Roadmap for operational sustainability: an approach based on Integrated Management Systems and Business Process Management

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RESUMO

Objetivo - Este artigo propõe um roadmap para a sustentabilidade nas operações com base em princípios e práticas de Sistema de Gestão Integrado (SGI) e Business Process Management (BPM).

Referencial teórico – As empresas consideram seus resultados baseados nas dimensões econômica, ambiental e social desta forma, alguns pesquisadores apontam a contribuição do SGI para a sustentabilidade. Outro aspecto importante da mudança para modelos de negócios mais sustentáveis é a estrutura organizacional. O BPM foca na implementação da gestão horizontal da organização por meio de processos de negócios.

Metodologia – Diante deste contexto, foi realizada uma revisão sistemática da literatura (SLR), a fim de identificar princípios, práticas e técnicas de IMS e BPM, seguidos da elaboração do roteiro e da pesquisa de campo com especialistas.

Conclusões - Os resultados da pesquisa de campo indicam que o roteiro representa uma estrutura que pode apoiar as organizações a alcançar seus objetivos de sustentabilidade.

Limitações / implicações da pesquisa - Uma das limitações do estudo foi o número reduzido de especialistas que analisaram o roteiro, desta forma, sugere-se consultar outros especialistas. Outra limitação é o fato de o estudo ter que avançar nas questões de implementação apresentadas pelo roteiro proposto. Nesse sentido, um estudo adicional deve ser realizado para abordar esse ponto.

Originalidade - Esta pesquisa utiliza conceitos já consolidados na literatura (SGI e BPM) como suporte para empresas que buscam se tornar mais sustentáveis.

Palavras-chave: Sistema de gestão Integrado; Gerenciamento de processos de negócios; Roteiro; Sustentabilidade; IMS; BPM.

ABSTRACT

Purpose - *This paper proposes a roadmap for the sustainability of operations based on the principles and practices taken from Integrated Management Systems (IMS) and Business Process Management (BPM).*

Theoretical framework *- Companies must consider results based on the economic, social, and environmental dimensions of the Triple Bottom Line, and as such, some researchers point to the contribution made by IMS for sustainability. Another important aspect of changing to more sustainable business models is organizational structure. BPM focuses on implementing horizontal management in the organization through business processes.*

Design/methodology/approach – *Within this context, a Systematic Literature Review (SLR) was carried out to identify IMS and BPM principles, practices and techniques, then a roadmap was designed and field research was carried out by specialists.*

Findings *- Field research findings indicate that the roadmap represents a framework which can support organizations to achieve their sustainability goals.*

Research limitations/implications - *One of the limitations in the study was the reduced number of specialists who analyzed the roadmap. Therefore, it is suggested, as a further study, that this roadmap is validated by other experts, including people from other countries. Another limitation is that the study must progress further on the issues of implementation posed by the proposed roadmap. As such, a further study should be carried out to address this point.*

Originality/value - *This study uses concepts that have already been consolidated in the literature (IMS and BPM) as support for companies that seek to become more sustainable.*

Key words - *Integrated Management System; Business Process Management; Roadmap; Sustainability; IMS; BPM.*

1. INTRODUCTION

In order to address sustainability, companies have to consider the triple bottom line's dimensions, economic, social and environmental (ELKINGTON, 1998). Sustainability has been increasingly attracting attention of academics and practitioners (LINNENLUECKE; GRIFFITHS, 2010). According Kiron *et al.* (2017), around 90% of executives see sustainability as important and 50% of companies have changed their business models for reach sustainability. These companies do not only focus on process improvement, but also on offering products and services, value chain processes and organizational structure changes (KIRON *et al.* 2013). According to Kleindorfer *et al.* (2005), the management of sustainable operations will contribute to make the companies more adaptable, agile and aligned with the dimensions of sustainability.

Some researchers point out the contribution of IMS for sustainability. According to López-Fresno (2010), Integrated Management Systems (IMSs) can provide several benefits related to decision making, communication and resource use (e.g. ISO 9001, ISO 14001, OHSAS 18001 and ISO 26000). Jørgensen *et al*. (2006) assert that if integration is seen as strategic, it will bring better competitive advantages, as well as contribute to sustainable development. Other authors such as Rocha *et al*. (2007) and Jørgensen (2008) also address the contribution of IMSs to sustainable development. According to Asif et al. (2011), using Integrated Management Systems (IMSs) enables sustainability in the main business processes. The integrated application of standards focused on quality (ISO 9001), the environment (ISO 14001), social responsibility (ISO 26000) and health and safety (OHSAS 18001) lead to major contributions concerning the development of more sustainable companies.

Another important aspect of changing to more sustainable business models is organizational structure. The functional management approach tends to isolate areas of knowledge in departments, making it more difficult to disseminate a systemic vision, which is a fundamental aspect for sustainability. In contrast to this approach, a Business Process Management (BPM) focuses on implementing the horizontal management of the organization through business processes (SILVA *et al*., 2012).

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According to ABPMP (2009), BPM is a disciplined approach to identify, design, execute, document, measure, monitor, control and improve business processes. It aims to meet an organization's strategic goals with customer focus. BPM can be understood as a method that complements Business Process Reengineering (BPR) and Total Quality Management (TQM) as it seeks to improve operational and managerial processes based on the objectives and goals established in strategic planning (GARVIN, 1995; TRKMAN, 2010).

Considering that both IMS and BPM contributes to performance improvement in sustainability dimensions, this paper aims to present a proposal of a roadmap (a step-by-step guide that helps reach a certain goal) for sustainability in operations based on principles and practices of integrated management systems and business process management. The research question behind this proposal is "what are the knowledge and good principles and practices already publicized in the literature relating IMS and BPM and how to consolidate them into a roadmap to improve the maturity of BPM and IMS with focus on operations sustainability?" The proposal is the result of a three-year project. A systematic bibliographic review was conducted in order to identify IMS and BPM principles, practices and techniques. Based on the literature search findings, the roadmap was designed. A field research with specialists was carried out so as to review and evaluate the value of the roadmap.

