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***Information Systems for supporting decision-
making process in SME: a Systematic Literature
Review***

Daniela Barbosa Nikuma

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Orientador: Prof. Doutora Susana Garrido Azevedo

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Dedictory

To my parents for unconditional support.

My sister and my nephew Rafael for their special love and affection.

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Resumo

O presente trabalho oferece uma Revisão Sistemática da Literatura (RSL) para analisar como os Sistemas de Informação (SI) podem melhorar o processo de tomada de decisões nas Pequenas e Médias Empresas (PME) com o objetivo de analisar na literatura os objetivos e métodos de pesquisa aplicados, os tipos de sistemas de informação, os benefícios e os principais impactos associados ao uso de SI para apoiar decisões nas PMEs. A revisão da literatura foi realizada com base em artigos de revistas e artigos de conferências de 2008 a 2018, utilizando os bancos de dados B-on, Science Direct e Web of Science. Assim, esta revisão sistemática representa um importante contributo para as organizações e pesquisadores, possibilitando esclarecer abordagens e componentes do uso de SI para melhorar a tomada de decisões nas PME.

Palavras-chave

Sistemas de Informação, Processo de Tomada de Decisão, Performance Organizacional, PME

Resumo Alargado

A informação deve ser vista como um dos recursos mais valiosos nas organizações, tendo em vista a internalização e a globalização dos mercados. Assim, é necessário que a informação esteja disponível de forma integrada e atualizada, proporcionando uma visão de alto nível que promova a eficácia no processo de tomada de decisão e, conseqüentemente, no desempenho das PME.

Para analisar como os Sistemas de Informação (SI) podem melhorar a tomada de decisões nas PME foi realizada uma Revisão Sistemática da Literatura, cujo objetivo foi o de analisar os principais objetivos de pesquisa e métodos aplicados nos trabalhos que focam esta temática, os tipos de sistemas de informação disponíveis, os benefícios e os principais impactos associados quanto a utilização de SI para apoiar o processo de decisão nas PME. Portanto, foram selecionados 14 artigos com base na metodologia de Denyer & Tranfield (2009); Kitchenham & Charters (2007); Rousseau et al. (2008) e Tranfield et al. (2003), publicados entre 2008 e 2018, nas bases de dados B-on, Science Direct e Web of Science.

Quanto aos tipos de SI, não há consenso em relação à classificação/tipologia, mesmo porque devido às inovações tecnológicas emergentes estão em constante atualizações. Os tipos de SI utilizados nas PME variam de acordo com uma série de fatores como o tipo de negócio da empresa, a cultura, a indústria, os recursos disponíveis, entre outros aspectos.

Assim, quanto aos objetivos de pesquisa, a maioria dos trabalhos que fazem parte da amostra possuem como objetivo principal validação e depois o desenvolvimento, adaptação ou criação de um tipo de SI ou elaboração de framework utilizado no processo de tomada de decisões. Esses resultados demonstram que existe uma tendência em estudar um tipo específico de SI em relação a outro. Já em relação aos tipos de SI utilizados para apoiar o processo de tomada de decisão nas PME, o Business Intelligence System (BIS) e o Enterprise Resource Planning (ERP) são os tipos mais utilizados, embora em alguns estudos foram utilizados dois tipos simultaneamente, como ERP e BIS ou ERP e Product- Service Systems (PSS). Há evidências nos artigos pesquisados, que o impacto no desempenho organizacional ocorre principalmente a nível estratégico, na organização como um todo, em outros setores de cadeia financeira ou produtiva e na Supply Chain. Finalmente, no que diz respeito às medidas de desempenho apoiadas pelo uso de SI nas PME, apenas 6 estudos mencionaram algum indicador, como a eficácia financeira, operacional, controlo de receitas e despesas, produtividade e satisfação do usuário.

Assim, esta revisão sistemática representa um importante contributo para as organizações e pesquisadores, possibilitando esclarecer abordagens e componentes do uso de sistemas de informação para melhorar a tomada de decisões nas PME.

Abstract

The present work offers a Systematic Literature Review (SLR) to analyze how information systems could improve decision making in SMEs with a focus on objectives and methods used, types of information systems, benefits and the main impacts associated with the use of IS to support decisions in SMEs. A conceptual framework containing this issues is developed. The literature review is based on articles from journals and conference articles from 2008 to 2018, using B-on, Science Direct and Web of Science databases. Thus, this systematic literature review represents an important contribution to the organizations and researchers, making it possible to clarify approaches and components of IS use to improve decision making in SMEs.

Keywords

Information Systems, Decision-Making Process, Organizational Performance, SME

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List of Acronyms

BIS	Business Intelligence System
CMN	Collaborative Manufacturing Network
CRM	Customer Relationship Management System
DSS	Decision Support Systems
ERP	Enterprise Resource Planning
IC	Intellectual Capital
IS	Information Systems
IT	Information Technologies
KMS	Knowledge Management Systems
MIS	Management Information System
PSS	Product- Service Systems
SLR	Systematic Literature Reviews
SME	Small and medium-sized enterprises

Chapter 1

Introduction

In the contemporary business environment, SMEs are increasingly using Information Systems (IS) to achieve performance improvement, sustainable competitive advantages and opportunities to secure long-term success (Ghobakhloo, Arias-Aranda & Benitez-Amado, 2011).

A good information system provides an integrated supply chain trading partnership, critical information and internal business operations to make Small and Medium Enterprises (SMEs) more competitive (Bhagwat & Sharma, 2007; Bulak, Turkyilmaz, Satir, Shoaib, & Shahbaz, 2016). SMEs often have severe resource constraints (financial, information and skills) depending on the short-term planning and use of informal and dynamic strategies and decision-making process (Ghobakhloo & Tang, 2013).

The significant role played by individual decision-makers in SMEs means that their personal characteristics and interpretations are highly likely to affect their strategic decisions (Child & Hsieh, 2014 and Nielsen & Nielsen, 2011).

However, IS is one of the most relevant components of the current business environment offering great opportunities for companies' success; given that IS(s) have the capability of collecting, processing, distributing, and sharing data in an integrated and timely manner (Almazán, Tovar, & Quintero, 2017). In general, IS is regarded as a crucial resource required for better communication and integration of business functions (Bhagwat & Sharma, 2007; Ghobakhloo, Hong, Sabouri, & Zulkifli, 2012).

Liao, Deschamps, Loures, & Ramos (2017) suggest that we are going through the fourth Industrial Revolution (Industry 4.0), representing it a digital revolution that would be motivated by technologies.

Therefore, the information should be seen with valuable resource within the organizations, in view of the internalisation and globalization of the markets. Thus, it is necessary that the information be available in an integrated and updated way providing a high-level vision that promotes effectiveness in the decision-making process. The fashion of the theme results from being considered a current and comprehensive topic in the business context, due to the impact that information systems can have on decisions and, consequently, on the performance of SMEs.

In addition, there is a gap in this area, since most SI studies are focused on the use or implementation or development of a particular type of IS for the decision-making process, thus leaving a gap in more as systematic reviews of the literature.

This investigation aims to propose information systems to support managerial decisions in SMEs. To attend this main objective, a classification of Information Systems attending to a certain typology is performed and the impact that information systems have on organizational performance is also explored. To reach the research objectives, a systematic methodology of literature review was carried out.

The article is organized as follows: after the introduction, Chapter 2 presents a methodology. In Chapter 3, the results and discussion regarding results obtained and the objectives of the study, and finally, Chapter 4 is a synthesis of the main conclusions of the study presenting also some limitations and suggestions to future investigations.

The main contribution of this work is to offer a systematic review of existing literature on how information systems can improve the decision-making process in SMEs, providing guidance on the subject and presenting existing gaps in the literature.

Chapter 2

Methodology

2.1. Information Systems

Initially, it is necessary to understand the concept of IS, that according to Laudon & Laudon (2014) can be defined technically as a set of interrelated components that collect (or retrieve), process stores, and distribute information to support decision making and control organizational. According to Salehfar (2011) IS is a software system to capture, transmit, store, retrieve, manipulate, or display information, thereby supporting people, organizations, or other software systems.

One of the characteristics that can differentiate SMEs from large enterprises is the type of information and IS requirements since the nature of large-scale enterprises demands information in a more systematic and organized way than SMEs (Bhagwat & Sharma, 2007). However, the implementation of IS can create advantages that make the organizations more dependable on it to carry out their daily activities (Almazán, Tovar, & Quintero, 2017 and Vieites & Rey, 2012) which forces them to invest more in this type of technologies (Petter, Delone, & Lean, 2008).

In the SLR performed in this study were found definitions for the types of IS such as Enterprise Resource Planning (ERP), Customer Relationship Management System (CRM) and, Decision Support Systems (DSS). For other types of IS the definitions were not so consensual as is the case of Business Intelligence (BI), Knowledge Management Systems (KMS) and, Product Service Systems (PSS).

