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Process Mapping and Modeling: A Theoretical tool Analysis

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Article Info
Volume 83
Page Number: 25914– 25925
Publication Issue:
May - June 2020

Article History
Article Received*: 11 May 2020*
Revised*: 19 May 2020*
Accepted*: 29 May 2020*
Publication*: 12 June 2020*

Abstract

The technological development and continuous changes in economic policies have motivated looking for greater efficiency in all levels of an organization. Organizations include in their management improvements that facilitate the control of their processes and activities. In this sense, management tools for process mapping and modeling have a positive influence on the companies' performance since their inclusion encourages the improvement and optimization of daily activities. However, there is evidence of disadvantages in the application of some adopted methods. This paper analyzes the weaknesses and strengths of the available management models and tools to cover three specific purposes. Firstly, exploring different tools and models for process mapping and modeling used in business management. Secondly, prioritizing tools that enable their integration with the ISO standard and process costing systems. Finally, establishing the advantages and disadvantages of prioritized tools, as well as their main characteristics. To this end, this work contemplates a theoretical analysis and comparison of the methods Business Process Management (BPM), Business Process Reengineering (BPR), and Event Process Chain (EPC).

Keywords: *Management models, management tools, process, mapping, modeling*.

I. INTRODUCTION

Nowadays, continuous technological advancements and constant changes in economic policies and tax regulations have forced companies to maintain strict controls in their operations. Organizations have had to tilt their operations towards models of control and management to develop their processes efficiently and to fulfill their stated objectives. In the process management, it is imperative to know each sub-process, activity, task, and resources required(Baldwin, 2010). To manage these complexities, different models have emerged, as well as tools to facilitate the recognition and representation of business processes. The main management models developed are those related to the quality, innovation process, and business, being the most prominent those oriented to process management. There are multiple tools designed to

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perform identification, mapping, and processes modeling(Dumas, 2013). However, up to our knowledge, no model combines several process tools to the ISO 9001standard and a formal costing system.

On the one hand, the ISO 9000 standard is a series of conventions for process normalization, which primary objectives are facilitating trade and promoting global harmonization(Apcer, 2016). Among its versions, ISO 9001:2015 (ISO, 2015)maintains a strong emphasis on the process-based approach. This regulation establishes that an organization needs to manage its processes to achieve desired results, by providing to its customers consistent products and services, and complying with the Plan, Do, Check, and Act cycle (PDCA) of continuous improvement. This standard is based on seven principles of quality management: client, leadership, people commitment, process-based approach, improvement, evidence-based decision-making, and relationship management.

On the other hand, in the accounting setting, there exist two relatively novel approaches called Activity-Based Costing (ABC) and Time-Driven Activity-Based Costing (TDABC). ABC is a costing system designed by Kaplan and Cooper (1998). Compared to traditional costing methods, it develops a more accurate and efficient treatment of indirect costs(Ellis-Newman, 1998). ABC revolutionized the costing management and was the basis for TDABC(Kaplan, 2003). TDABC advantages permit overcoming the weaknesses of previous approaches(Dejnega, 2011). This technique allows the development of accurate cost information on a wide range of activities(Siguenza-Guzman, 2013).

The purpose of this study lies in the literature review of main models and tools for process mapping and modeling, compatible with the ISO 9001 standard and the TDABC system. First, the work includes a systematic literature review regarding tools and models that facilitate the implementation of process management. Second, the work presents a prioritization matrix to identify tools compatible with ISO 9001 and TDABC. Finally, the work analyses the main features, advantages, and disadvantages of each selected tool, as well as integration issues. The structure of the paper is as follows. Section 2 presents a theoretical background regarding management models and tools. Section 3 describes the methodology employed. Section 4 encompasses results together with analysis and discussion. Finally, the conclusion section gathers the main findings of the study as well as proposals for future work.

II. LITERATURE REVIEW

The management concept comes from the Italian word maneggiare and the French word manège. It is associated with driving or operating in a systemic, creative, reflective, and questioning style and sees processes as a means to achieve the objectives of an organization(Djelic, 2016; Karlöf, 2007). The concept of process refers to those activities partially ordered in order to achieve a goal (Hammer, 2009). Most processes contain inputs, outputs, resources, and control systems. Some authors classify business processes as strategic, support, and operational(Hernández-Nariño, 2014). The management is responsible for turning the company into an integral system, where processes are the basis of strategic changes, subjected to constant revisions for continuous improvements.