At a time when sustainability is increasingly required, studying this theme and looking for ways to provide a guide that supports the achievement of sustainability based on available and consolidated principles and practices is one of the main contributions of this article. Another contribution is the result of the systematic literature review developed during the project.

2. THEORETICAL FOUNDATION

2.1 Integrated Management Systems (IMSs)

A management system is a set of procedures that an organization adopts to reach its objectives (ISO, 2015a). An IMS can be defined as a process of joining different management systems inside a single system (BECKMERHAGEN *et al*. 2003).

Karapetrovic and Willborn (1998) present three strategies for implementing an IMS: 1) Organizations can implement a quality management system and then an environmental

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management system; 2) they can implement the environmental management system first and then the quality management system or 3) use both systems simultaneously.

There are many management systems and the most used worldwide are: ISO 9001 (Quality Management System), ISO 14001 (Environmental Management System), OHSAS 18001 (Occupational Health and Safety Management System), ISO 26000 (social responsibility), SA 8000 (Social Accountability 8000), AA 1000 (Assurance Standard 1000), and others.

The ISO 26000 provides guidelines for social responsibility practices in organizations. It provides guidance on the principles of social responsibility, considering stakeholder engagement, human rights, environment, work practices, legal operating practices, and others (ISO, 2010). The Social Accountability 8000 (SA 8000) also points out social responsibility requirements for organizations to develop, maintain and enforce policies and procedures related to the subject. The focus of this norm is related to working conditions (Social Accountability International, 2014). The AA1000 (Assurance Standard 1000) is a standard for social responsibility, but focusing on the inclusion of stakeholders and ensuring the quality of accounting, auditing and ethical social reporting (ACCOUNTABILITY, 2015).

The ISO 9001 and ISO 14001 were updated in 2015. These versions were considered in this study. These two standards follow the same high level structure, which reinforces the commonalities of both standards. In addition to that, there several other similarities: stakeholders should be considered and engaged; top management must take responsibility for the environmental or quality management system, ensure competencies, awareness and communication, evaluate performance and continuously improve the system. In ISO 9001 risks and opportunities must be identified and considered (FONSECA; DOMINGUES, 2017). ISO 14001: 2015 brings the need to consider the life cycle perspective as a novelty (FONSECA, 2015). However, although there are many commonalities, there are important differences between these two management systems. For instance, while clause 8 of ISO9001 presents the requirements to minimize the chance of non-conformity throughout product realization, clause 8 of ISO14001 deals with requirements to minimize environmental impacts.

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There has been an increase in the number of certifications. From 2004 to 2014, ISO 9001 certifications went from 660,132 to 1,138,155 and ISO 14001 certifications increased from 90,554 to 324,148 (ISO, 2015c).

The OSHAS 18001 standard presents requirements for the implementation of an occupational health and safety management system (BRITISH STANDARDS INSTITUTION, 2007).

Mežinska *et al.* (2013) state that the requirements of ISO 9001, ISO 14001 and OHSAS 18001 can be used together in an IMS focusing on social responsibility, but the IMS alone does not ensure corporate social responsibility. These standards show clear benefits on certain issues, such as efficiency, employees, systematization, customers and other stakeholders, which indicates that, in general terms, certified firms improve people, operational and stakeholder performance (TARÍ et al., 2012).

Jørgensen (2008) claims that management systems of quality, environmental and occupational safety contribute to sustainable management. According to Fresner and Engelhardt (2004), the basis for sustainable development can be developed by small steps, starting with implementing Cleaner Production, followed by an IMS and optimizing relations in the supply chain.

According to Witjes *et al.* (2017), the necessity of understanding the use of integrated management systems for the success of corporate sustainability in different enterprises is confirmed, as it was observed that the importance of certifying business management systems with the use of standards increased as companies grew towards the sustainability stage.

Rebelo *et al.* (2016) states that the adoption of an IMS is nowadays a strategic decision of relevant importance for the competitiveness and sustainability of organizations. He points out that the integration of several management systems standards versus individual management systems may bring benefits such as the elimination of conflicts between individual MSs and the creation of added value for business through the elimination of several types of organizational waste.

The main benefits of integration shown by various studies are: a reduction in audits, a reduction in bureaucracy, a decrease in documentation, cost reduction, improvement in communication, improvement in making decisions, promoting better alignment with strategic

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planning, a holistic view, better involvement of employees, resolving conflicts, among others (POLTRONIERI *et al.,* 2017). But, it is very difficult to manage different management systems on a separated way, which makes very important the integration between them. IMS became necessary inside the organizations as ISO made it easier to integrate different standards, which is made by a continuous learning process through cross-functional groups, teamwork and knowledge management. In addition, the integration of MSs promotes sustainable management (HOLM *et a*l., 2015).

2.2 Business process management (BPM)

Business Process Management can be understood as a management approach to achieving strategic objectives as outlined in an organization's strategic plan, which means going from strategic goals to individual process goals, doing it through the improvement and control of business processes (JESTON; NELIS, 2006).

According to ABPMP (2009), BPM is a disciplined approach to identify, design, execute, document, measure, monitor, control and improve business processes and it aims to meet an organization's strategic goals with customer focus. BPM can be understood as a method that complements Business Process Reengineering (BPR) and Total Quality Management (TQM) as it seeks to improve operational and managerial processes based on the objectives and goals established in strategic planning (GARVIN, 1995 and TRKMAN, 2010).