ERP systems have been considered as a promising tool helping managers make good decisions (Chaabouni & Yahia, 2014). ERP systems can and do provide a number of tangible and intangible operational and strategic benefits for both enterprise and SMEs (Hitt, Wu, & Zhou, 2002; Raymond & Uwizeyemungu, 2007; Ruivo, Johansson, Oliveira, & Neto, 2013; Ruivo, Oliveira, & Neto, 2012 and Ruivo, Oliveira, & Neto, 2014).

Harrigan, et al. (2010) used the CRM concept defined by Payne & Frow (2005) as the cross-functional integration of processes, people, operations, and marketing capabilities that is enabled through information technology and applications. Already, for Ahani, Rahim, & Nilashi (2017) used the definition of Morgan & Hunt (1994) which considered it as a strategic method to marketing supported by relationship marketing theory.

Aureli, Ciambotti, & Savári (2014) defined DSS as a naturally emerged from management information systems, intended to help decision-makers to compile useful information from a combination of raw data, documents, and personal knowledge, or business models to identify and solve problems and make decisions. Its interactivity and the capability of elaborating problem-analysing models makes it especially effective at tactical levels.

Business Intelligent Systems is a contemporary term for data and software tools for organizing, analyzing and providing access to data to help managers and other enterprise users make more informed decisions (Laudon & Laudon, 2014). Thus, Knowledge Management Systems (KMS) is a class of information systems applied to managing organizational knowledge (Alavi & Leidner, 2001).

While, the concept of Product- Service Systems (PSS) which create value by highly integrating products and services, has attracted much attention and it is a growing field of research and industry practice, with the intentional and designed combination of products and services at its core (Shimomura, Nemoto, & Kimita, 2014).

For the most part, today's information systems and reporting methods treat factors such as emissions, waste and employee protections as externalities. However, many factors, including economic uncertainty, population growth, and climate change and escalating demand for natural resources, are placing new pressures on companies to take a broader set of considerations into account when making decisions. Information systems should help companies assess and disclose the impacts that their extended value chains have not only on financial performance, but also on what some refer to as "the triple bottom line": environment, society and the economy (Odenwald & Berg, 2014).

In SMEs, decision-makers can make fairly accurate interpretations and evaluations without having to examine all available information (Nielsen & Nielsen, 2011). However, while decision making always involves the use of some information, that information can vary greatly both in form and scope. The pursuit of a more rational process of decision making will require information of greater explanation and scope in order to compare and assess alternatives and options (Child & Hsieh, 2014). Thus the quality of decisions making is the main source of the organizations' effectiveness and it is, no doubt, the managers' goal to meet the stakeholders' expectations (Negulescu & Doval, 2015).

2.2. Methodology

This section proposes a Systematic Literature Review (SLR) to analyse how information systems could improve decision making in SMEs.

SLR seeks to provide answers to specific questions or test hypotheses (Tranfield, Denyer, & Smart, 2003). According to Rousseau, Manning, & Denyer (2008) an SLR should have the following characteristics: comprehensive in the sense that it should include all relevant studies; use transparent analyses, and apply specific criteria to generate value from a body of previous literature.

According to Fink's (2010) a research literature review is a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners corresponding to what we understand as a systematic literature review.

In the literature, the number and designation of the proposed phases for a systematic review differ as can be seen in Table 1.

Table 1. Autor and amount of phases proposed for a RL.

Amount Phases	Author/ Year	Designation of phases
9	Tranfield et al. (2003)	1)Identification for the need for a review, 2)Preparation of a proposal for a review, 3) Development of a review protocol, 4) Identification of research, 5) Selection of studies, 6)Study quality assessment, 7) Data extraction and monitoring progress, 8) Data synthesis, 9) The report and recommendations and Getting evidence into practice.
6	Rousseau et al. (2008)	1)Construct Validity, 2)Internal Validity, 3)Effect Size, 4)Generalizability, 5)Intervention Compliance and 6)Contextualization.
	Denyer & Tranfield (2009)	1)Question formalation, 2)Locating studies, 3) Study selection and evolution, 4)Analyses and synthesis and 5)Reporting using results.
5	Briner and Denyer (2012)	1)Identify the Review Question, 2)Locate and Select Relevant Studies, 3)Critically Appraise the Studies, 4)Analyze and Synthesize the Findings from the Studies and 5)Disseminate the Review Findings.
	Kilubi (2017)	1)Database selection, 2)Journal Selection, 3)Article selection,4) Article classification and 5)Article analysis.
	Inayat, Salim, Marczak, Daneva, & Shamshirband (2015)	1)Planning the review: Review objectives and research questions, Search strategy, Search criteria, and Inclusion and exclusion criteria; 2) Conducting the review: Study search and selection; Data extraction and synthesis; Methodological quality assessment and Findings review.
3	Kitchenham & Charters (2007)	1) Planning the review: Identification of the need for a review, Commissioning a review, Specifying the research question, Developing a review protocol, Evaluating the review protocol; 2) Selection of primary studies, Study quality assessment, Data extraction and monitoring, Data synthesis) and 3) Reporting the review: Specifying dissemination mechanism, Formatting the main report and Evaluating the reporting.

In this study, the next five phases are used following the methodology proposed by Denyer & Tranfield (2009); Kitchenham & Charters (2007); Rousseau et al. (2008) and Tranfield et al. (2003): (1) problem formulation and question identification; (2) literature search; (3) evaluation of research; (4) research analysis and interpretation; and (5) presentation of results, (Figure1).

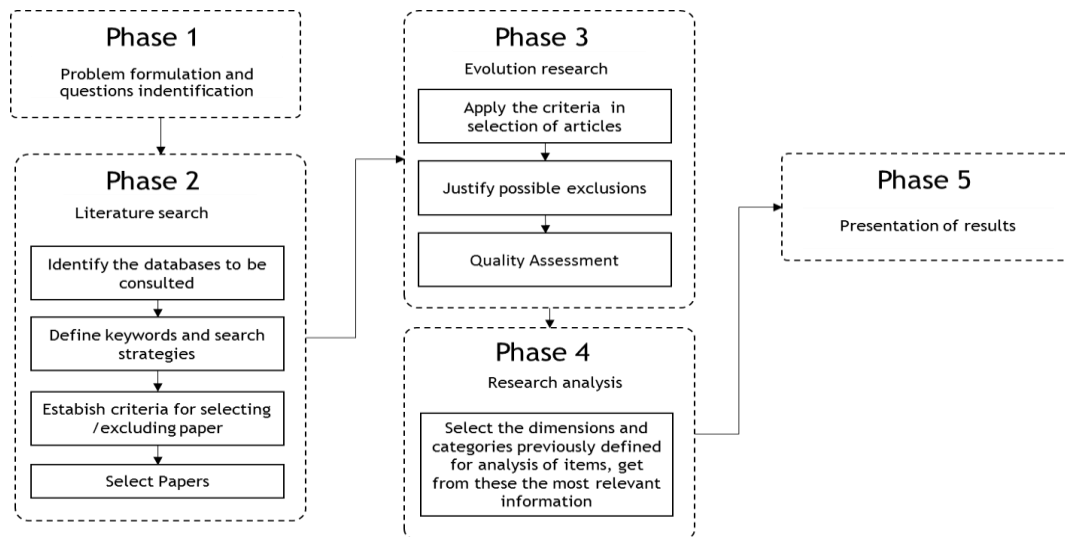


Figure 1. Phases of SLR.

Source: Adapted from Denyer & Tranfield (2009); Kitchenham & Charters (2007); Rousseau et al. (2008) and Tranfield et al. (2003).

2.2.1. Phase 1— Problem Formulation and Research Questions Identification

The increasing competitiveness in a global and immediate environment means that organizations should make high-level assertiveness and agile decisions. The information systems are, today, a strategic tool for most organizations and because of that companies need appropriate background on information technologies (ITs) for their successful development (Hanclova, Rozehnal, Ministr, & Tvrdivkova, 2015).

The customers are becoming more demanding in terms of the convenience of IT for purchasing, ordering, checking status, and ease of returning items what represents a pressure for small companies since they should be able to meet or exceed these expectations to be able to compete or survive in the Market (Mazurencu-Marinescu, Mihaescu, & Niculescu-Aron, 2007; Nguyen, Newby, & Macaulay, 2015).

In addition, Managers are inundated with irrelevant and abundant information from various sources of information, which can often lead to a distortion of reality and ineffective decision making (Rascão, 2001). However, Odenwald & Berg (2014) mention the absence of reliable information systems that can provide a comprehensive view of how enterprise resources are being managed.

Even though it is recognized, that computerization of management processes improves work efficiency. However, the SMEs have not been able to implement it mainly because of a lack of financial resources and a more specialized staff that is necessary for planning and supervising the computerization process (Dibrell, Davis, & Craig, 2008; Doll & Torkzadeh, 1998; Foong, 1999 and Lee & Know, 2014).

However, as each study is inevitably limited in scope, researchers and decision-makers need to be able to rigorously and systematically locate, assess and aggregate the outcomes from all relevant empirical studies related to a particular topic of interest, in order to provide an objective summary of the relevant evidence (Brereton, Kitchenham, Budgen, Turner, & Khalil, 2007).

