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Business Process Reengineering: A Scoping Review

Amanda Chiote Cabral[1]

Abstract: Business Process Reengineering (BPR) is a management practice that has been widely studied and used over the past 30 years, when its concept and utility were strongly disseminated and used in large corporations around the world, as a model of radical transformation of processes generating an increase in competitiveness. This research is intended to conduct a BPR scope review, developing a mapping of how the practice has been employed over the years, providing an indication of the volume of literature and studies available, as well as an overview of the areas in which BPR operates and how it has been used, through a bibliometric and longitudinal analysis of its publications and also contains suggestions for future research in the area.

Keywords: Business Process Reengineering, BPR, Scoping Review

1 Introduction

Business Process Reengineering (BPR) is a management practice that has been widely used over the past 30 years, when its concept and usefulness were widely disseminated and used in large corporations around the world, as a model for radical process transformation. However, despite being a consolidated and widely used practice, there is a gap in relation to scoping reviews on BPR, which locates existing studies, selects, summarizes and evaluates contributions, data and reports the evidence in order to allow reasonably clear conclusions reached on what is and what is not known about the BPR process.

According to Munn et al (2018), a scoping review is an ideal tool to determine the scope or coverage of a body of literature on a given topic and provide a clear indication of the volume of available literature and studies, as well as an overview (or detailed) of your focus. Scoping reviews are useful for examining evidence when it is not yet clear what other more specific issues can be asked and addressed with value by a more accurate systematic review. From the BPR scoping review, we can answer the following research questions.

i) How has the practice of BPR been applied in recent years?
ii) What are the main areas in which reengineering has been used?

Business Process Reengineering (BPR) or Reengineering was the buzzword in the 1990s. Success stories were widely reported in the press: “Ford reduces the number of accounts payable by 75%”, “Xerox redesigns its customer service process ordering and improves service levels by 75% to 97% and cycle time by 70%, with inventory savings of $500 million”, “Detroit Edison reduces payment cycles for work orders by 80%”, among other success stories that have shaped the corporate landscape in recent years (Grover & Malhotra, 1996). Such success is explained by the transformative character of the BPR practice, which according to Hengst & Vreede (2004) consists of a radical program of innovation and change of a multidisciplinary nature.

[1]A. C. Cabral (e-mail: amandachiotecabral@gmail.com)
Industrial Engineering Department, Pontifical Catholic University of Rio de Janeiro, Rua Marquês de São Vicente, 225, Gávea, Rio de Janeiro, RJ, Brazil

The practice offers the opportunity to restructure processes, with the objective of increasing efficiency, effectiveness and competitiveness with the help of information technology, with three main principles: radical change of one or more processes, clean slate approach and organizational participation from above down.

When applying the practice of BPR, according to de Pena & Fisher (1994), the organization can obtain some advantages, such as:

- Reduced bureaucracy and indirect costs
- Redundancy, rework and errors avoided
- Increase in profits
- Skilled and motivated workers

The concept and use of reengineering has been widely used and disseminated both in the corporate environment and in academia, as according to Grover & Malhotra (1997), a large part of its fame and legitimacy started from some articles and books published in academia. Both books stimulated the Reengineering activity in practice and in the academy, in addition to the wide dissemination by the consulting programs of the success cases of the application of BPR in large corporations, initiating several other future studies in the area.

The general objective of this study is to offer a scoping review that indicates the strategic mapping of the researched topic, aiming to support practical decisions on the implementation of the BPR and outlining future research in the area. The specific objective is to carry out a bibliometric and longitudinal analysis of the practice of BPR in recent years.

The research is divided into theoretical framework, which addresses the main definitions of the practice by the main authors, the methodology that will be delimited in the research, discussion of the results of the bibliometric analysis and of the longitudinal analysis and the research conclusions with suggestions for future research.