BPM originates from two approaches: business process reengineering, which was an approach introduced by Michael Hammer (Hammer, 1990); and total quality management. Both approaches focus on business process improvement in different ways: business process reengineering is a radical approach for change, while total quality management prioritizes incremental changes. BPM can be seen as a balanced approach, which combines BPR and TQM to improve and manage business processes (GARVIN, 1995).

Kohlbacher (2010) highlights that the main benefits of BPM include: increasing operation speed, enhancing customer satisfaction, reducing operational costs, improving financial performance and improving the quality of products and services. Neubauer (2009) and McCormack *et al*. (2009) also mentioned that BPM enables companies to achieve quick

organizational adaptation by providing the development and continuous improvement of organizations.

Recently, the ISO standards for quality and environmental management have been updated and now explicitly mention BPM as an important part of management systems. According to ISO 9001 and 14001, quality and environmental management systems have to be integrated into key business processes in order to improve quality and environmental performance. Some examples of key business processes aiming at quality and environmental performance include: purchasing and supply chain management, manufacturing and product development.

During the SLR, similar principles were identified in the literature on IMSs and BPM (i.e., involvement and commitment, leadership, continuous improvement, business process view, systemic thinking) (see Appendices A and B). This fact makes it easier to achieve greater maturity in both areas since the same principle contributes to increasing the maturity of both BPM and IMSs. The concept of maturity will be explained shortly. Furthermore, BPM allow organizations to overcome several barriers among its departments (SILVA *et al*. 2012) which can support IMSs.

2.3 Maturity of IMSs and BPM

According to PMI (2003), a maturity model is a structure formed of parts that define the maturity in a specific area. For Maier et al. (2012), maturity models help organizations to understand where they are and how much is missing to reach the best practices.

Maturity models are widely used and specific models can be found for quality management, product development, innovation, software development, among other areas. According to a systematic review carried out by Wendler (2012), although there are maturity models for various areas, the largest concentration is in the areas of software development and software engineering.

The Crosby's Quality Management Maturity Grid is considered the first maturity model. According to Crosby (1986), the score has 5 levels of maturity designated as (Table 1): uncertainty, awakening, enlightenment, wisdom and certainty. In total, there are 6 items

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evaluated. These items are: Management understanding and attitude; Quality organization status; Problem handling; Cost of quality as % of sales; Quality improvement actions; and Summary of company quality posture. To use the tool, just read each row and note which columns best fit the reality of the organization being evaluated. Ideally, different people within the same organization should complete this evaluation tool to assess how different the perspectives are.

Table 1- Part of Crosby's Quality Management Maturity Grid

	Uncertainty	Awakening	Enlightenment	Wisdom	Certainty
Problem handling	Problems are fought as they occur, no resolution, inadequate definition, lots of yelling and accusations.	Teams are set up to attack major problems. Long-range solutions are solicited.	Corrective action communication established. Problems are faced openly and resolved in an orderly way.	Problems are identified early in their development. All functions are open to suggestion and improvement.	Except in the most unusual cases, problems are prevented.

Source: adapted from CROSBY, 1986.

One of the best known models, the CMM - Capability Maturity Model, was inspired by Crosby's Quality Management Maturity Grid. The CMM was elaborated by the Software Engineering Institute (SEI) - Carnegie Mellon, and this institute developed several other models after the CMM, among them the CMMI - Capability Maturity Model Integration (Bruin *et al.,* 2005). In the area of management systems, there is a model to evaluate quality management systems and it was published in ISO9004.

Maturity models for IMSs and BPM were identified in the literature: for IMSs, Domingues *et al*. (2016) and Poltronieri *et al.* (2017); for BPM, OMG (2008), Jeston and Nelis (2006), Skrinjar and Trkman (2013) and Rohloff (2011). All maturity models were used to build the Maturity Assessment Tool (see Appendices C and D).

3. METHODOLOGICAL PROCEDURES

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The methodology consisted firstly of a bibliographical review that aimed to identify principles, practices and techniques of IMS and BPM. This search was of great importance in the subsequent process of building the roadmap and was divided into two stages: an exploratory review and a systematic literature review (SLR). Five articles about IMSs and nine articles about BPM were read with the objective of conducting an exploratory review that served as the basis developing strings used in the systematic review, as well as for the initial survey of principles, practices and techniques.

An SLR on IMSs and BPM was conducted according to Conforto et al. (2011). The SLR helps to achieve a higher level of reliability in the review and the proposal presented by them was made with the intention of adapting it to the area of operations management. The databases used for the search were the Web of Science and Scopus. The search strings were developed using a previous literature review about IMSs and BPM, as mentioned below (Table 2).

Table 2 - Search string

Area	String
IMS	*TS=((ISO OR OHSAS OR EMAS OR SA8000 OR BS7750 OR BS5750 OR BS8800 OR NBR16001 OR NBR18801 OR AS/NZS 4801) AND ("integrated management system" OR "integrated management systems") OR ("normalized management system" OR "normalized management systems" NEAR/3 integrat*) OR ("standardized management system" OR "standardized management systems" NEAR/3 integrat*) OR ("management system standards" NEAR/3 integrat*))*
BPM	*TS=(("business process management" OR "process orientation") NOT ("software engineering" OR "data mining" OR "web services" OR "information technology"))*

Source: Authors.

The string presented was used in the Web of Science and adapted to Scopus.

The search string was applied to titles, abstract and keyword in both databases. To select an article, it had to contain principles, practices or techniques concerning IMSs or BPM. Two undergraduate and three graduate students participated in this extraction process.