Therefore, the purpose of the SLR is to summarize and synthesize the empirical evidence of IS to support decisions in SMEs and what are their possible impacts on organizational performance. Table 2 lists the four research questions that support the implementation of the SLR in this study, along with their main motivations.

Table 2. Motivations associated the research question.

ID	Research Question	Motivation
RQ ₁	Wich are the main research methods and objectives in relation to the use of IS to support decision making in SMEs?	To identify research objectives in the literature related to the use of IS to support decisions in SMEs.
RQ ₂	What are the types of information systems used to support decision making in SMEs?	To identify the types of information systems used to support decision making in SMEs and define a typology.
RQ ₃	What benefits of using IS for supporting decision-making process?	To identify the main benefits that result from using IS for supporting decision-making process.
RQ ₄	What are the main impacts associated to the use of IS on organizational performance?	To discuss the impacts of using IS on organizational performance and to indentify which indicators are used to assist in the decision-making process in SMEs.

2.2.2. Phase 2—Literature Search

In the second phase the databases were defined, as well as the keywords and the research strategy. Tranfield, Denyer & Smart (2003) recommend not only the use of various sources of information from unpublished studies, conference proceedings, the Internet but also scoping studies to assess the relevance and size of the literature and to delimit the subject area or topic.

However, the search strategy is to select papers that contain in the title, abstract or keywords various combinations of those keywords (see Table 3), from 2008 to 2018, in the databases B-ON, Science Direct and Web of Science.

The search was conducted in October and November 2017. The following search terms were applied: "decision-making process" and "information systems OR IS" and "organizational performance" and "SME", "decision support system OR DSS" and "information systems OR IS" and "organizational performance" and "SME", "decision-making process" and "information systems" and "SME", " decision support system OR DSS " and "information systems OR IS" and "SME".

It was also necessary to include the types of IS studied by the sample' articles such as: Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) System, Management Information System (MIS), Decision Support System (DSS), Knowledge Management Systems (KMS), and Business Intelligence System (BIS), with the aim of refining the scope of research, thus analyzing the impact of these systems on the performance of SMEs (Table 3).

Table 3. Results by the bibliographic database.

Keywords	Database			
	B-On	Science Direct	Web of Science	Total
"decision making process" and "information systems or IS" and "organizational performance" and "SME"	23	53	1	77
"decision support system" and "information systems or IS" and "organizational performance" and "SME"	39	43	5	87
"decision making process" and "information systems or IS" and "SME"	61	179	49	289
"Business Intelligence System" and "SME" and "decision making process"	13	12	6	31
"Customer Relationship Management" and SME" and "decision making process"	6	32	6	44
"Enterprise Resource Planning" and "SME" and "decision making process"	8	18	20	46
"Knowledge Management Systems" and "SME" and "decision making process"	6	26	16	48
"Management Information Systems" and "SME" and "decision making process"	12	14	21	47
Total	168	377	124	669

2.2.3. Phase 3—Evaluation of Research

In this stage of the research the inclusion and exclusion criteria were established so that only articles relevant to the study were selected. Then, each of the works identified in the initial search stage was analyzed, using the inclusion and exclusion criteria to reject or retain the paper. Were used three inclusion criteria, the first criterion focus in the abstracts (abstracts focusing on information systems or IS, decision making and SMEs), the second focus was on the full text of the papers (papers focusing on information systems, decision making and SMEs) and the third only empirical studies are included.

The decision was taken by reading the title, abstract and keywords, or the full text if needed. Each researcher placed the candidates into one of the following categories: (1) Included: the paper is considered included if it satisfies at least one of the inclusion criteria and none of the exclusion criteria; (2) Excluded: the paper is considered excluded if it satisfies at least one exclusion criteria and (3) Uncertain: all other situations.

After completing this step, for Kitchenham and Charters (2007), the quality assessment indicator (QA) is important for data synthesis and interpretation of findings which is usually based on a checklist of criteria that need to be assessed in each relevant study. Thus, a checklist containing five questions, listed in Table 4, was developed to determine the QA level of the studies evaluated.

Table 4. Quality Assessment checklist.

ID	Questions
QA ₁	Are the objectives of the study clearly defined?
QA ₂	Is the solution proposed well defined and discussed?
QA ₃	Was there an application of a type of IS in the study?
QA ₄	Has the use of IS any significance in the decision-making process?
QA ₅	It was represented the hierarchical level in which the IS was used for decision making?

Source: Adapted from Kitchenham and Charters (2007).

The five questions have three possible answers ‘Yes’, ‘Partly’, and ‘No’, these answers are scored as follows: (+1), (+0.5) and (0) respectively. In appendix 1, were considered only the relevant papers with acceptable quality, with a score of more or equal than 90% of the perfect score (Figure 2), similar criteria were used in Idri, Amzal, & Abran (2015); Idri, Mohamed, & Abran (2016) and Wen, Li, Lin, Hu, & Huang (2012).

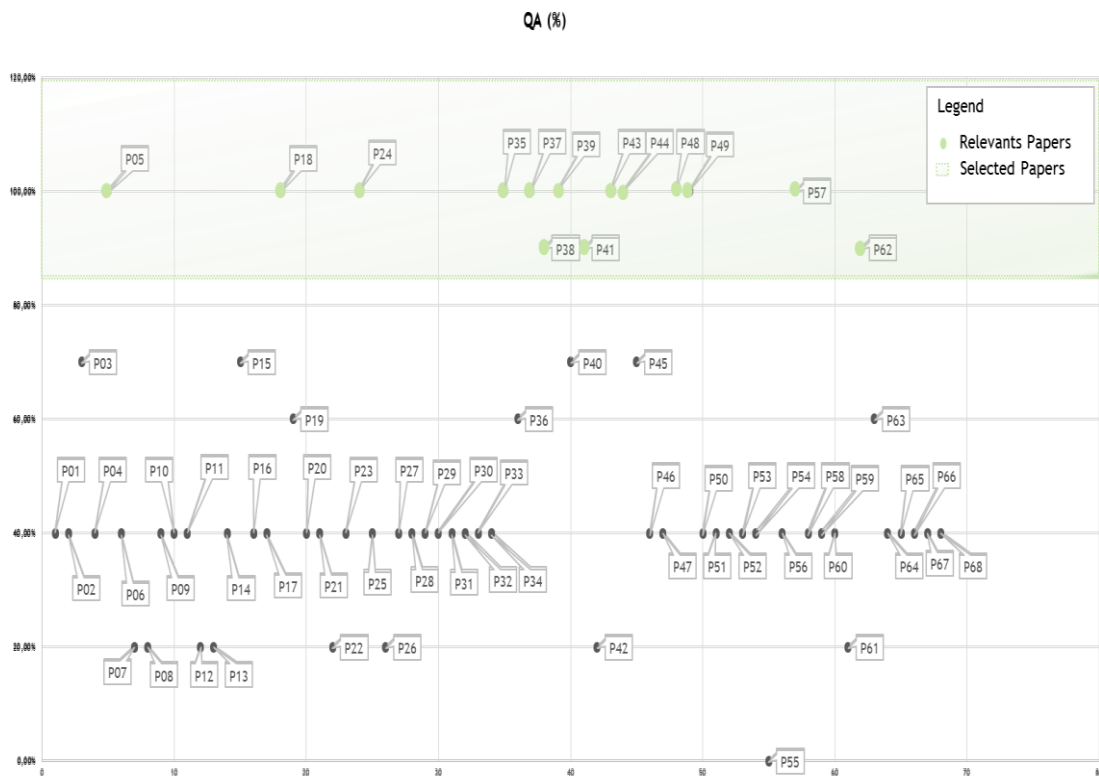


Figure 2. Application quality assessment and selection of relevant articles.

In general, in the quality evaluation process, the following results were presented in relation to the 68 articles selected in phase 3: QA₁ (98.5%), QA₂ (86.8%), QA₃ (30.1%), QA₄ (22.8%) and QA₅ (19.9%), that is, in QA₁ and QA₂ the articles met the requirements strongly, QA₃ responded moderately, while QA₄ and QA₅ were met only in some studies. Thus, 14 papers were effectively selected for this research (Appendix 2).

In the Figure 3 is presented the design associated to the development of this SLR. Kitchenham, et al. (2009) use the following criteria to evaluate the quality of SLR: (i) appropriated inclusion and exclusion criteria; (ii) literature search includes all relevant studies; (iii) the quality/validity of the included studies was assessed; and (iv) description of basic data about each study.