2 Theoretical Reference

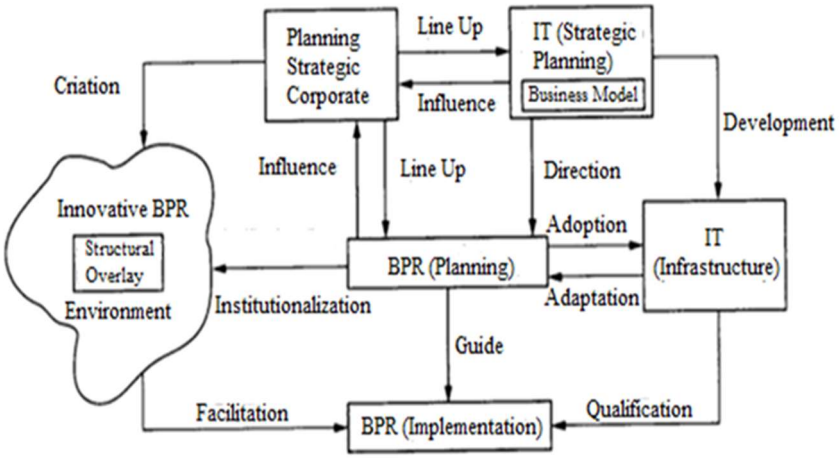
According to Guimaraes & Bond (1996), BPR means making radical changes in one or more business processes that affect the entire organization. It also requires a multifunctional effort, usually involving innovative applications of technology. Reengineering is a pioneering attempt to change the way work is done, briefly addressing all aspects of work that affect performance. Performance can include process activities, such as the tasks of people and their reward system, the structure of the organization, and the roles of executors and managers of organizational processes. The management system and the underlying corporate culture that maintains the beliefs and values that influence everyone's behavior and expectations can also be influenced by reengineering (Guimaraes & Bond, 1996).

With BPR, instead of simply eliminating steps or tasks in a process, the value of the entire process is questioned. Reengineering involves fundamental rethinking and a radical redesign of business processes to achieve dramatic improvements in various performance measures, such as cost, quality, service and speed. In BPR, there is an interrelation between the organizational components of the company, such as Business Process, Jobs and Structures, Values and Beliefs and Management and Measurement Systems (Hammer & Champy, 1993)

According to Grover et al (1993), BPR is increasingly recognized as a form of organizational change characterized by the strategic transformation of interrelated organizational subsystems, producing varying levels of impact. BPR's unique contribution to previous organizational change approaches is its primary focus on the business process. A process is a lateral or horizontal organizational form that encapsulates the interdependence of tasks, functions, people, departments and functions necessary to provide the customer with a product or service (Grover et al, 1993). Reengineering projects typically include attempts to transform the organizational subsystems of management (style, values, measures), people (jobs, skills, culture), information technology and organizational structures, including team and

coordination mechanisms. Changes in the subsystems are also visualized through the analytical lens of the business process (intra-functional, inter-functional, inter-organizational). The goal of transforming the process is to improve the products and services involved, measured in terms of cost, quality, customer satisfaction and shareholder value (Grover et al, 1993).

This perspective of organizational change recognizes that BPR is not a single concept, but a continuous concept of approaches to change processes. And while there is some similarity in the way companies approach reengineering, BPR projects differ in the magnitude of the planned change. The different characteristics of the project require different methodological choices and an emphasis on different techniques. Figure 1 describes the integrated structure for BPR planning.



Source: Adapted from Grover et al. (1993)
Figure 1: Integrated structure for BPR planning

In order to be implemented efficiently and effectively in organizations, an integrated planning of the different areas of the company must be followed, with a focus on the use of IT in its implementation. Firstly, there must be an initiative by top management for the existence of a formal BPR organization. In addition, it is necessary to integrate corporate strategic planning and strategic IT planning, which allows the beginning and success of BPR planning. Developing a corporate business model facilitates successful BPR planning. Its correspondence with the planning to be implemented, determines the successful implementation of Reengineering. An innovative organizational environment, including a formal BPR organization, facilitates the continued success of BPR, creating an environment conducive to the development of new processes that will replace the old ones.

The likelihood of BPR's initial and ongoing success is maximized by incorporating all elements of the strategy, implementation and innovation perspectives, driven by the integrated use of IT. BPR is best conducted in an integrated manner. In other words, to maximize the likelihood of success for BPR planning, it is necessary to consider all aspects of the structure together (Grover et al, 1993).