The following definitions were adopted in this research:

- Principle: management principles can be understood as fundamental rules which are accepted as the basis for management (SOUSA; VOSS, 2002; GAMBI, 2014).
- Practice: management practices are standard and recurrent execution of techniques based on principles (SOUSA; VOSS, 2002; GAMBI, 2014).
- Technique: methods (way of doing) and/or tools (intellectual mechanism) that support the management process (SOUSA; VOSS, 2002; GAMBI, 2014).

A two-step procedure was adopted to review and identify articles which fit the inclusion criteria: (1) select articles by reading articles title, abstract and keywords, (2) select articles by reading the full article. Figure 1 shows the results of each review.

Figure 1 - Results of the SLR
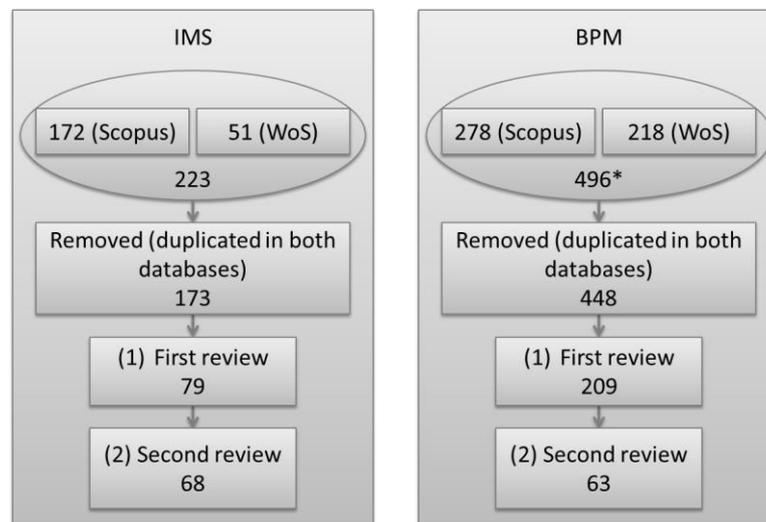
Source: Authors.

* For BPM, a previous refinement was made at the time of the search, accepting only articles from the following research areas: engineering; business economics; operations research management; environmental sciences; public administration; social sciences; and health care sciences services.

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The IMS and BPM principles, practices and techniques were extracted from the articles and added to a list. In the articles, it was identified that the same principles, practices and techniques had different nomenclatures. These nomenclatures were grouped and later standardized. This standardization was validated by 3 academic experts. The specialists hold a doctor degree and develop researches in the area.

The principles and practices were used to develop the matrix (see Appendices A and B). For BPM, 8 principles and 24 practices were found in the literature review. Note that this classification can make it easier to understand and apply BPM, as there is a misunderstanding about the definition of BPM in the related literature (JESTON; NELIS, 2006). For IMSs, 7 principles and 10 practices were identified. IMS and BPM principles and practices were detailed, based on articles, books and on the researchers' own experience, resulting in a glossary. The glossary was designed to help the practitioners in the organizations that have questions regarding the definitions of IMS and BPM principles and practices. The task of preparing the glossary was divided between three undergraduate students and supervised by three graduate students who were responsible for searching the definitions of each principle and practice as well as benefits, barriers, techniques and bibliographic references.

The next step taken when developing the roadmap was the search for IMS and BPM maturity models. The selected models were used to construct the maturity elements of IMSs and BPM (see Appendices C and D). Then, a tool was developed for maturity evaluation based on the maturity elements. For the evaluation, each question had to be answered on a 5-point scale, which varied from totally disagree (1) to totally agree (5). The instrument that evaluated maturity in IMSs had 19 questions (Poltronieri *et al*., 2016) and was made based on Poltronieri (2017), Domingues (2013), Bernardo (2009) and a reviewed version of the ISO 9001:2015 (ISO, 2015b). The BPM evaluation instrument has 29 questions and was developed based on studies from OMG (2008), Jeston and Nelis, (2006), Rohloff (2011) and Skrinjar and Trkman (2013).
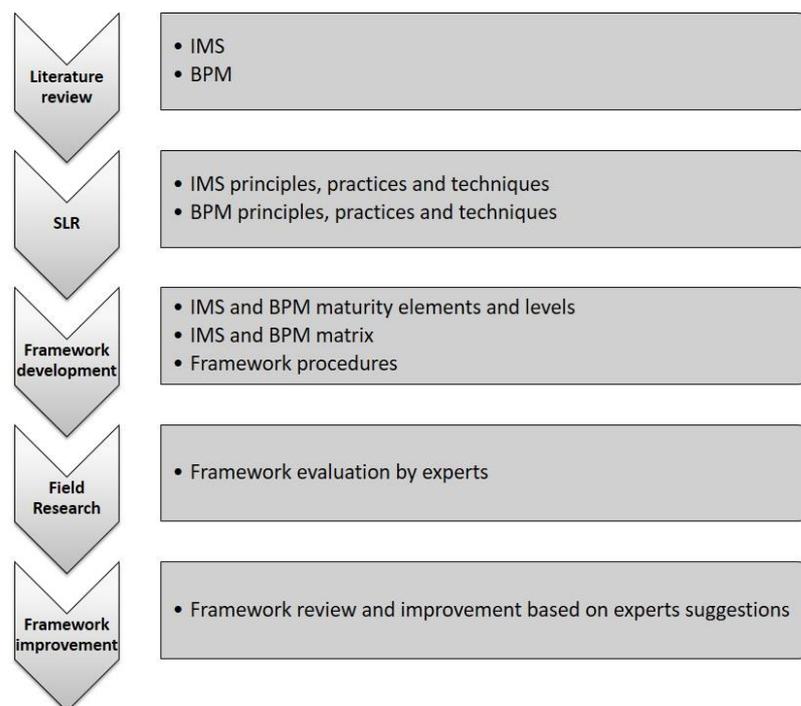
Next the matrix was developed for both IMSs and BPM, which relates maturity elements to principles and practices. Three academic experts were consulted to verify clarity and completeness of the matrix and sustainability principles were inserted into the IMS matrix

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based on Ferreira and Gerolamo (2016). The criteria selection of academic experts was background and experience in the IMS and BPM area.