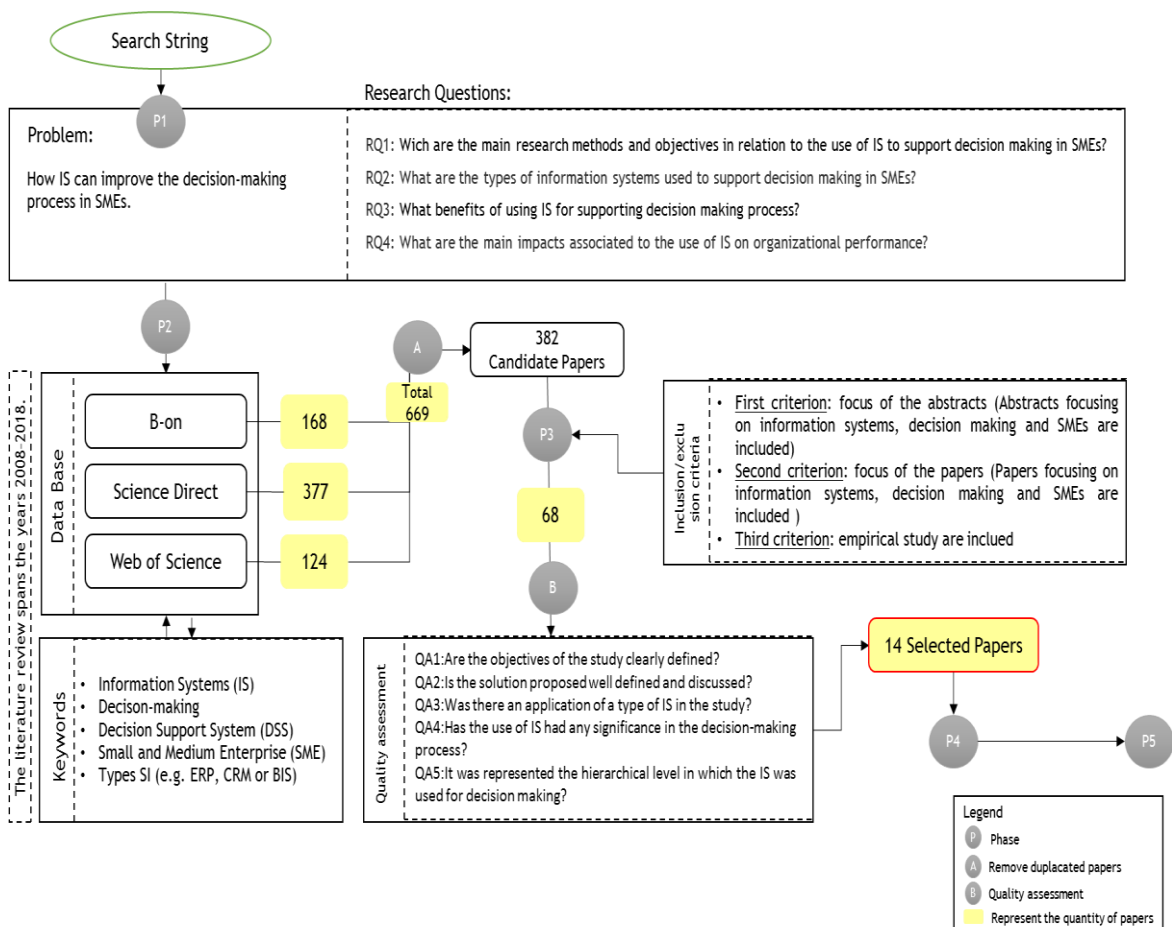


Figure 3. Development of SLR.
Source: Adapted from Idri, Mohamed, & Abran (2016).

2.2.4. Phase 4—Research Analysis and Interpretation

In this section the information was extracted and the studies were summarized. To Okoli & Schabram (2010) it is necessary categorizing existing research studies to analyze the progress in a field. Even for Denyer & Tranfield (2009) it is necessary cross tabuling the studies, in order to

key issues can be identified. For this, it defines five categories and fifteen subcategories that are specified in the Table 5.

Table 5. Categories used in SLR analysis.

Category	Subcategories	Description
Paper identification	Author	List of authors
	Title	Publication title
	Publication date	Year of publication
	Publication Type	Journal, conference, etc
Domain	Research Field	"IS" or "IS for decision making" or "Type IS"
Research Objectives	Application	Application of an IS type to aid in the decision-making process
	Development	Develop, adapt or create new type IS or framework
	Validation	Validate proposed or existing models, from the conceptual or empirical point of view
	Typology used to cluster	(1) Adoption factors: factors that led to the use of a certain type of IS as cost reduction, technology change, industry, innovation, improvement in internal processes, etc; (2) Decision-making process: the use of a particular type of IS in the decision-making process and (3) Organizational Performance: relation of the use of a certain type of IS in the organizational performance.
Research methods	Analytical	Conceptual (e.g., futures research scenarios or conceptual modelling), mathematical (e.g., mathematical simulation) or statistical methodologies
	Empirical	Experimental design (e.g., experimental empirical design), statistical sampling (e.g., surveys or expert panels), case studies, content analysis, mixed methods
	Others	Other methodologies not included in previous subcategories
Research specifications	Country	Country where the study was conducted
	Type IS	The type of IS used to aid in the decision-making process
	Hierarchical level	The level of IS utilization for decision making in SMEs: strategic, tactical or operational

Source: Adapted from Correia, et al. (2017).

2.3. Data Analysis

In this section, the findings of the systematic literature review considering our research questions are described.

2.3.1. Sample Description

As previously mentioned, 14 papers made part of the initial sample, which are clustered according to the publication channel, publication type and year of publication (Table 6). From these, only 14 works respect all the selection criteria, which are distributed in the following way: about 28.6% of them were published in conferences and 71.4% in journals. The year 2012, 2014 and 2017 represent the period with more publications with 21.4%, followed 2015 with 14.3% and 2010, 2013 and 2016 with only 5.9%.

Table 6. Distribution of papers according to the publication source.

Type	Year	Publication source	Number
Conference	2012	Procedia Economics and Finance	1
	2013	Conference on Information Systems and Technologies (CISTI)	1
	2015	The International Journal of Management Science and Information Technology (IJMSIT)	1
	2017	Procedia Technology	1
Journal	2010	International Journal of Information Management	1
	2012	International Journal of Electronic Commerce	1
		Journal of Cleaner Production	1
	2014	Information Technology for Development	1
		International Journal of Production Economics	1
		Journal of Intelligence Studies in Business	1
	2015	The Journal of High Technology Management Research	1
	2016	International Journal of Accounting Information Systems	1
	2017	Enterprise Information Systems	1
		Journal of Decision Systems	1
Total			14

The countries identified belong to the location of the SMEs used in the selected papers. Among the papers' sample the country with greater representativity was France with 10.7% of the research papers, and the others countries with 7.1% of the papers each. (Figure 4).

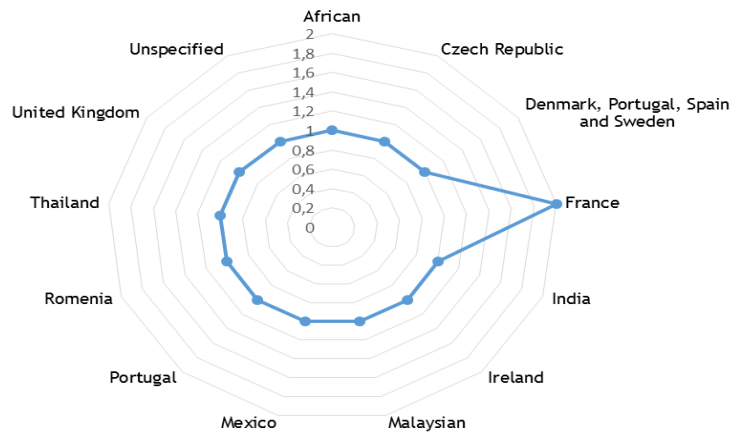


Figure 4. Countries represented in the papers' sample.

As can be seen in Table 7, and as previously noted, France, as research unit, has two works on the research topic authored by Chalal, Boucher & Marques and Gauzelin & Bentz.

Table 7. Countries represented in the papers' sample and author.

Countries represented in the papers' sample	Author
African	Chaabouni & Yahia
Czech Republic	Zach, Munkvold & Olsen
Denmark, Portugal, Spain and Sweden	Ruivo, Johansson, Oliveira & Neto
France	Chalal, Boucher & Marques Gauzelin & Bentz
India	Seethamraju
Ireland	Harrigan, et al.
Malaysian	Ahani, Rahim & Nilashi
Mexico	Neyoy, Rodríguez & Castro
Portugal	Ruivo, Oliveira, & Neto
Romenia	Tutunea & Rus
Thailand	Nupap, Neubert & Chakpitak
United Kingdom	Hernández, Lyons & Stamatopoulos
Unspecified	Lin, Nagalingam; Kuik & Murata

The research studies were also categorized by domain (Table 8). The domain "Type IS" was the one to reach greater representativity with 85.7% of the papers, while "IS for decision making" is focused in only 14.3% of them.

Table 8. Domain of the papers included in the sample.

Domain	B-on	Science Direct	Web of Science	Total
IS for decision making	0	1	1	2
Type of IS	3	6	3	12

Chapter 3

Results and Discussion

3.1. Research Methods and Objectives

The research question one (RQ₁) aims to identify research methods and objectives in the literature related to the use of IS to support decisions in SMEs. There are a set of research methods that can be found in literature about Information systems to support decision making in SMEs.

