance implementations and its impact on business/IT Alignment. Information Systems Management 26(2):123-137. doi:10.1080/10580530902794786

[31]. Reijers HA (2006) Implementing BPM systems: the role of process orientation. Business Process Management Journal 12(4):389-409. doi:10.1108/14637150610678041

[32]. Ramesh B, Jain R, Nissen M, Xu P (2005) Managing context in business process management systems. Requirements Engineering 10(3):223-237. doi:10.1007/s00766-005-0005-6

[33]. Dumas M, Koheborn T (2013) Gestão de processos habilidades por serviços. In: vom Brocke J. Roseman M (eds) Manual de BPM: gestão de processos de negócio [BPM Handbook: Business Process Management]. Bookman Editora, Porto Alegre, pp 151-171. Portuguese.

[34]. Lopes IL (2002) Uso das linguagens controlada e natural em bases de dados: revisão da literatura [Use of controlled and natural languages in databases: literature review]. Ciência da Informação 31(1):41-52. Portuguese. doi:10.1590/s0100-19652002000100005

[35]. Atteveldt W Van (2008) Semantic Network Analysis; Techniques for Extracting, Representing, and Querying Media Content. [PhD thesis]. Amsterdam: Vrije Universiteit.

[36]. Sowa JF (1991) Principles of semantic networks. Morgan Kaufmann Publishers, California

[37]. Lee H, Lee DI, Kim T, Lee J (2013) The moderating role of socio-semantic networks on online buzz diffusion. Journal of Business Research 66(9):1367-1.374. doi:10.1016/j.jbusres.2012.02.038

[38]. Gloor PA, Krauss J, Nann S, Fischbach K, Schoder D (2009) Web Science 2.0: Identifying Trends through Semantic Social Network Analysis. In: IEEE International Conference on Computational Science and Engineering. CSE, Vancouver, pp 215-222. doi:10.1109/cse.2009.186

[39]. Borgatti PS, Everett GM, Johnson JC (2013) Analyzing social networks. SAGE Publications Limited, London

[40]. Newman MEJ (2005) A measure of betweenness centrality based on random walks. Social Networks 27(1):39-54. doi:10.1016/j.socnet.2004.11.009

[41]. Chen C, Sanjuan FI, Hou J (2010) The structure and dynamics of cocitation clusters: a multiple-perspective cocitation analysis. Journal of the American Society for Information Science and Technology 61(7):1.386-1.409. doi:10.1002/asi.21309

[42]. Valente TW (1995) Network models of the diffusion of innovations. Hampton Press, Cresskill

[43]. Afflerbach P, Hohendorf M, Manderscheid J (2017) Design it like Darwin-A value-based application of evolutionary algorithms for proper and unambiguous business process redesign. Information Systems Frontiers 19(5):1101–1121. doi:10.1007/s10796-016-9715-1

[44]. Chang C, Srirama SN, Buyya R (2016) Mobile Cloud Business Process Management System for the Internet of Things. ACM Computing Surveys 49(4):1–42. doi:10.1145/3012000

[45] Suša Vugec D, Tomičić-Pupek K, Vukšić VB (2018) Social business process management in practice. International Journal of Engineering Business Management 10, 184797901775092. doi:10.1177/1847979017750927

[46] Jakhar SK (2016) Stakeholder Engagement and environmental practice adoption: the mediating role of process management practices. Sustainable Development 25(1):92–110. doi:10.1002/sd.1644

[47] Malfait S, Van Hecke A, Hellings J, De Bodt G, Eeckloo K (2016) The impact of stakeholder involvement in hospital policy decision-making: a study of the hospital's business processes. Acta Clinica Belgica 72(1):63-71. doi:10.1080/17843286.2016.1246681

[48] Delgado A, Calegari D, Arrigoni A (2016) Towards a Generic BPMS User Portal Definition for the Execution of Business Processes. Electronic Notes in Theoretical Computer Science 329: 39–59. doi:10.1016/j.entcs.2016.12.004

[49] Martin N, Depaire B, Caris A (2015) The Use of Process Mining in Business Process Simulation Model Construction. Business & Information Systems Engineering 58(1):73–87. doi:10.1007/s12599-015-0410-4

[50] Teixeira S, Agrizzi BA, Filho JGP, Rossetto S, Baldam RL (2017) Modeling and automatic code generation for wireless sensor network applications using model-driven or business process approaches: A systematic mapping study. Journal of Systems and Software 132:50-71. doi:10.1016/j.jss.2017.06.024

[51] Bisogno S, Calabrese A, Gastaldi M, Levialdi Ghiron N (2016) Combining modelling and simulation approaches. Business Process Management Journal 22(1):56–74. doi:10.1108/bpmj-02-2015-0021

[52] Johannsen F, Fill HG (2017) Meta Modeling for Business Process Improvement. Business & Information Systems Engineering 59(4):251–275. doi:10.1007/s12599-017-0477-1

[53] Lehnert M, Linhart A, Roeglinge M (2017) Exploring the intersection of business process improvement and BPM capability development. Business Process Management Journal 23(2):275–292. doi:10.1108/bpmj-05-2016-0095

[54] Khosravi A (2016) Business process rearrangement and renaming. Business Process Management Journal 22(1):116–139. doi:10.1108/bpmj-02-2015-0012

[55] Nadarajah D, Syed A, Kadir SL (2016) Measuring Business Process Management using business process orientation and process improvement initiatives. Business Process Management Journal 22(6):1069–1078. doi:10.1108/bpmj-01-2014-0001

[56] Palattella MR, Dohler M, Grieco A, Rizzo G, Torsner J, Engel T, Ladid L (2016) Internet of Things in the 5G Era: Enablers, Architecture, and Business Models. IEEE Journal on Selected Areas in Communications 34(3):510–527. doi:10.1109/jsac.2016.2525418

[57] Yousfi A, Bauer C, Saidi R, Dey AK (2016) uBPMN: A BPMN extension for modeling ubiquitous business processes. Information and Software Technology 74:55–68.doi:10.1016/j.infsof.2016.02.002

[58] Faroque AR, Morrish SC, Ferdous AS (2017) Networking, business process innovativeness and export performance: the case of South Asian low-tech industry. Journal of Business & Industrial Marketing 32(6):864–875. doi:10.1108/jbim-06-2015-0113

[59] Kalenkova AA, Van Der Aalst WMP, Lomazova IA, Rubin VA (2015) Process mining using BPMN: relating event logs and process models. Software & Systems Modeling 16(4):1019–1048. doi:10.1007/s10270-015-0502-0