The binary scale was used to relate principles, practices and maturity elements. In other words, this classification indicates the potential of a principle or practice to enhance the maturity level of IMS or BPM elements. Afterwards, the roadmap was developed by researchers. The roadmap was based on PDCA (Plan-Do-Check-Act) cycle.

Next, the roadmap was submitted to a field research. This procedure included an evaluation by experts on IMSs and BPM from research and professional areas. The field research method is shown in Figure 2.

Figure 2 - The field research steps

Literature review
- IMS
- BPM

SLR
- IMS principles, practices and techniques
- BPM principles, practices and techniques

Framework development
- IMS and BPM maturity elements and levels
- IMS and BPM matrix
- Framework procedures

Field Research
- Framework evaluation by experts

Framework improvement
- Framework review and improvement based on experts suggestions

Source: Authors.

First, a search of IMS and BPM experts was conducted in some Brazilian companies and universities. The selection of the specialists was based on the following criteria. For IMS specialists, having a university degree, training in ISO 14001 and ISO 9001 standards and at least two years of practical experience in the field. For the BPM specialists, also having a

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university degree and be member of the Association of Business Process Management Professional (ABPMP). Moreover, prior to the evaluation by the specialists, as a pilot test, the roadmap was evaluated by 7 students (undergraduate, master´s and doctoral students).

The research was conducted using contacts with acquaintances and through the professional network: Linkedin. In total, 27 specialists in IMS and 26 in BPM were contacted by e-mail. From the 27 IMS specialists, only 9 accepted to participate in the validation, but 4 actually responded to the survey. From 26 BPM specialists, 11 accepted but in fact only 5 answered. The validation was sent by Google Forms and e-mail.

In order to evaluate the roadmap, four criteria were adopted in the field research, adapted from Oiko (2013): clarity, completeness, usability and cohesion. In addition, questionnaires were designed to identify the strengths and weaknesses of the roadmap. The process of analyzing the answers of the specialists was qualitative since there wasn´t enough data for quantitative analysis. The results from the field research were analyzed and used to review the roadmap.

4. RESULTS

4.1 Theoretical roadmap

In order to improve maturity elements towards a sustainable business, companies should focus on IMS and BPM principles and practices (see Figure 3). In this research, principles and practices on IMS and BPM were identified using an SLR and can be seen as the basis for improvements and integration in IMSs and BPM (see Appendices A and B). The IMS and BPM elements were extracted from maturity models found in the literature. Afterwards, the Maturity Assessment Tool to assess IMS and BPM maturity was developed. The objective was to achieve sustainability.

Figure 3 - Framework for BPM and IMS maturity levels, principles and practices.

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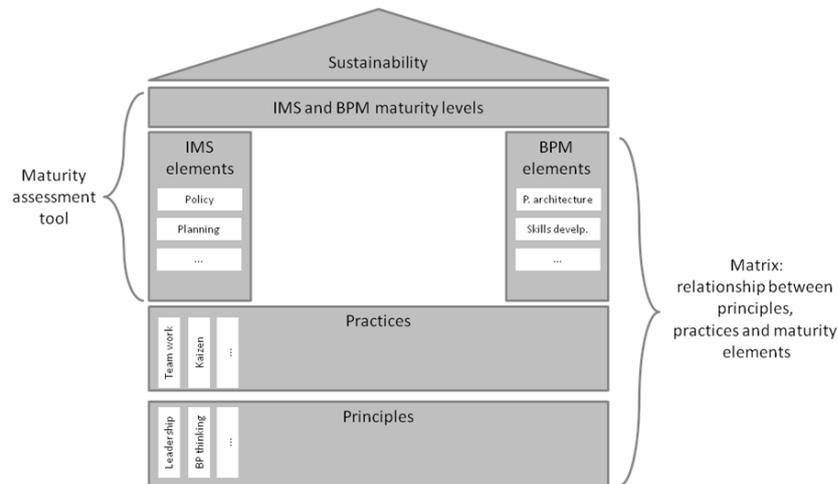
Source: Authors.

Based on Figure 3, the theoretical roadmap was developed and reviewed through field research. Although the literature review has identified techniques as well, the proposed roadmap considers only principles and practices since the choice techniques is very much case dependent. Considering the results of the field research, the roadmap presented in topic 4 was developed. The theoretical roadmap is not presented here and some changes were made in the theoretical version, resulting in the final roadmap presented in this paper. These modifications can be seen in the next topic.

4.2 Field research results

According to the experts' answers, the overall evaluation of the model was positive. The experts agreed that the roadmap includes the main principles of IMSs and BPM and the tool considers all the aspects of each element. However, it was pointed out that the model does not focus on Information Technology (IT) for BPM, which is not foreseen in the scope of the project. All the tools developed to help the roadmap ranked high in clarity, usability and content. Similarly, the phases of the roadmap were also given good scores in the criteria above and in continuity as well, which evaluates if the phases are presented in a logical way.

Additionally, the experts were asked to highlight the strengths and weaknesses of the proposed model. The roadmap was considered logical, well-structured and as having good theoretical content. However, the model requires the user´s previous knowledge in BPM and

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IMSs in order to successfully evaluate the organization's maturity level and hereafter develop the roadmap.