3 Methodology

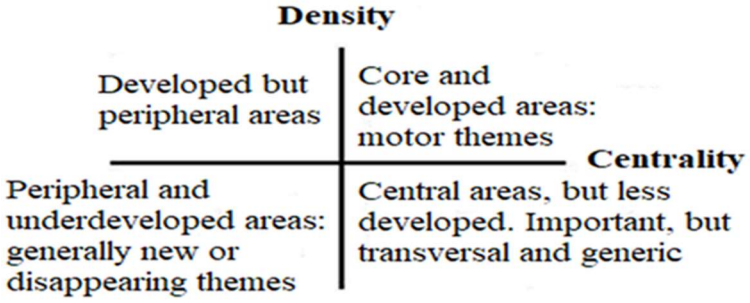
The study for the development of this article was developed in seven stages: (i) planning and formulation of research questions, through the study of analysis needs, scope definition, conceptualization of the topic, research questions; (ii) literature search through the collections of the Web of Science (WoS) databases; (iii) data collection through a filtering of the publications generated by the research from the previous step; (iv) data analysis and synthesis using tools such as Bibliometrix, a bibliometrics tool for the computational language R and Scimat, a bibliometric analysis software; (v) presentation of results through

figures, tables, graphs and clusters of the proposed thematic evolution; (vi) interpretation of the analysis previously performed, through the thematic evolution of the research (vii) final analysis of the results with the conclusion of the study and suggestion for future research. Each main step comprises specific substeps or individual tasks to be performed or also together.

Carrying out the bibliometric analysis stage, the main collection of WoS was used as a database, with the following search keywords in the titles, abstracts and keywords of the records: "BPR" OR "Business Process Reengineering". The results were improved, limiting the types of documents to articles and research papers and selecting only the material in English. There were no restrictions on the years of publication. The indexed databases included were SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH and ESCI. Then, the main descriptors (year, periodicals, authors, research, areas and organizations) were extracted from the database and analyzed with Bibliometrix and Biblioshiny, both packages of computational language R. Biblioshiny was also used to prepare analytical matrices for analysis of the occurrence / co-occurrence of keywords, citations, co-citations and geographic archives.

Then, a longitudinal analysis of the co-occurrence of authors and keywords from the WoS was carried out, showing the evolution of the main topics covered in BPR. The SciMAT software (Cobo et al., 2012a) was used to create thematic clusters and show Callon's thematic strategic diagrams (Callon et al., 1991) (Cobo et al., 2012b). The strategic diagrams are based on the co-occurrence of keywords measured by the similarity index $e_{ij} = {c_{ij}}^2/c_i\, c_j$ where e_{ij} is the equivalence index, c_{ij} is the number of documents in which two keywords co-occur, c_i and c_j is the number of documents in which each one occurs (Cobo et al., 2011).

The strategic diagram is a tool to visualize two measures of co-occurrence of clusters: Callon's centrality and Callon's density (Callon et al., 1991; Cobo et al., 2011; Cobo et al., 2012). Centrality measures the degree of interaction between a network and other networks. It is calculated as c= $10\sum e_{kh}$, where k is a keyword pertaining to the theme is a keyword pertaining to other themes. Density measures the internal strength of the network and is equal to d = $100(\sum e_{ij}/w)$, where i and j are keywords belonging to the theme and w is the total number of keywords in the theme, as shown in Figure 2. The results presented here are based on the density and centrality of the h index of the keywords. The H index is simply defined as the number of articles with a citation number ≤ h (Hirsch, 2005).



Source: Callon et al. (1991)

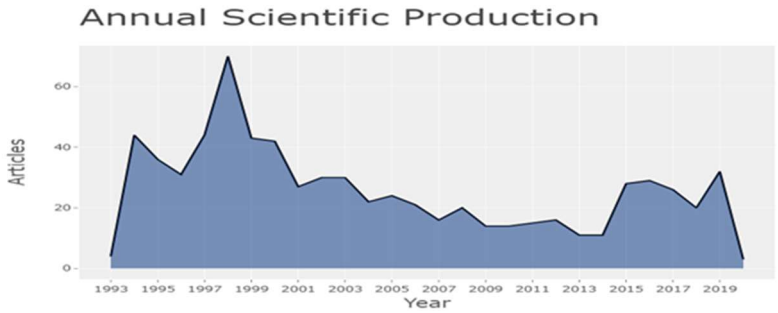
Figure 2: The four quadrants of the strategic diagram

4 Results

The bibliometric analysis was carried out through the research carried out in the Web of Science database, with research resulting in a network of 724 publications from 266 journals, with 1591 occurrences of authors in the period from 1990 to 2020. For this study, the Bibliometrix tool was used. , from the computational language R, which performs a comprehensive analysis of the mapping for quantitative research in bibliometrics that includes all the main bibliometric methods of analysis (Bibliometrix, 2020). The main descriptors (year, periodicals, authors, publications and countries) will be analyzed, followed by a longitudinal analysis of the evolution of the topics covered.