Management conceives a company as an integral system of processes, seeking to turn them into a solid base for strategic changes in the organization. A management system helps companies to establish processes, methodologies, responsibilities, resources, and activities, among other tasks, to achieve the expected objectives in a given period(Beltrán, 2002). The management model (how to develop it) relates to responsibilities (who), resources (with what), methodologies (how), programs (when), and, finally, expected results to achieve (results achieved). Many companies use

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recognized standards or models to conduct and control their organizations. Hence, it is essential to define stages of a process mapping, which can work independently of the model used. Process mapping is a way of representing processes, sub-processes, and activities as accurately as possible, in search of achieving a particular result or product. Process mapping techniques help project teams to document existing processes(Kettinger, 1997), by using simple representational techniques such as process flow diagrams, or more structured techniques as role activity diagramming(Huckvale, 1994)and workflow modeling.

According to(Chen, 2007; Dumas, 2013; Ten Have, 2003), several tools for mapping and modeling processes are available in the literature; however, the most common are: Definition of Integration for Modeling Functions, IDEF; Business Process Management, BPM; Event Process Chain, EPC; Unified Modeling Language, UML; Data flow diagram, DFD; Structured Analysis and Flow Model of Design Techniques, SADT; Business Process Reengineering, BPR; and, Business Activity Monitoring, BAM. The IDEF family is a set of notational formalisms for representing and modeling processes and data structures in an integrated fashion(Giaglis, 2001). BPM develops a process-oriented organization, eliminating activities that do not add value and improving the process flow within the limits of an organization(Kujansivu, 2008). EPC is a modeling language used to describe business processes(Dehnert, 2003). UML is a standard graphic language to specify, build, visualize, and document software-intensive systems (Booch, 1999). DFD is a technique for graphically depicting data flows among external entities, internal processing steps, and data storage elements in a business process(Kettinger, 1997). SADT is a graphic language that provides a limited set of primitive constructs from which analysts and designers can compose orderly structures of any required size(Ross, 1977). BPR is a form of organizational change characterized by a strategic transformation of interrelated organizational subsystems producing varying levels of impact(Kettinger, 1997). Finally, BAM is one of the emerging areas in business process analysis. Its goal is to use data logged by the information system to diagnose the operational processes(Weske, 2004).

III. MATERIALSAND METHODS

This work contemplates a theoretical analysis of management models and tools for mapping and modeling process. This analysis bases on the integration of compatible tools with the ISO 9001 standard and TDABC. Firstly, a literature review about mapping tools and process modeling was performed. The management tools identified were IDEF, BPM, EPC, UML, DFD, SADT, BPR, and BAM. Next, the construction of a prioritization matrix helped for the integration level analysis of these tools with the main ISO 9001 and TDABC requirements. The study included 26 papers selected from the specialized literature. Appendix A contains a full list of references.

The prioritization matrix allowed including four key criteria for the integration of these tools with ISO 9001 and TDABC. These criteria are time per activity, costs per activity, process map, and flowcharts. In the TDABC context, the first and second criteria are directly related to two of the main application requirements(Kaplan, 2003). The first refers to the determination of time per activity, people or machine, used to perform an activity. The second corresponds to the resolution of the cost per activity, quantifying the time incurred, adding the use, and resource consumption. The third and fourth criteria are aimed at integrating these tools with the main requirements of the ISO system(ISO, 2015). Thus, the third criterion refers to the planning of process mapping and determination of the process classification, according to the needs and customer satisfaction. Finally, the last criterion refers to the design and preparation of flowcharts that allow visualizing the connections among the organization

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departments.

For the evaluation of results, the literature review allowed determining each criterion. In this sense, through the theoretical analysis of process management models, mapping tools, and process modeling, it was possible to determine those criteria integrable with the TDABC system and the ISO 9001 standard. For this purpose, the study included qualitative aspects such as concepts, advantages, disadvantages, and criteria. The tools prioritization matrix allowed conceiving the qualitative analysis performed. Here, the symbol (o) refers to tools complying with the parameters of integration in the selected criterion, whereas (x), symbolizes not compliment. Table 1 summarizes the qualitative results and includes the four criteria mentioned above.