4.3 Proposal of the roadmap

Figure 4 shows the developed roadmap which is based on the structure previously presented in the PDCA. The main purpose of this roadmap is to support IMS and the adoption of process management in order to promote business sustainability. This roadmap is designed for internal use only, which means that companies can use the roadmap based on their own maturity in IMSs and BPM, as well as their own practices.

Figure 4 - Proposal of a roadmap for sustainability in operations.
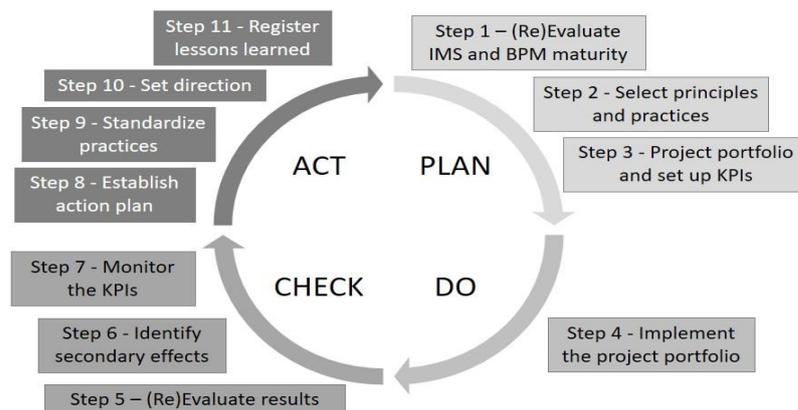
Source: Authors.

4.3.1 Plan

This phase has three steps: (re)evaluate IMS and BPM maturity, select the main IMS and BPM principles and practices and define the project portfolio. During this phase, companies are supposed to identify their maturity both in IMS and BPM, as well as what the specific elements are which require attention. Then, companies can identify and select principles and practices in IMS, BPM and sustainability which can contribute to improving the maturity of the elements. These principles and practices are explored in workshops in

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order to generate ideas, which are then compiled in projects. These projects are the basis for the roadmap. The following sub-sections present the 3 steps of the Plan phase.

Step 1 – (Re)Evaluate IMS and BPM maturity

The main purpose of the first step is to evaluate IMS and BPM maturity in order to provide a clearer picture about where the company is concerning IMS and BPM practices. In this step, the company has to use the Maturity Assessment Tool regarding IMS and BPM which must be answered by experts. It is recommended that more than one expert on each topic participate, and if possible, experts should be selected according to their company background.

The Maturity Assessment Tool (see Appendices C and D) was developed through an in-depth literature review on IMSs and BPM. The IMS tool has 19 elements with 19 questions and it was published by Poltronieri et al. (2016). The BPM tool has 13 elements including 29 questions and was developed based on four studies: OMG (2008), Rohloff (2011), Skrinjar and Trkman (2013), and Jeston and Nelis (2006). The most recurrent and key elements were identified and grouped into 13 BPM elements, following the methodology adopted by constructing the IMS tool.

The experts must answer the Maturity Assessment Tool based on their knowledge. For each question, they must choose the agreement level in a 5-point scale, which varies from (1) totally disagree to (5) totally agree. If more than one expert participates in the maturity evaluation, the final score must be calculated through the average responses. These results will identify the weakest elements in IMSs and BPM which will require attention in the following step.

Step 2 – Select the main IMS and BPM principles and practices

In this step, the company has to select the main IMS and BPM principles and practices to address the weakest elements identified in the previous step. The matrices of IMS and BPM principles and practices were developed using an SLR and analysis by experts. By using these matrices, companies can identify principles and practices that can improve the maturity of IMS and BPM elements.

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Each matrix links principles and practices with maturity elements on a scale of 3 points: weak, medium and strong potential of improvement. This relationship can be used to prioritize principles and practices, since the company has to select few principles and practices to develop improvement projects and define the project portfolio in the next step. Other criteria include: potential of improvement across IMS and BPM elements; number of relationships with maturity elements; strength of each relationship.

The principles and practices can be prioritized by users using the Maturity Assessment Tool that analyzes the elements of maturity of the BPM and IMS. Employees who answer this tool should have knowledge on the issues addressed. The results will show which elements need to be attacked. After this diagnosis, users will be able to identify which principles and practices are common between IMS and BPM and prioritize for a greater integration between the BPM and IMS.

The roadmap also includes a glossary which presents a description of each principle and practice of the IMS and BPM. In depth-research about the selection is recommended before the next step as this is strongly related to the success of implementing practices and its contribution to enhancing IMS and BPM maturity.

Step 3 – Project portfolio

The purpose of this step is to define the projects and action plans to improve the maturity of IMS and BPM. In this step, companies should develop: an IMS project, a BPM project and a final project including IMS and BPM. In this step, the company will need to define which Key Performance Indicators (KPIs) they will use and which they will select to evaluate the roadmap.

During step 3, a team of experts identifies and develops attributes for projects and their relationships with each other (KOSTOFF; SCHALLER, 2001). For this, experts should perform iterative workshops whose purposes are to capture and discuss perspectives, explore opportunities, build a consensus and develop a roadmap to implement the projects.

At least three workshops must be carried out: the IMS and sustainability workshop, the BPM workshop and the integration workshop. The first workshop is about IMS and sustainability principles and practices, while the second is about BPM principles and

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practices. To select the experts who will participate in the workshop, they will be used as criterion to work in one of the respective areas, in the case of BPM or IMS, in their organization. Both workshops have the same structure: introduction about selected principles and practices; developing improvement projects for each principle and practice; identifying relationships between projects and maturity elements; evaluating the proposed projects; constructing the project portfolio.

The third workshop presents some differences. First, the input is the project portfolio developed in the previous workshops. Second, the team of experts should focus on integrating projects into the final project portfolio, which means merging similar projects and adjusting projects in order to optimize efforts and results. The final project portfolio must be validated before the next phase.