4.1 Study Descriptors

The term "Reengineering" first appeared in the early 1990s, with its first article published by Michael Hammer, and published in Harvard Business Review under the title "*Reengineering work: don't automate, obliterate*". It was, however, after the publication, in 1993, of the best-selling book "*Reengineering the corporation – A manifesto for business revolution"* that the theme came to gain great popularity, becoming known worldwide.



Source: Bibliometrix, 2020

Figure 3: Annual scientific production of BPR

Figure 3 shows the graph with the annual scientific production of Reengineering, in which it is possible to notice the peak of its production in the 90's, mainly in the interval between 1997-1999, where the concept was disseminated and used in several companies. Figure 4 shows the publications with the highest number of citations respectively and their year of publication, with emphasis on authors Michael Hammer and Thomas H. Davenport. Michael Hammer has great prominence in Reengineering, as he was one of its creators and great proponent of the management technique. Thomas H. Davenport is an important American writer, with emphasis on publications in the area of information systems, more precisely in information technology.

	Paper	Author	Publication Year	Number of Citations
1	Reengineering the Corporation	Michael Hammer	1993	270
2	Reengineering don't automate, obliterate	Michael Hammer	1990	176
3	Process Inovation: Reengineering Work Through Information Technology	Thomas H. Davenport	1993	155
4	Sloan Management Review	Thomas H. Davenport	1990	134
5	Toward a Theory of Business Process Change Management	Varun Grover	1995	48
6	Business Process Improvement: The Breakthrough Strategy fot Total Quality, Productivity and Competitiveness	H. James Harrington	1991	46
7	Reengineering Business Change of Mythic Proportions ?	Thomas H. Davenport	1994	45
8	Reengineering Management: The Mandate for New Leadership	James A. Champy	1995	37
9	Business Reengineering at CIGNA Corporation	J. R. Caron	1994	36

Source: Bibliometrix (2020)

Figure 4: Most cited publications and their respective authors and year of publication

In Figure 5, the main authors are presented through the analysis of their respective H indexes. The H index measures the impact on productivity and citations of publications. The H index is measured by the number of articles (h) published in which each article is cited by other articles at least h times (Hirsch, 2005). In addition, the M index is calculated, which is defined by h / n, where h is the H index and n is the number of years since the first article published by the author. From this table, it is possible to analyze that the author with the highest H index is Teng JTC, with the H: 11 index, having the highest productivity in BPR among all others.

AUTHOR	H INDEX	M INDEX	TOTAL CITATIONS	NUMBER OF PAPERS	YEAR OF FIRST PUBLICATION
Teng J.T.C	11	0.3929	623	12	1993
Grover V.	8	0.2858	274	9	1993
Fiedler K.D	8	0.2858	281	8	1993
Guimaraes T	6	0.2400	98	7	1996
Mccabe D	6	0.2609	244	6	1998
Deshmukh S.G	4	0.1905	59	5	2000
Irani Z.	3	0.1429	24	5	2000
Kettinger W.J	4	0.1538	343	5	1995
Maull R.S	5	0.1852	207	5	1994
Reijers H.A	4	0.2105	102	5	2002

Source: Bibliometrix (2020)

Figure 5: H index and M index of the authors

In Figure 6, the countries with the largest number of publications in Reengineering and the number of publications from a single country and publications from multiple countries are analyzed, and through it, it is observed that the countries with the largest number of publications and with the highest frequencies it is the United States, where the movement was created, and the United Kingdom. These countries are also those that collaborate most with other countries, in absolute terms due to the volume of publications. However, in relative terms, Canada and Australia have a higher multi-country publication ratio than that reported for the United States and United Kingdom.