Table 1. Prioritization matrix of tools for mapping and modeling processes

Management Tools	Time per activity	Cost per activity	Process map	Flowchart
IDEF	x	x	x	o
BPM	x	x	o	o
EPC	x	x	x	o
UML	x	x	x	o
DFD	x	x	x	o
SADT	x	x	x	o
BPR	x	x	o	o
BAM	x	x	x	o

Note IDEF=Definition of Integration for Modeling Functions; BPM=Business Process Management; EPC=Event Process Chain; UML=Unified Modeling Language; DFD=Data flow diagram; SADT=Structured analysis and flow model of design techniques; BPR=Business Process Reengineering; BAM=Business Activity Monitoring.

IV. RESULTS AND DISCUSSION

The analysis of the prioritization matrix leads to prioritize three of the eight tools: BPM, BPR,

and EPC. This work shows the links of the selected tools with the ISO 9001 standard and the TDABC system. The chosen criteria of the ISO 9001 standard and TDABC system, presented in Table 1, were the basis for a deep analysis that included characteristics, advantages, and disadvantages. Finally, to guarantee the research quality, an expert in the subject checked the findings and integration capabilities. The analysis concluded that no specific management model adapts to TDABC. This is

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because none allows determining the time or costs per activity. However, from the literature analysis, in the first instance, it was possible to determine that the models' BPM and BPR allow mapping and process modeling aimed at the ISO certification or recertification. In a second phase, due to the data quality gathered, about processes, sub-processes, activities, times, and resources, these methods allow easy connection to costing systems as ABC or TDABC. These data are obtained through application forms for the process mapping.

In a subsequent analysis of Table 1, the appearance of two checkmarks indicates that both BPM and BPR reached significant results. The other six tools got one checkmark individually. This is because they consider process modeling only through flowcharts. Based on these results, there was an in-depth analysis of the BPM and BPR models. Both models create process maps and flowcharts based on the needs and client's satisfaction through the development of strategic, support, and operational processes. The above is the link between the tools analyzed and the ISO 9001 since this standard proposes representing the processes, through maps, as a global activity compiled in the scope of the quality management system(ISO, 2015).

The analysis also included EPC as a third tool due to its link with Business Process Management and Notation (BPMN). According to *BPMN (Specification - Business Process Model and Notation*), Business Process Management Initiative (BPMI) developed BPMN in order to provide easy and understandable notation for all users in the organization. In this sense, some authors extended the meta-models of EPC and BPMN to provide notation elements to include performance aspects into process models(Korherr, 2007). Some users refer to EPC as easy to understand and a complement for the application of BPMN.

It is worth noting that these three tools are compatible with the ISO 9001 standard. Moreover, although the five remaining tools allow the realization of flowcharts, it was not possible to determine, through literature analysis, advantages that significantly contribute to the integration with ISO and TDABC.

1 General description of prioritized tools BPM, BPR, and EPC

Business Process Management (BPM)

BPM is considered the most adaptable system to analyze processes in terms of context and activity. It is widely used in the assembly industry based on principles, methods, and tools to improve processes (Aalst, 2016). The main idea of BPM is to develop a process-oriented organization by eliminating activities that do not add value (Kujansivu, 2008). Its implementation in organizations is through a series of steps and activities, called the BPM life cycle(Dumas, 2013). BPM seeks to improve the quality of products and services, for which it uses a systematic and structured approach to analyze, control, and manage processes (Elzinga, 1995). This approach includes a series of techniques and tools to increase the flow of operational, support, and strategic processes, or to integrate the administration of the entire organization. An essential part of BPM is BPMN, the standard notation for modeling business processes (Recker, 2010). Process modeling tools permit to obtain graphical representations of active and future processes within organizations (IIBA, 2009).

Business Process Reengineering (BPR)

There are different BPR conceptions that depend on the changes applied to organizations. According to Davenport (1990), BPR is considered a system for diagramming workflows and processes within the entity and between companies. Hammer (2009) has promoted "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical and contemporary measures

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of performance, such as cost, quality, service, and speed".Kettinger (1997) quotes that "BPR is increasingly recognized as a form of organizational change characterized by the strategic transformation of interrelated organizational subsystems that produce different levels of impact". Although new techniques and BPR tools are available, no BPR project planner exists with a universal method. Instead of a quick fix, there is a BPR contribution to organizational change with business processes as a primary focus (Kettinger, 1997). Researchers indicate that internal BPR teams often modify existing methods of Total Quality Management (TQM) to adapt to a more proactive change in business processes(Harkness, 1996). BPR projects often include attempts to transform management subsystems, people, information technology, and organizational structures, including coordination mechanisms and equipment. The objective of this transformation is to improve products and processes.