4.3.2 Do

In this phase, the company has to implement the project portfolio through project management practices. The proposed project portfolio was built based on PMBOK (Project Management Body of Knowledge) from the Project Management Institute (PMI, 2013), which is a complete framework for project management and the company should adapt to its needs case-by-case.

In general, each project has five stages: initiation, planning, executing monitoring and controlling, and closing. Figure 5 shows a short description of each stage. During this phase, the main stakeholders related to business can be identified and engaged according accountability standards AA1000 SES, which define a process and tools for stakeholders engagement (ACCOUNTABILITY, 2015).

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Figure 5 - Implement the project portfolio.

Initiation	Planning	Executing	Monitoring and Controlling	Closing
• Identify stakeholders • Develop project charter • Objective • Scope • Resources	• Define scope • Specify actions • Develop project plan: • Scope • Timing • Quality • Communication • Resources • Risks • Acquisition • Costs • Requirements • Process improvement • Stakeholders	• Project execution • Manage stakeholders expectations • Measure performance • Update project plan	• Project follow up • Monitoring and controlling • Analyze results • Organize progress • Change management • Register lessons learned	• Integrate lessons learned • Check activities and requirements • Confirm project closing • Review activities and deliverables • Manage documents

Source: adapted from PMI 2013.

4.3.3 Check

The aim of this phase is to check the results of the project implementation. In general, 3 steps have to be followed by companies: (re)evaluate results, identify secondary effects and monitor the KPIs.

In order to (re)evaluate the results, the companies should analyze the main objective of each project and compare it against their deliverables. Companies should adopt follow-up reports and visual management. In this phase, companies also have to identify and create a list of secondary effects, which could be positive or negative. Based on this list, an action plan can be established for each secondary effect, especially the negative ones. Then, the KPIs selected to evaluate the project portfolio should be monitored.

4.3.4 Act

In this phase, companies have to select a decision about the next steps. Four steps should be executed in this phase: establish action plan, establish standard of new practices, set direction and register lessons learned.

Implementing each project will drive changes in the company's business processes. Based on the secondary effects listed in the previous phase, the company must define an

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action plan to address them. This could be done through business process improvement techniques (i.e. Ishikawa Diagrams, Theory of Constraints tools). The company also has to engage people in order to establish the standard of new practices, which means communicating and managing the new practices. The company has to make a decision about the next step, improving the IMS, BPM and sustainability maturity. Finally, lessons learned from each project should be reviewed and integrated. This can be useful to promote critical reviews and improvement.

5. CONCLUSION

The main objective of this study was to develop and evaluate the roadmap for IMSs focused on process management aiming at sustainability. The roadmap was developed through an extensive SLR to identify the principles, practices and techniques of IMSs and BPM. In addition, the following was developed: a tool to evaluate the maturity of IMSs and BPM from the main models of maturity in the literature; matrices to relate the potential contribution of principles and practices to increase the maturity of IMSs and BPM; and a glossary with a description of each principle and practice of IMSs and BPM found in the matrix.

The proposed roadmap is a generic model that can be used by any type of organization to increase the maturity of IMSs and their process management practices, aiming at sustainability. According to specialists, the roadmap requires some knowledge on IMS and BPM to be properly adopted. The roadmap provides a list of IMS and BPM principles and practices as well as a step-by-step approach to guide organizations to enhance their capability in IMSs and BPM. One of the benefits of this approach is to be flexible so that each organization defines which course is most appropriate based on its resource availability, strategy and priorities, and also the maturity level of the company's IMS and BPM.

Regarding consultation from experts (5 experts from BPM and 4 from IMSs), the theoretical roadmap was evaluated well and most of the notes were between "partially agree" and "strongly agree". The positive result of consulting with experts indicates that the roadmap is clear, it has relevant content and is consistent. When using the usability criterion, it was

understood that evaluation through consultation with experts indicates the potential to be an easy-to-use tool.

A significant contribution of this research is the relationship between IMSs and BPM. It could be observed that the two topics are treated separately in the literature, although the new management system standards, published in 2015 (ISO 9001 and ISO 14001), explicitly mention the importance of integrating management systems into business processes. Thus, the roadmap developed can be used by organizations for this task, integrating management systems and the business processes.

Regarding the roadmap, it is an instrument that requires minimum knowledge of the two topics, which limits its application.

One of the limitations of the study was the reduced number of specialists who analyzed the roadmap. Therefore, it is suggested as a further work that this roadmap be validated by other experts, including people from different countries. Another limitation is the fact that the study has to advance on implementation issues posed by the proposed roadmap. In this sense, a further study should be carried out to address this point.

Finally, future work for this project includes: conducting case studies to evaluate the usability criteria of the roadmap, as well as improving it; developing a maturity instrument for sustainability; analyzing and detailing phases 2, 3 and 4 of the roadmap; defining the minimum knowledge level in IMSs and BPM to use the roadmap.

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Appendix A. Matrix of principles and practices for BPM. Relationships are shown in gray and no relationships are shown in white.

Appendix B. Matrix of principles and practices for IMS and sustainability. Relationships are shown in gray and no relationships are shown in white.