The research method with greater application in the sample' papers is the "Survey" (Table 9). The survey is present in 26.33% of the selected papers followed by "Case Studies" which represents 21.1%, the "Mixed Methods" is present in 15.8% of the papers and the "Semi-structured interviews" and "Content Analysis" represent 5.33%.

Table 9. Research Methods and Objectives.

Research Methods	Research Objectives	Author/Year
Case Study	Conceptual models	Application Nupap, Neubert & Chakpitak (2012)
		Development Chalal, Boucher & Marques (2015)
	Structured Models	Validation Zach, Munkvold & Olsen (2014)
		Chaabouni & Yahia (2012)
Content Analysis	Structured Models	Validation Tutunea & Rus (2012)
Mixed Methods	Conceptual models	Development Hernández, Lyons & Stamatopoulos (2016)
		Neyoy, Rodríguez & Castro (2017)
		Seethamraju (2015)
Semi-structured interviews	Structured Models	Validation Gauzelin & Bentz (2017)
Survey	Likert - Questionares	Validation Ruivo, Oliveira, & Neto (2014)
		Application Harrigan, et al. (2010)
	Structured Models	Ruivo, Johansson, Oliveira & Neto (2013)
		Development Ahani, Rahim & Nilashi (2017)
		Lin, Nagalingam; Kuik & Murata (2012)

The survey can be explained when individuals are questioned on a topic or topic, with a subsequent description of their responses, describing aspects or characteristics of the population, or testing hypotheses about the nature of relationships within a population (Jackson, 2011).

According to Yin (2005), the case study is an empirical investigation that investigates a contemporary phenomenon within its real-life context. Semi-structured interviews creates opening for a narrative to unfold, while also including questions informed by theory, it also leaves a space through which might explore with participants the contextual influences evident in the narratives but not always narrated as such (Galletta, 2013).

The mixed methods are used when different research methods are employed (e.g. such as survey and case study), as Hernández, Lyons, & Stamatopoulos (2016) used content analysis and case study. For Krippendorff (2013), content analysis is the enable research methods to plan and examine critically the logic, and protocols of research methods, to evaluate the performance of individual techniques and estimate the likelihood of particular research designs to contribute to knowledge.

As regards the research objectives, the “validation” is expressed in 31.6% of the research papers; the “development” represents 26.3% and the “application” 15.8%. In particular, Kitchenham & Charters (2007) recommends SLRs as a means to assuring reliable software development and application, software engineering and information systems; describe systematic mapping studies and tertiary reviews as special cases of systematic literature review.

However, Rousseau, Manning, & Denyer (2008) focus on SLRs in management and organization science, with the synthesis or analysis of results of studies obtained in an SLR. For example, Nupap, Neubert, & Chakpitak (2012) proposed Knowledge Management System (KMS) application framework based on the concept of Intellectual Capital (IC) through a case study.

Also, Chalal, Boucher, & Marques (2015) developed a system to support decision-making based on Product Service Systems (PSS). Gauzelin & Bentz (2017) validated the impact of Business Intelligence Systems (BIS) on organizational decision-making and performance using interviews to 200 members of 10 selected SMEs.

The main objectives of SLR studies are presented in Table 10. The typology used to cluster the sample' papers in terms of research objectives is the following: Adoption factors, Decision-making process, Organizational Performance. The category of the most used objective was organizational performance and adoption factors, which represented 42.9% each, followed decision-making process was 14.3%.

Table 10. Research Objectives in selected papers for SLR.

Category	Reference	Research Objectives
Adoption factors	Ahani, Rahim & Nilashi (2017)	To observe and prioritize adoption factors of social CRM by SMEs from the viewpoint of SMEs owner/manager.
	Lin, et al. (2012)	Proposed to offer maximum interoperability between all the distributed participants of a Collaborative Manufacturing Network (CMN) and their management information systems.
	Ruivo, Oliveira, & Neto (2014)	This paper empirically measures and analyses the determinants of ERP use and value in a single framework, as well as provides empirical evidence from Portuguese small and medium enterprises (SMEs).
	Seethamraju (2015)	Investigated the determinants and challenges in the adoption of SaaS ERP systems by SMEs.
	Tutunea & Rus (2012)	To present the place and the role of Business Intelligence in SME's activity and to identify their level of use.
	Zach, Munkvold & Olsen (2014)	To explore these influences of the SME context on the ERP system implementation process.
Decision-making process	Chaabouni & Yahia (2012)	To shed light on knowledge management as a crucial factor determining the contribution of ERP to the decision-making process.
	Neyoy, Rodríguez & Castro (2017)	To design a support system for decision making for the sales area of a SME in the restaurant sector, using a public database.
Organizational Performance	Chalal, Boucher & Marques (2015)	To provide operational support which integrates the specific business and industrial features of so-called 'product-service systems' in order to study the interactions of different types of performance factors, notably market-oriented versus industrial-oriented factors.
	Gauzelin & Bentz (2017)	The impact of business intelligence systems on organizational decision-making and performance.
	Harrigan, et al. (2010)	That generic Internet technologies, once used, can enable and enhance SMEs' eCRM capabilities, which in turn lead to improved performance benefits.
	Hernández, Lyons & Stamatopoulos (2016)	To present how, by mentoring and supporting SME organisations through on-line based collaboration, it is possible to engage in improved collaborative alliances and how precision-engineering SMEs can benefit and are able to enhance their performance.
	Nupap, Neubert & Chakpitak (2012)	To overcome the problem of business survival and to improve the organizational performance for Thai ceramic SMEs, their proposed Knowledge Management System (KMS) implementation framework based on the concept of IC.
	Ruivo, Johansson, Oliveira & Neto (2013)	The aim of this study is to provide insights into the IT productivity subject, more precisely focus attention on the interplay of Enterprise Resource Planning (ERP) use across European Small and Medium Sized Enterprises (SMEs) and the impact ERP systems can have on user productivity.

3.2. Types of Information systems used for support decision making in SME

For a better understanding of what constitutes each of the IS focused in this work Table 11 is present.

Table 11. Characteristics of the IS used for support decision making in SME.

IS	Characteristics	Authors
BIS	<ul style="list-style-type: none"> • Large amounts of information of multiple sources; • Analytical processing (transforms the data into useful information); • Development of new opportunities for a business organization, working with hypotheses. 	Negash & Gray (2008), Aureli, Ciambotti & Savári (2014) and Papachristodoulou, Koutsaki & Kirkos (2017)
ERP	<ul style="list-style-type: none"> • Allows transparent integration of all the information; • Facilitate manage the relationships with outside stakeholders; • Improve visibility of information and processes in the product life cycle and resource usage in real time. 	Davenport (1998), Aureli, Ciambotti & Savári (2014) and Dehning, Richardson, & Zmud (2007)
CRM	<ul style="list-style-type: none"> • Organize, automate, and synchronize business processes; • Integrate applications. 	Aureli, Ciambotti, & Savári (2014) and Laudon & Laudon (2014)
DSS	<ul style="list-style-type: none"> • Provide analytical modelling and information to support semi-structured and unstructured organizational decision making. 	Ada & Ghaffarzadeh (2015)
KMS	<ul style="list-style-type: none"> • Enable organizations to better manage process for capturing and applying knowledge and expertise. 	Laudon & Laudon (2014)
PSS	<ul style="list-style-type: none"> • Compose of a physical product and associated services that support the product through-life. 	McKay & Kundu (2014), Boehm & Oliver (2013) and Chahal, Boucher, & Marques (2015)

The types of IS used in the sample' papers are illustrated in Figure 5. The analysis of the papers make possible to state that the types of IS most used by SMEs are the Business Intelligence System (BIS) and the Enterprise Resource Planning (ERP) representing both almost 60.0% of the IS identified in the sample papers. The Customer Relationship Management (CRM) and the Decision Support Systems (DSS) represent 14.3% each, the Knowledge Management System (KMS) and the Product Service Systems (PSS) only 7.1%.

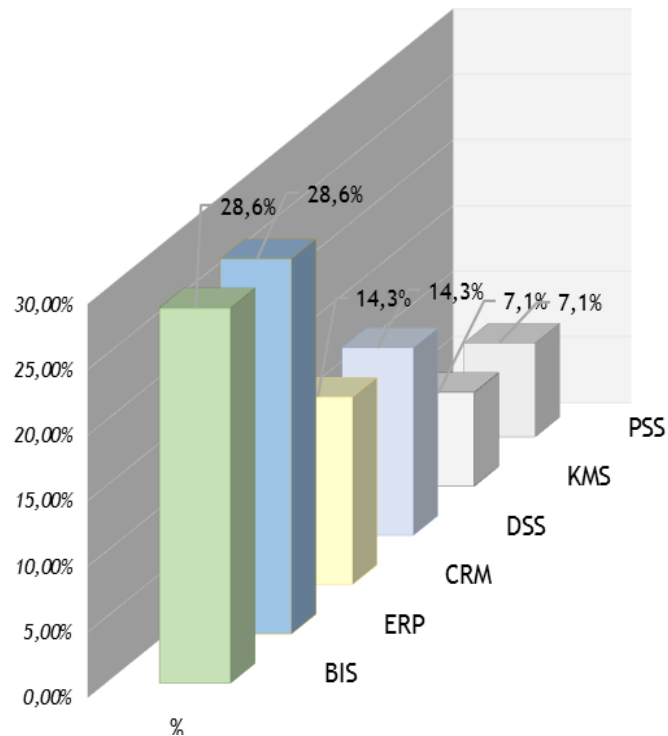


Figure 5. Types of IS focused in the papers' research.