Event Process Chain (EPC)

EPC represents an graphic and intuitive business process description language that is easy to learn and understand (Dehnert, 2003; Aalst, 1999). This language describes processes at the business logic level, not necessarily at the level of formal specification. An Event Process Chain consists of the following elements: functions, events, and logical connectors. Functions symbolize basic building blocks, where a function corresponds to an activity to execute. Events that link functions describe the state before and after a function is executed. An event corresponds to the following condition of a function and may act as a precondition of another function. EPC is commonly used for redesigning business processes through modeling and analysis. This solution allows handling the modeling language to represent different conditions of a business process. In this sense the activity-based costs, and process documentation related to quality, are fundamental according to the requirements of the ISO standard 900x(Loos, 1998).

2 Characteristics of the prioritized tools

Table 2 focuses on presenting the main features of the selected tools. This individual analysis is important since it allows knowing the affinity degree of each tool in terms of the ISO 9001 standard and the TDABC system. Essential characteristics, such as the use of new processes or conditions of existing ones, are crucial in their mapping. The risk level refers to the context in which these tools are implemented, considering it in terms of management, low risk if the administrative impact of changes is minor, and high risk if changes to be made in the processes are considerable.

Table 2.Main features of BPM, BPR and EPC tools for integration with ISO and/or TDABC

Features	BPM	BPR	EPC
Use new or existing processes	Automate and reuse existing processes	Reuse existing processes or recreate processes from scratch	Work with process map from another tool to develop flowcharts
Risk	The administrative risk of the implementation is low	The administrative risk of the implementation is high	The risk administrative of the implement is low
Change	Processes change is continuous	Tremendous change at the end	The change is continuous
Time required for implementation	Takes a long time (weeks – months) to be	Takes a long time (weeks – months) to be	The time to be implemented is not

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	implemented, depending on the company size and the complexity of the organization's processes	implemented, depending on the size of the company and the complexity of the organization's processes	significant since it has few simple and easy to understand graphic notations
Collaboration	Business collaboration and information technology is essential for the implementation	Business and IT collaboration is optional for implementation	Business collaboration and information technology is essential for the implementation
Separately work / Simultaneously work	One or more processes can be taken and work simultaneously	It takes an important process, and it is worked at the same time	One or more processes can be taken and work simultaneously.
Financial Impact	Once implemented, BPM leads to asset optimization	Through its implementation, BPR lead to staff layoffs	Not available
Cultural Impact	It does not affect the culture of the organization	During implementation, cultural issues become an important concern since changes can be radical	It does not affect the culture of the organization
Cost of implementation	It is not very expensive; it depends on the time required for its implementation	It is costly, considering that it makes radical and profound changes in organizations	It is not very expensive since it only performs flowcharts

The adoption of these tools may bring gradual, continuous, or radical changes in the processes. The following characteristic analyzed concerns the time needed for tools implementation, which depends on the company size and the organization processes complexity. A medium-sized company would require a few weeks or even months to implement BPM. It would even take longer for BPR due to the reengineering and the level of changes made in processes. However, EPC requires much less time if the process maps are available. The feature called collaboration relates to the cooperation for the application of technology, or personnel of the organization, in search of the connection and adoption of tools that allow managers to make a preliminary decision before acceptance.

In turn, the next point is to determine if the integration and application of each tool allow working with a single or several processes at the same time. However, it is important to mention that the ultimate purpose of each tool does not differ from the individual or group analysis of one or several processes at the same time. The following characteristic refers to the level of the financial impact on the connection and adoption of optimized tools; this is defined in monetary terms of savings or considerable expenses through its application. The characteristic called cultural impact establishes the level of impact on the management performed by people in organizations since significant changes can even lead to a complete restructuring of the institution or even the elimination of certain positions. Finally, implementation costs closely relate to the time required for the combination and adoption of organizations and the internal changes generated in the application of any prioritized tool.