Elements	BPM Principles								BPM Practices																						
	Involvement and commitment	Client focus	Learning organization	Leadership	Improvement	Win-win relationship (stakeholders)	Business Process View	Systemic thinking	Business Process Analysis	Multifunctional audit	BPM life cycle	Business Process Design	Business Process Office	Communication Management	Change Management	Value Chain Management	Performance Management	Project Management	Hands-off Management	Hoshin Kanri	ISO 9001	Kaizen	Lean	Business Process Modeling	Rewards program	Skills development program	Business Process Reengineering (BPR)	Process simulation	6 Sigma	Business Process Team	Total Quality Management (TQM)
Planning of organizational improvement																															
Strategy and capability process alignment																															
Strategic measurement of business process																															
Process architecture																															
Stakeholders oriented																															
Process roles and responsibilities																															
BPM norms and guidelines																															
Process definition, implementation and documentation																															
Process optimization																															
Information technology																															
Skills development																															
Process leadership																															
Organizational culture																															

	Proactive approach	Involvement and commitment	Learning Organization	Leadership	Improvement	Business Process View	Systemic thinking	Risk based approach	Multifunctional audits	Communication Management	Change Management	Performance Management	Stakeholders Management	Skills development program	Systematic for Integration (methods)	Team Work	Shared Value Generation	Risk Management	Life Cycle Thinking	Pollution Prevention	Occupational Health and Safety	Social Responsibility
Organizational context and stakeholders																						
Top management and leadership																						
Policy																						
Roles, responsibilities and authorities																						
Planning																						
Risk analysis																						
Goals, targets and requirements																						
Resources																						
Skills																						
Communication																						
Documented information																						
Operation																						
Monitoring, measurement, analysis and assessment																						
Internal audits																						
Management review																						
Non-compliances, corrective actions and improvement																						
Team																						
Indicators																						
External audits																						

Appendix C. Maturity Assessment Tool for IMS

For each question, consider the following degrees of agreement 1-5, where 1 means "Strongly Disagree" and 5 means "Strongly Agree". If you are not sure of the answer or consider that it does not apply, check the alternative N/A.

Element	Question	Agreement (1-5)
1. Organizational context and stakeholders	The evaluation of the organization's context and stakeholders is made considering the various management systems.	
2. Top management and leadership	The leadership treats their different management systems in a joint and unified way.	
3. Policy	There is a single policy that is integrated and it is deployed in constantly revised indicators.	
4. Roles, responsibilities and authorities	Roles, responsibilities and authorities are assigned and communicated considering different management systems.	
5. Planning	Planning is done jointly, resulting in a single plan.	
6. Risk analysis	The company performs risk analysis in an integrated manner.	
7. Goals, targets and requirements	Goals, targets and requirements are aligned and integrated.	
8. Resources	The resources (human, infrastructure, financial) are distributed considering the needs of the rules together.	
9. Skills	The necessary skills are established considering the demands of the different management systems, providing training and	

	other activities in a unified manner.	
10. Communication	There is a unique structure that takes care of the whole communication process (internal and external communication).	
11. Documented information	Creation, control and disclosure of all documented information is treated in an integrated manner, using a disclosure process to ensure that everyone has access to it.	
12. Operation	Operational control is done jointly, considering the different processes required meeting the requirements of different management systems.	
13. Monitoring, measurement, analysis and assessment	The management system assessment (monitoring, measurement and analysis) is seen in an integrated way, and the indicators are treated together and reviewed constantly.	
14. Internal audits	Internal audits are made considering the requirements of the different management systems.	
15. Management review	The management review is done jointly, resulting in a single document.	
16. Non-compliances, corrective actions and improvement	Treatment of non-compliances is done considering the different management systems.	
17. Team	There is a single organizational structure area responsible for management systems.	
18. Indicators	Indicators are jointly selected and the results are widely available, and they are constantly	

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	revised.	
19. External audits	External audits (the certifying body) are made while considering the requirements of the different management systems.	

Appendix D. Maturity Assessment Tool for BPM

For each question, consider the following degrees of agreement 1-5, where 1 means "Strongly Disagree" and 5 means "Strongly Agree". If you are not sure of the answer or consider that it does not apply, check the alternative N/A.

Element	Question	Agreement (1-5)
1. Planning of organizational improvement	The business process improvement activities are driven by strategic planning.	
2. Strategy and capability process alignment	The business processes are strategically aligned in order to completely perceive their capabilities.	
	There is a bi-directional relationship between organizational strategy and business processes.	
3. Strategic measurement of business process	The performance measurement is process-oriented and disseminated.	
	The performance measurement integrates activities and processes across the departments.	
	The performance measurement deploys the vision, mission and strategic goals from business processes to operations.	
4. Process architecture	The business processes are aligned with each other hierarchically and with business strategy.	

	The business process architecture is articulated in order to keep up with strategy changes.	
5. Stakeholders oriented	Stakeholders actively participate in business process improvement initiatives.	
	There are communication systems to promote integration with stakeholders.	
	The collaboration between stakeholders generates value to those involved in business processes.	
6. Process roles and responsibilities	Process roles and responsibilities are clear and defined including all functions related to BPM.	
	The governance practices are institutionalized.	
7. BPM norms and guidelines	BPM norms and guidelines are well defined and documented.	
8. Process definition, implementation and documentation	The business process notation is standardized.	
	The business process models are clear and contain the main process information (inputs, outputs, roles, etc).	
	The employees are knowledgeable and have access to business process models.	
9. Process optimization	There is systematic planning to identify and implement business process improvements.	
	There are resources available to apply techniques and models of process optimization, such as: PDCA cycle, Six Sigma, etc.	
10. Information technology	There is an information system oriented to a business process which address their requirements.	

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	The information technology accelerates and facilitates business process improvement and innovation.	
	The IT database is standardized and reflects the real business processes.	
11. Skills development	There is a BPM training program.	
	There is an evaluation of employees' knowledge about BPM.	
12. Process leadership	Process leaders feel motivated and adopt good leadership and management practices.	
	The process improvements are developed and deployed in an effective manner by the person in charge.	
13. Organizational culture	All employees feel free to contribute with BPM.	
	Leaders show total engagement with BPM.	
	The culture supports quick organizational changes.	

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