In some sample'papers more than one IS is focused. For example, the ERP and the BIS are focused [concurrently](#) in Gauzelin & Bentz (2017), Tutunea & Rus (2012), Zach, Munkvold, & Olsen (2014). The Product- Service Systems (PSS) and the Enterprise Resource Planning (ERP) are focused by Chalal, Boucher, & Marques (2015). In both examples the IS are used to support the decision-making process.

It is important to emphasize, that according to Alter (2002) and Dumas, Aalst, & Ter Hofstede (2005), it is ambitious to classify the many types of information systems that have emerged in practice because one type of information system belongs to multiple categories.

Moreover, Tutunea & Rus (2012) defended that SME's generally choose very easy solutions for static or dynamic analysis of data with the help of spreadsheets MS Excel, Open Office Calc, Lotus 1-2-3, etc., of synthetic reports and graphic presentations tools, starting from the aggregation of existing data from multiple formats and data management locations, simple statistical analysis, what-if analysis, scenarios, etc. All these simple tools can be concentrated in menus and visualized in the form of simple dashboards.

Table 12 identifies the type of IS focused in the sample'articles that are usually used by SMEs to support decision-making process and define a typology. These results make possible to answer research RQ₂, related to the identification of the types of information systems used to support decision making in SMEs.

Table 12. Information Systems used for supporting decision-making process and corresponding advantages.

IS	Reference	Main advantages of using IS for supporting decision-making process of SMEs
	Gauzelin & Bentz (2017:pp.40)	“The study found out that when BIS are deployed in SMEs, they facilitate timely decision making, improves organizational efficiency, enable a company to meet client’s needs appropriately and lead to more satisfied employees.”
	Neyoy, Rodríguez & Castro (2017: pp. 6)	“Decision support systems facilitate and make the decision-making process more efficient in the phases of design, selection and intelligence.”
BIS	Tutunea & Rus (2012, pp. 870)	“Consider the benefits offered in decision making support such as: the quality of business information provided, powerful tools for data analysis and visualization, lower cost of decision making, web-based accessibility, increased efficiency and effectiveness of decisions.”
	Zach, Munkvold & Olsen (2014, pp.313)	“Decision making is generally centralised with fewer layers of management and decision makers. This centralised decision making implies that the CEO can either be the main obstruction or the main catalyst for change. Furthermore, the decisionmaking cycle is usually short term. In addition, the decision process in SMEs is more intuitive and based on experience, as a limited number of formal information and decision models are employed.”
CRM	Ahani, Rahim & Nilashi (2017, pp.560)	“The outcomes of this research benefit executives’ decision-making by identifying and ranking factors that enable them to discover how they can advance the usage of social CRM in their firms.’
	Harrigan, et al. (2010, pp.12)	“Using these applications not only allows for the capture and sharing of customer details within the organization, but also provides analytic capabilities that support decision making by automatically identifying patterns among the organization’s customers.’
DSS	Hernández, Lyons & Stamatopoulos (2016, pp.1257)	“This proposed solution in different SMEs from different sectors across the UK and EU as well as considering different coordination mechanisms to ensure the companies are accessing on-time and real-time information for supporting their operations management and decision-making process through collaborative decision support systems.”
	Lin, Nagalingam; Kuik & Murata (2012,pp.2)	“The development of a Global Decision Support System (GDSS) enables optimized decision-making via facilitating interactions amongst the stand-alone manufacturing systems, and the adoption of a generic collaborative decision-making model.”
	Chaabouni & Yahia (2012, pp.303)	“Results show that the good practices of knowledge management favour a suitable use of ERP, and consequently lead to an undeniable improvement of the decision-making process.”
ERP	Ruivo, Johansson, Oliveira & Neto (2013, pp.85)	“It is urgent that these additional constraints on growth and acquisition of IT resources makes more imperative the study of ERP and user’s productivity in order to decision-making process of firms business applications adoption to raise productivity and support competitiveness strategies.”
	Ruivo, Oliveira, & Neto (2014, pp.180)	“Findings suggest that most changes appeared to be occurring with collaboration and analytics which improve the functionality of management accounting with used ERP. In other words, management accounting is moving beyond back-office accounting systems to front-end decision making.”
	Seethamraju (2015,pp.478)	“To give faster decision making, cost imperatives and flexibility, it may be relatively easy to deal with change management and implementation issues in SMEs.”
KMS	Nupap, Neubert & Chakpitak (2012)	The decision-making process becomes more effective, since the organizational information is available in a systematized form generating a source of knowledge.
PSS	Chalal, Boucher & Marques (2015,pp.378)	“They raised the strong need for decision support systems to help industrial decision-makers in managing the transition which affects both the cost/revenue models of the company and the organisational performance.”

3.3. Benefits of using IS for supporting decision-making process

Attending to Table 13 it is possible to systematize in an aggregated way the main benefits associated to the use of the Information Systems in supporting the decision-making process, thus responding to answer research RQ₃.

According to Rezende (2005) “efficiency” means doing things well, with performance and is based on methods, means and times; “effectiveness”, however, means doing the right thing in the right way, being the sum of effectiveness and efficiency, based on regularity, practicality, durability and constancy; “quality” in IS refers to explicitly stated requirements and performance compliance, standards of development, compliance with standards of a standard or customer and “economicity” means no waste of resources, that is, effectiveness with costs that are appropriate to the reality in organizations, is based on cost versus benefit.

Being so, the main benefits mentioned by using IS for decision making are efficiency (40.0 %), quality (30.0%), effectiveness and economicity (26.6% together). Analyzing the results by type of IS, the greatest benefits found associated to BIS are quality and efficiency, while in the use of CRM are efficiency. In the DSS there has been a balance between efficiency and quality in terms of ERP, representing the most perceived benefit in the decision-making process, in the KMS is the effectiveness and finally, in the PSS there is also a balance between effectiveness and efficiency (Table 13).

Table 13 .Benefits of using IS for supporting decision-making process.

Type IS	Reference	Benefits to support decision-making process			
		Effectiveness	Efficiency	Quality	Economicity
BIS	Gauzelin & Bentz (2017)	-	√	√	-
	Neyoy, Rodríguez & Castro (2017)	√	-	√	-
	Tutunea & Rus (2012)	√	√	√	√
	Zach, Munkvold & Olsen (2014)	-	√	-	-
CRM	Ahani, Rahim & Nilashi (2017)	-	√	-	-
	Harrigan, et al. (2010)	-	√	√	-
DSS	Hernández, Lyons & Stamatopoulos (2016)	-	√	√	-
	Lin, Nagalingam; Kuik & Murata (2012)	-	√	√	-
ERP	Chaabouni & Yahia (2012)	-	√	√	-
	Ruivo, Johansson, Oliveira & Neto (2013)	√	√	√	√
	Ruivo, Oliveira, & Neto (2014)	-	√	√	-
	Seethamraju (2015)	-	√	-	√
KMS	Nupap, Neubert & Chakpitak (2012)	√	-	-	-
PSS	Chalal, Boucher & Marques (2015)	√	√	-	√

3.4. The impact of IS on organizational performance of SMEs

The implementation of new technology by micro-firms is an essential vehicle for their survival and growth in the global market. Its use will contribute to expand their business, by allowing a more personalized service and faster response to customers' demands, providing a cheaper and easier connection with external contacts both locally and globally (Franco & Garcia, 2017).

In order to answer the research question RQ₄ about the impact of IS implementation on organizational performance, initially, to the identification of the impacts on organizational performance in the select papers, the hierarchical level and the internal areas where the IS are most applied to support decision-making are identified.

According to Rezende (2005) the levels of information and organizational decision-making obey the standard hierarchy in most organizations, also called organizational pyramid: the strategic level of influence considers the organizational structure of the whole organization, where the level of information is macro, both in internal and external environments; the tactical level of influence considers a set of homogeneous aspects of the organizational structure, in this case the level of information is aggregated or synthesized contemplating departmental information or a business or an activity; and the operational level of influence considers a very specific part of the structure, in which the level of information is detailed to a given task or activity.

The Figure 6 represents synthetically IS types by hieraquic level, as well as information and characteristics in relation to the decision-making process.