Based on the review performed, Table 2 presents the main features of the three tools. It allows visualizing

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the connection made with the ISO 9001 standard by EPC through the flow diagrams, and BPM and BPR through process maps and flowcharts. However, although the link of the tools with the norm is direct, it should also be taken into account the integration with TDABC since it better allocates indirect costs to cost objects and establishes priorities for process improvements(Siguenza-Guzman, 2013). Thus, it would allow, in the first instance, determining that by improving the mapping and process modeled through the ISO standard, the integration of tools and the TDABC is also possible.

3 Advantages and disadvantages of the prioritized tools

Table 3 presents an analysis of the main advantages and disadvantages observed in BPM, BPR, and EPC in terms of integration with the ISO 9001 standard and the TDABC system. From the literature analyzed and the inherent characteristics of the models, it is possible to outline these feature aspects.

Table 3. Advantages and disadvantages of BPM, BPR, and EPC

	Advantages	Disadvantages
BPM	- Applicable to any project, independently of the Business Process Management Suite (BPMS) - Design and modeling of the process are prioritized - Follow up can be performed by any user, not only technical - Processes are modeled through BPMN and understandable to any user - Techniques applied are commonly used - Improves understanding and visualization of processes in the organization because it uses specialized characterization forms for the process mapping - Allows improvements in time and costs by increasing professional efficiency - Provides a continuous process improvement approach by providing an evolutionary and incremental procedure - Provides robust tools to increase the development and automation of processes	- Starts without being prepared - Does not contemplate an initial analysis phase - Thinking is based only on functions - Does not consider the end-users - Approach is based on the short term - Decision making becomes empirical - Sometimes it applies techniques or steps that prove unnecessary for certain BPMS and delay the project - Must be complemented with other methods to cover the entire project (i.e., time management, costs, indicators) - Requires a multidisciplinary team for its implementation - Requires time to verify results obtained at the end of all phases of the cycle

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BPR	- Effort concentrated in areas of the organization and specific procedures - Get improvements in a short time and visible results through the process characterization forms - Generates a reduction of defective products, and thus, a reduction in costs due to lower consumption of raw materials - Increases productivity and directs the organization towards competitiveness - Contributes to the adaptation of the processes to the constant technological advances - Allows eliminating repetitive processes	- Resistant to change - Implies a high risk since changes that arise are radical - Initially, it only took into account the operational section and neglected the redesign of Administration (Management) - Reengineering has served as a perfect excuse for the dismissal of staff and elimination of jobs
EPC	- Powerful and easy to understand for end-users - Used to capture and discuss business processes with people without training in modeling techniques - Models can be refined and used for the definition of requirements of an information system - Connections to traditional modeling methods have been very useful in developing information systems for process-oriented organizations	- Presents an unclear link between activities and objects which are best visualized using interaction diagrams or state diagrams - Occasionally, far from being complemented, EPC has been gradually replaced by BPMN which is more expressive with rich tool holders

The main advantage of BPM lies in the design and process modeling, which is easy to understand and to handle and facilitates development and automation. However, the main disadvantage is not having a previous analysis phase, which could delay its application. The application of BPR has the advantage of becoming big support for organizations wanting to improve productivity and competitiveness in the environment in which they operate, through the reduction of costs incurred in unnecessary or repetitive activities. Nevertheless, its application often suggests radical changes, which is a clear disadvantage. Finally, EPC is easy to understand and to connect with different tools for process modeling. Its main weakness lies in the modeling system.

4. Integration of prioritized tools with ISO 9001 and TDABC

For the process mapping and modeling, the tools BPM, BPR, and EPC have features compatible with the ISO 9001 standard and the TDABC system. Table 3 presents the particular advantages of prioritized tools. The literature review showed that these tools are applicable regardless of the type of activity performed at the organizations; furthermore,

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they may exhibit short, medium, and long term vision scopes. Additionally, the results are easy to understand, they improve the processes by adapting or eliminating them according to the needs of the organization, their vision is not limited to the process analysis, and contemplates later stages as part of a management model integrating costs and optimization. These tools also allow the company to know all its processes, threads, and activities and enable professionalizing in different business areas. Finally, the tools contain suitable application forms for process mapping that facilitate the collection of information related to process, time, and costs. These forms aid the integration of the tools with the ISO 9001 standard and the TDABC system.