LOCAL	NUMBER OF PAPERS	FREQUENCY	PUBLICATIONS FROM A SINGLE COUNTRY	PUBLICATIONS FROM DIFFERENT COUNTRIES	RATIO BETWEEN COUNTRY PUBLICATIONS
United States of America	151	21.45%	94	57	0.377
United Kingdom	135	19.18%	104	31	0.230
China	61	8.66%	45	16	0.262
Australia	32	4.55%	18	14	0.438
Taiwan	29	4.12%	27	2	0.069
Italy	27	3.84%	22	5	0.185
Netherlands	24	3.41%	15	9	0.375
Korea	22	3.12%	19	3	0.136
Germany	18	2.56%	14	4	0.222
Canada	13	1.85%	6	7	0.538

Source: Bibliometrix (2020)

Figure 6: Countries with the highest number of publications

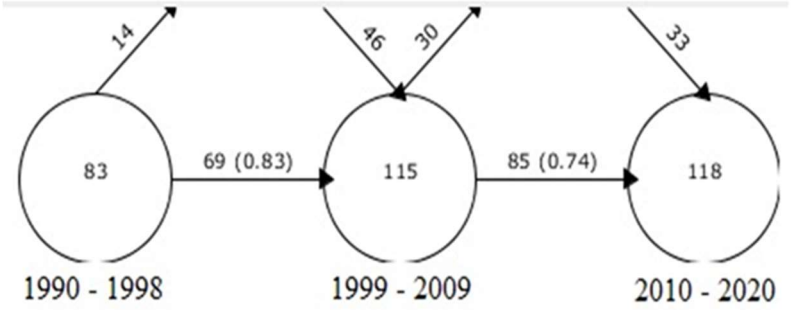
The ten main sources of Reengineering, with the largest number of publications, are also shown in Figure 7. The main sources are *International Journal of Operations & Production Management, The International Journal of Production Economics and Business Process Re-Engineering: Information Systems Opportunities and Challenges, Business Process Re-Engineering: Information Systems Opportunities and Challenges, International Journal Of Production Research and Business Process Management Journal,* with the largest number of articles published.

	Sources	Papers
1	International Journal of Operations & Production Management	43
2	International Journal of Production Economics	28
3	Business Process Re-Engineering: Information Systems Opportunities and Challenges	19
4	International Journal of Production Research	19
5	Business Process Management Journal	18
6	Production Planning & Control	16
7	Information & Management	15
8	Computers in Industry	14
9	International Journal of Flexible Manufacturing Systems	14
10	New Technology Work and Employment	14

Source: Bibliometrix (2020)
Figure 7: Main sources in BPR

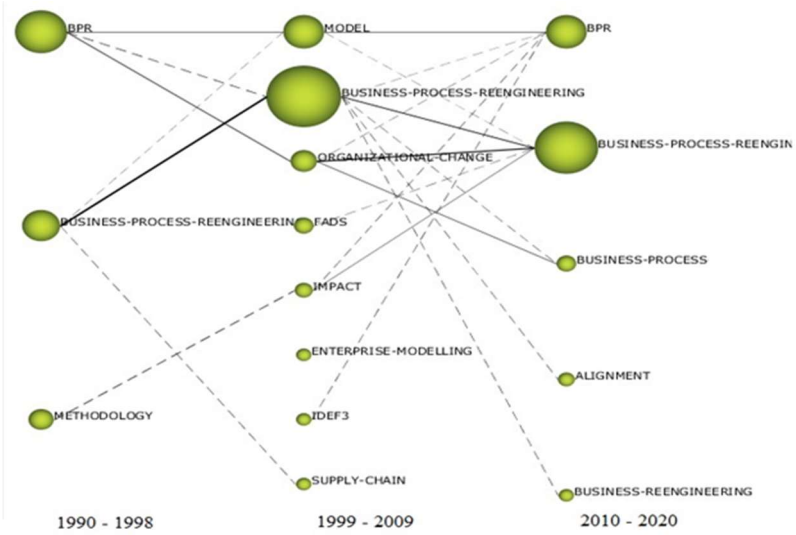
4.2 Thematic Evolution: 1990-2020

To carry out the study of thematic evolution, the publications were distributed in 3 periods of analysis. The longitudinal analysis of articles and keywords selected in the WoS were divided into 3 consecutive periods, showing an increasing number of keywords in the successive periods, as illustrated in Figure 8.



Source: Scimat (2020)
Figure 8: Overlapping map of keyword stability between periods

The number of keywords is within the circles for each period in Figure 8, with the exit and entry arrows indicating, respectively, the number of keywords that leave and arrive at a certain period. The numbers in parentheses are the proportion of keywords that remained from one period to the next. The total number of keywords increased from 83 in the period from 1990 to 1998 to 115 keywords, with 83% of keywords remaining for the next period. In the period from 1999 to 2009, there was a small increase in the number of keywords, with 74% of them remaining from one period to the next. Figure 9 shows the main themes for each period.