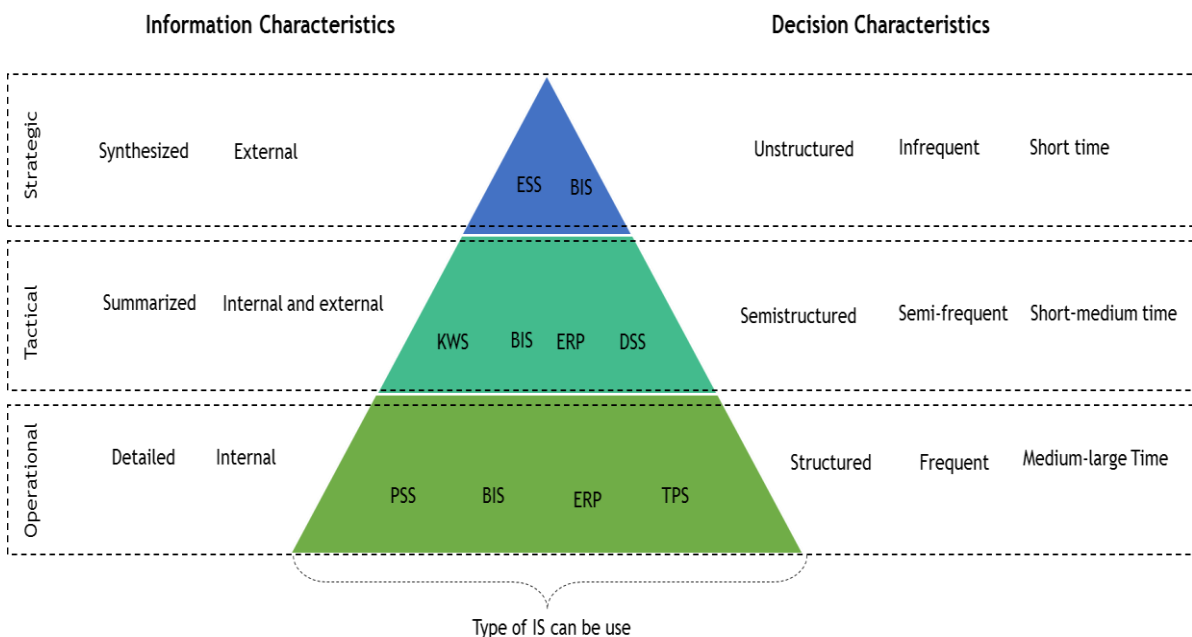


Figure 6. Information and decision characteristics for level and type of IS.

Source: Adapted from Laudon & Laudon, 2014; Rascão, 2001; and Turban, Aronson, Liang, & Sharda, 2007.

In the research' sample the implementation of IS at strategic level is more representative with 78.6%, then the operational level obtained 14.3% and the tactical level only 7.1 % (Table 14). Analyzing the hierarchical levels where the IS are implemented it is verified that at strategic level the following types of IS are used: BIS, CRM, DSS, ERP and KMS; while at the tactical level only BIS is used and in operational only the PSS is implemented.

Table 14. Impact of IS on organizational performance (RQ₃) attending to the implementation level.

IS	Reference	Level of implementation	Impact on organizational performance
BIS	Gauzelin & Bentz (2017)	Tactical	The overall results of all these impacts of BIS are improved company performance, as portrayed by the study.
	Neyoy, Rodríguez & Castro (2017)	Tactical	The prototype to the implementation using the actual data of the company to facilitate the decision-making process in the sales area.
	Tutunea & Rus (2012)	Strategic	In a competitive world, a right decision, made at the right time and based on an efficient BIS solution can become a consistent competitive advantage, for any SMEs.
	Zach, Munkvold & Olsen (2014)	Strategic	Better strategic planning of IS will help SMEs to recognise the potential benefits offered by ERP systems. Furthermore, SMEs should place emphasis on a thorough business process analysis.
CRM	Ahani, Rahim & Nilashi (2017)	Strategic	This is very important so that the SMEs' owners/managers can learn how to distinguish and to measure the results of the adopted social CRM strategy.
	Harrigan, et al. (2010)	Strategic	The technologies must be applied effectively to enhance SME eCRM capabilities. It is only when eCRM capabilities are effectively strengthened that improved performance will result. Among other things, to the opportunity for SMEs to create advanced customer relationships and thus enhance their ability to create direct performance benefits.
DSS	Hernández, Lyons & Stamatopoulos (2016)	Strategic	The main impact to this manufacturing SME from the collaborative platform was the way in which the feedback from a variety of supply chain units was considered, such as: service/product contracting, sales and marketing for services and product, customer service and support, logistics and finance and others.
	Lin, Nagalingam; Kuik & Murata (2012)	Strategic	Provides appropriate support to all necessary decision-making steps towards the attainment of the network's strategic goals.
ERP	Chaabouni & Yahia (2012)	Strategic	ERP favoured creating, storing and supplying external and internal knowledge, thereby facilitating detection of problems.
	Ruivo, Johansson, Oliveira & Neto (2013)	Strategic	Maybe have increase productivity employees and greater effectiveness in decision-making.
	Ruivo, Oliveira, & Neto (2014)	Strategic	This study also provides evidence that for Portuguese SMEs, the value of ERP greatly sets on its contribution to user satisfaction, individual productivity and customer satisfaction, but mostly to management control.
	Seethamraju (2015)	Strategic	With its ability to connect employees spread across the globe through the Internet, a SaaS based ERP solution can deliver real-time data, visibility and standardized processes and information, and help in collaboration and improved performance.
KMS	Nupap, Neubert & Chakpitak (2012)	Strategic	In the era of widespread in using modern information technology, every organization requires continuous and improvement of knowledge creation, sharing and implementation to compete in global market, gain competitive advantage and survive in the world crisis.
PSS	Chalal, Boucher & Marques (2015)	Operational	System dynamics simulation is used to anticipate long-term strategic performance.

In this context, for type of IS were discussed the impact in organizational performance:

- **BIS:** For Bernstein (2009) competitive or business intelligence is formed by processing the data, which produce information, processed information which produces knowledge and processed knowledge which leads to intelligence. Scholz, Schieder, Kurze,, Gluchowski, & Bohringer (2010) they concluded that product-oriented companies have better prospects in the application of BIS. Nenzhelele & Pellissier (2014) identify which business areas mainly applied business or competitive intelligence and whether they understand the concept. The main tool in the development and support of competitiveness, among SMEs is BIS and the decision support systems that are based on computer applications offer tools so that businesses can process data to extract information and to make better business decisions challenges (Papachristodoulou, Koutsaki, & Kirkos, 2017).
- **ERP:** According, Zach, Munkvold, & Olsen, (2014) the level of strategic planning was limited in the case of SMEs, with the companies preferring to keep with the concepts of the old systems, better strategic planning of IS might potentially help companies see the benefits of adopting new functional possibilities offered by ERP systems. While, the fast decision-making process may be due to a flat organisational structure with few layers of management and decision makers. The use of ERP in SMEs can keep them agile and competitive (Ogunrinde, Jusoh, Rahman, & Abdullah, 2016).
- **CRM:** Haislip & Richardson (2017) the CRM system implementation firms show improvements in operational performance, operational efficiency, accounts receivable collectability, and earnings predictability.
- **DSS:** Chan, Song, Sarker, & Plumlee (2017) suggest increased DSS motivation and usage of a DSS, which incorporates an accurate additive difference compensatory decision strategy, should lead to improved decision performance.
- **KMS:** The use for specific KMSs reduce misalignment and improve the operational performance of an enterprise in terms of a KMS's efficiency and effectiveness. The knowledge management alignment evaluation process represents an indispensable phase in the KM process due to its crucial effect on the improvement of an enterprise's overall performance (Centobelli, Cerchione, & Esposito, 2018).

Table 15 shows the benefits of using IS in the decision-making process for each hierarchical level. The perceived benefits at the strategic level are efficiency and quality that accounted for 73.9%, while effectiveness and economicity accounted for 26.1%. At the tactical level, two benefits were perceived: quality and efficiency accounting respectively for 66.7% and 33.3%, however at the operational level there was a balance between effectiveness, efficiency and economicity.

Table 15. Benefits to support decision-making process by level of implementation.

Level of implementation	Benefits to support decision-making process			
	Effectiveness	Efficiency	Quality	Economicity
Strategic	√	√	√	√
Tactical	-	√	√	-
Operational	√	√	-	√

Moreover, in 64.3% of the papers analyzed, the use of information systems has an impact in all areas of the organization. Organizational area is highlighted in 42.9% of the research' papers. The financial, production and supply chain areas account individually for 5.9% and, the unspecified area is focused 35.3%. However, BIS was used in the financial, organizational and non-specified areas. Already, the CRM was adopted only in the operational, while the PSS only in production. The DSS was used in the organization as a whole, as well as in the supply chain. ERP was also used by the organization and in areas not specified in the sample' papers (Table 16).

Table 16. Impact of IS by sector or area.