V. CONCLUSIONS

Management is a continuously evolving subject that provides industries with precise control of their operations, as well as resources consumed in their execution. For the prioritization of management model tools is was necessary to study and to analyze their strengths and weaknesses. In this sense, the present study was aimed at achieving three fundamental objectives. Firstly, the study considered different tools for process mapping and modeling used in business management models. Eight modeling tools were examined through the selected literature. A prioritization matrix allowed choosing three modeling tools that enable their integration with the ISO 9001 standard and the TDABC system. These modeling tools were BPM, BPR, and ECP, and their advantages and disadvantages were stipulated, as well as their main features. Among the criteria for prioritizing the tools considered are mapping and modeling processes inputs for effective process execution, the existence of a planning phase focused on risks, correct allocation of resources per process, and coupling with the Plan-Do-Check-Act cycle. Regarding the adaptation to the TDABC system, the selected tools cover primary mapping requirements, such as processes, sub-processes, activities, resources used, and the time spent in their execution.

VI. SCOPEFOR FUTURE RESEARCH

Future research is underway to design a new methodology that integrates the tools analyzed for process mapping and modeling, as well as a more in-depth analysis for defining phases, stages, and steps required in its implementation.

VII. ACKNOWLEDGMENTS

This study is part of the research project “Modelo de gestión para la optimización de procesos y costosen la Industria de Ensamblaje,” supported by the Research Department of the University of Cuenca (DIUC). The authors gratefully acknowledge the contributions and feedback provided by the IMAGINE Project team.

Appendix A: List of References read in the Literature Review

This section can be found on line athttps://imagineresearch.org/wp-content/uploads/2020/02/Process-Appendix-A-References.pdf

REFERENCES

1. Aalst, W. M. P. van der, Rosa, M. L., & Santoro, F. M. (2016). Business Process Management. Business & Information Systems Engineering, 58(1), 1-6. https://doi.org/10.1007/s12599-015-0409-x
2. Apcer. (2016). Guía del Usuario ISO 9001: 2015. https://www.apcergroup.com/espana/images/site/graphics/guias/APCER_GUIA_ISO9001-2015_ES.pdf
3. Baldwin, C. (2010). Gestión Empresarial. http://www.ebrary.com
4. Beltrán, J., Carmona, M., Carrasco, R., Rivas, M., & Tejedor, F. (2002). Guía para una gestión basada en procesos. Instituto Andaluz de Tecnología. Govern de les Illes Balears.
5. Booch, G., Rumbaugh, J., & Jacobson, I. (1999). The Unified Modeling Language User Guide Addison-Wesley. Reading.