Source: Scimat (2020)

Figure 9: Thematic Evolution of BPR by period

The thickness of the lines is proportional to the strength of the connections between the themes from one period to the next. The solid line means that the theme retains the same name in the next period or the theme in the following period incorporates a theme with another name from the previous period. The size of the circles is proportional to the H index of each theme and shows the impact of the theme in terms of citations received.

For example, Business Process Reengineering in 1990-1998 maintains the same theme name in 1999-2009 through a solid and even stronger line. A dotted line means that themes share elements (subthemes) that are not the name of the themes. For example, some elements of Business Process Reengineering in 1990-1998 are associated with Models and the Supply Chain in 1999-2009, resulting in a dotted line connecting the clusters in both periods, as Business Process Reengineering is not a keyword Models and Supply Chain. The size of the circles is proportional to the H index of each theme and shows the impact of the theme in terms of citations received. Theme names are taken from the densest theme in the cluster. The keyword Methodology appears in the 1990-1998 analysis, moves to the Impact cluster in 1999-2009 and is carried over to the final period of 2010-2020, joining the Business Process Reengineering cluster. Enterprise Modeling appears isolated in the period 1999-2009 and does not appear in the next period. Business Process Reengineering appears as an influential theme in 1990-1998 and its influence is strengthened in 1999-2009, a period in which the theme peaked, demonstrated by the increase in the size of its circle.

The strategic diagrams for the four periods are shown in Figure 10.

Source: Scimat (2020)

Figure 10: Strategic diagrams based on the H index by period

The size of the circles is proportional to the H index and indicates the impact of the theme on the field, measured by the consistency of the citations received. BPR has a high centrality and density between 1990 and 1998. Business Process Reengineering appears as a central and less developed keyword in the first period. It is important to note that in the period 2010-2020, it remained below in a less dense position, becoming a central theme, but less developed in the period. This trajectory may be partly a reflection of the emergence of new themes related to the process.

By observing the upper right corner of the diagrams, we find the dominant themes of each period, those with high centrality and high density: BPR (1990-1998), Model (1999-2009) and Alignment (2010-2020). Themes with high centrality and low density are important for the research field, but they still need to be further developed. They evolved from Business Process Reengineering (1990-1998) to the same theme in the next period, gaining even more strength in this quadrant, together with Impact and Organizational Change in the period 1999-2009, and in the final period (2010-2020) returning the BPR and Bussiness Process Reengineering themes.

5 Conclusion

Reengineering is recognized for business transformation or business process change management and was originally a pioneer in the early 1990s, focusing on the analysis and design of workflows and business processes within an organization, involving all stages of the process business, from information technologies executed in the organization, to the organizational structure of workers. The results of bibliometrics networks confirm the multidisciplinary nature of BPR, as well as its relationship with information technology, process management and the area of information systems, but also indicate that these scientific areas tend to evolve independently.

The authors who have great prominence in the theme are Michael Hammer and Thomas H. Davenport, who stand out for being a pioneer in the technique and in the use of Information Technology in it, respectively. The most prominent publications cited are "*Reengineering the Corporation*" and "*Reengineering don't automate, obliterate*", both by Michael Hammer, published in the 90s, showing the relevance of the decade in management technique.

The countries with the largest number of publications are the United States, where the technique was created and the United Kingdom, respectively, and also those with the highest number of citations. The sources with the largest number of publications in BPR are International Journal of Operations & Production Management and International Journal of Production Economics, both focused on management and processes, a central theme of Reengineering. In the evolutionary and longitudinal analysis of the theme, the main keywords of great prominence were BPR, Business Process Reengineering, Methodology, Model, Organizational Change, among others.

It is expected that the accumulation of empirical evidence and knowledge on the areas related to Reengineering discussed here will support the development of models that relate background, characteristics and results of the study integrated with Reengineering management practices. It is also worth highlighting the potential contribution arising from the development of data analysis and integration procedures presented in this study. For the next studies in the area, it is worth developing a research to record the documentation of articles and publications in general of the areas treated here in this study, resulting in a categorization of the areas in which most BPR stands out. The analyzes used in this research allowed the structuring of a BPR scope review. This result can guide researchers and managers interested in the area, in addition to suggesting future research that relates how the Business Process Reengineering technique has been practiced to date with the future, especially in its relationship with information technology and new management techniques. of processes in general.

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