May-June 2020
ISSN: 0193-4120 Page No. 25914– 25925

6. BPMN Specification - Business Process Model and Notation. (s. f.). Recuperado 29 de enero de 2020, de http://www.bpmn.org/
7. Chen, C. C., & Jones, K. T. (2007). Management Tools. The CPA Journal; New York, 77(8), 50-55.
8. Davenport, Thomas H, S., James E. (1990). The New Industrial Engineering: Information Technology And Business Process Redesign - ProQuest. Sloan Management Review, Tomo 31(4), 11-27.
9. Dehnert, J. (2003). A methodology for workflow modeling. From business process modeling towards sound workflow specification: Dissertation/Technische Universitat Berlin, Germany.
10. Dejnega, O. (2011). Method Time Driven Activity Based Costing – Literature Review. Journal of Applied Economic Sciences (JAES), VI(1), 9-15.
11. Djelic, M.-L. (2016). History of management – what is the future for research on the past? A Research Agenda for Management and Organization Studies. https://www.elgaronline.com/view/edcoll/9781784717018/9781784717018.00006.xml
12. Dumas, M., La Rosa, M., Mendling, J., & Reijers, H. A. (2013). Fundamentals of Business Process Management. Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-33143-5
13. Ellis-Newman, J., & Robinson, P. (1998). The cost of library services: Activity-based costing in an Australian academic library. The Journal of Academic Librarianship, 24(5), 373-379. https://doi.org/10.1016/S0099-1333(98)90074-X
14. Elzinga, D. J., Horak, T., Chung-Yee Lee, & Bruner, C. (1995). Business process management: survey and methodology. IEEE Transactions on Engineering Management, 42(2), 119-128. https://doi.org/10.1109/17.387274
15. Giaglis, G. M. (2001). A Taxonomy of Business Process Modeling and Information Systems Modeling Techniques. International Journal of Flexible Manufacturing Systems, 13(2), 209-228. https://doi.org/10.1023/A:1011139719773
16. Hammer, M., & Champy, J. (2009). Reengineering the Corporation: Manifesto for Business Revolution, A. Zondervan.
17. Harkness, W. L., Kettinger, W. J., & Segars, A. H. (1996). Sustaining Process Improvement and Innovation in the Information Services Function: Lessons Learned at the Bose Corporation. MIS Quarterly, 20(3), 349-368. JSTOR. https://doi.org/10.2307/249661
18. Hernández-Nariño, A., Medina Leon, A., Nogueira Rivera, D., Negrin-Sosa, E., & Marqués-León, M. (2014). Systems characterization and classification, a needed step for processes management and improvement. The specifics of health care organizations. DYNA, 81, 193-200.
19. Huckvale, T., & Ould, M. (1994). Software Assistance for Business Re-engineering (K. Spurr, P. Layzell, L. Jennison, & N. Richards (Eds.); pp. 81–97). John Wiley and Sons Ltd. http://dl.acm.org/citation.cfm?id=197422.197435
20. IIBA, I. I. of B. A. (2009). A Guide to the Business Analysis Body of Knowledge (BABOK Guide), Version 2.0. International Institute of Business Analysis.
21. ISO, S. (2015). 9001: 2015. Sistemas de Gestión de la Calidad-Requisitos.
22. Kaplan, R. S., & Anderson, S. R. (2003). Time-Driven Activity-Based Costing (SSRN Scholarly Paper ID 485443). Social Science Research Network. https://papers.ssrn.com/abstract=485443
23. Kaplan, R. S., & Cooper, R. (1998). Cost & Effect: Using Integrated Cost Systems to Drive Profitability and Performance. Harvard Business Press.
24. Karlöf, B., & Lövingsson, F. H. (Eds.). (2007). Organization and management. En

May-June 2020
ISSN: 0193-4120 Page No. 25914– 25925

ReOrganization (pp. 59-65). Springer. https://doi.org/10.1007/978-3-540-33273-2_4

25. Kettinger, W. J., Teng, J. T. C., & Guha, S. (1997). Business Process Change: A Study of Methodologies, Techniques, and Tools. MIS Quarterly, 21(1), 55. https://doi.org/10.2307/249742
26. Korherr, B., & List, B. (2007). Extending the EPC and the BPMN with Business Process Goals and Performance Measures. ICEIS (3), 287–294.
27. Kujansivu, P., & Lönnqvist, A. (2008). Business process management as a tool for intellectual capital management. Knowledge and Process Management, 15(3), 159-169. https://doi.org/10.1002/kpm.307
28. Loos, P., & Allweyer, T. (1998). Object-orientation in business process modeling through applying event driven process chains (EPC) in UML. Proceedings Second International Enterprise Distributed Object Computing (Cat. No.98EX244), 102-112. https://doi.org/10.1109/EDOC.1998.723246
29. Recker, J. (2010). Opportunities and constraints: the current struggle with BPMN. Business Process Management Journal, 16(1), 181–201.
30. Ross, D. T. (1977). Structured Analysis (SA): A Language for Communicating Ideas. IEEE Transactions on Software Engineering, SE-3(1), 16-34. https://doi.org/10.1109/TSE.1977.229900
31. Siguenza-Guzman, L., Van den Abbeele, A., Vandewalle, J., Verhaaren, H., & Cattrysse, D. (2013). Recent evolutions in costing systems: A literature review of Time-Driven Activity-Based Costing. Review of Business and Economic Literature, 58(1), 34–64.
32. Ten Have, S., Ten Have, W., Stevens, F., vander Elst, M., & Pol-Coyne, F. (2003). Key management models: The management tools and practices that will improve your business. Pearson Education.
33. Van der Aalst, W. M. P. (1999). Formalization and verification of event-driven process chains. Information and Software Technology, 41(10), 639-650. https://doi.org/10.1016/S0950-5849(99)00016-6
34. Weske, M., Van der Aalst, W. M., & Verbeek, H. M. W. (2004). Advances in business process management. Data & Knowledge Engineering, 50(1), 1–8.