IS	Reference	Financial	Organizational	Production	Supply Chain	Unspecified
BIS	Gauzelin & Bentz (2017)	-	√	-	-	-
	Neyoy, Rodríguez & Castro (2017)	√	-	-	-	-
	Tutunea & Rus (2012)	-	-	-	-	√
	Zach, Munkvold & Olsen (2014)	-	-	-	-	√
CRM	Ahani, Rahim & Nilashi (2017)	-	√	-	-	-
	Harrigan, et al. (2010)	-	√	-	-	-
DSS	Hernández, Lyons & Stamatopoulos (2016)	-	-	-	√	-
	Lin, Nagalingam; Kuik & Murata (2012)	-	√	-	-	-
	Chaabouni & Yahia (2012)	-	-	-	-	√
ERP	Ruivo, Johansson, Oliveira & Neto (2013)	-	√	-	-	-
	Ruivo, Oliveira, & Neto (2014)	-	√	-	-	-
	Seethamraju (2015)	-	-	-	-	√
KMS	Nupap, Neubert & Chakpitak (2012)	-	-	-	-	√
PSS	Chalal, Boucher & Marques (2015)	-	-	√	-	-

In relation to the hierarchical levels and the areas where the IS are implemented to support the decision-making process in the SMEs, at the strategic level the financial, organizational, supply chain and unspecified areas are supported by this IS, while at the tactical level only the organizational and financial areas are identified and at the operational level only in productive areas the IS are used to support them (Table 17).

Table 17. The hierarchical levels and the areas where the IS were implemented.

Level of implementation	Financial	Organizational	Production	Supply Chain	Unspecified
Strategic	√	√	-	√	√
Tactical	√	√	-	-	-
Operational	-	-	√	-	-

According to the literature review, the benefits supported by the use of IS in the financial area were only the quality; in the organizational efficiency and quality together represent about 85% of the benefits, while effectiveness and economicity represent 15%; in production there is a balance between effectiveness, efficiency and economicity; in the supply chain a balance between efficiency and quality exists and in the unspecified areas efficiency accounted for 33.3% of benefits, quality and economicity together account for 50.0% and effectiveness for 16.7% (Table 18).

Table 18. The benefits supported by the use of IS in organizational areas.

Areas	Benefits to support decision-making process			
	Effectiveness	Efficiency	Quality	Economicity
Financial	-	-	√	-
Organizational	√	√	√	√
Production	√	√	-	√
Supply Chain	-	√	√	-
Unspecified	√	√	√	√

The performance measures that are supported by using IS in SMEs are present in only 6 papers which refer the types of performance indicators that are measured through the use of IS. In general, financial indicators are the most used, as well as those related to production or customer satisfaction (Table 19).

Table 19. Performance Indicators used.

IS	Reference	Performance Indicators used
BIS	Gauzelin & Bentz (2017)	Financial, Operational and Overall effectiveness
	Neyoy, Rodríguez & Castro (2017)	Control of revenues and expenses
DSS	Hernández, Lyons & Stamatopoulos (2016)	Financial indicators
ERP	Ruivo, Johansson, Oliveira & Neto (2013)	Productivity employees
	Ruivo, Oliveira, & Neto (2014)	User satisfaction, individual productivity and Customer Satisfaction
PSS	Chalal, Boucher & Marques (2015)	(1) Service-oriented indicators: Satisfaction rate for purchase demand, Satisfaction rate for service delivery; Mean reaction time in maintenance/installation; Average number of delays in maintenance/installation and (2) Industrial-oriented indicators: Overall workload per type of competence; Average level for product inventory; Number of stock shortages.

Regarding the hierarchical level of implementation and the performance indicators used, at the strategic level financial indicators and customer satisfaction are used, already at the tactical level indicators of control of revenues and expenses and effectiveness in some areas are implemented and at the operational level production indicators are used. Financial indicators used in all areas of the organization such as supply chain and production, as well as indicators of satisfaction of both internal and external customers. However, in the productive area productivity-related indicators are used.

Attending to the SLR performed and the analysis of the sample' papers it is possible to suggest a conceptual model for a better understanding about the use of IS to support the decision-making process of SMEs (Figure 7).

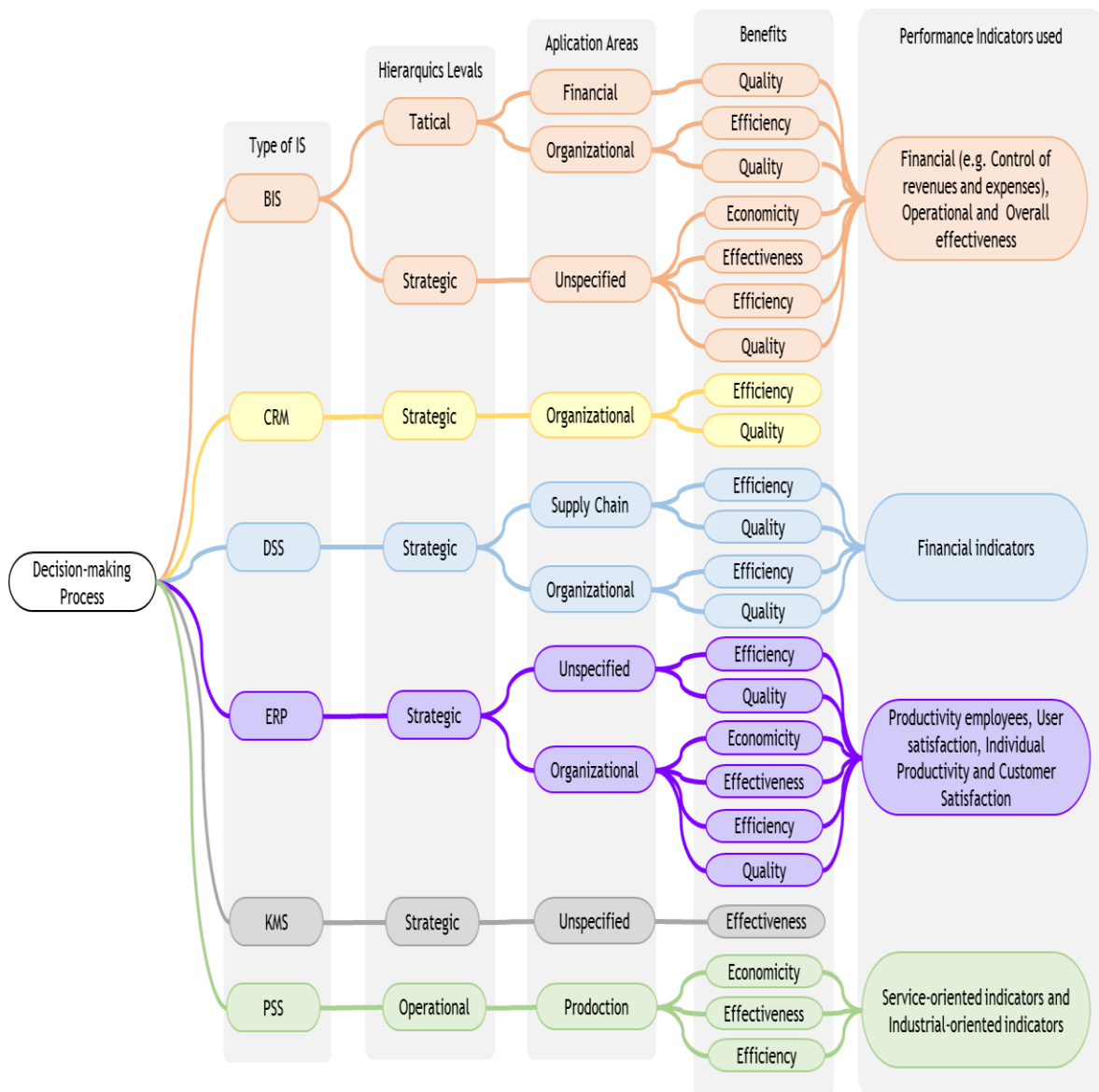


Figure 7. Conceptual model.

Chapter 4

Conclusion

The globalisation and current state of the economy are forcing many enterprises to change in order to survive and to compete in global markets and in such scenario, many SMEs need to develop new business strategies and employ also some technologies in supporting many decision makings (Ruivo, Oliveira, & Neto, 2014).

The types of IS used to support decision making in SMEs and the impact of their use on organizational performance were examined. The research sample is formed by 14 articles selected based on the methodology by Denyer & Tranfield (2009); Kitchenham & Charters (2007); Rousseau *et al.* (2008) and Tranfield et al. (2003), divided into 5 phases, published from 2008 to 2018, in the following databases B-on, Science Direct and Web of Science. As for the types of IS, there is no consensus regarding classification/Typology, even though due to emerging technological innovations they are changing/updating. The type of IS used in SMEs varies according to a series of factors such as the type of business of the company, the culture, industry, the available resources, among other aspects.

Thus, the objectives of this study were achieved, where it is possible to answer the first research question (RQ₁), in view of that most of the papers in the sample have as their main objective validation and after development the types of IS. These results demonstrate that there is a tendency to study a particular type of IS in relation to another as organizational performance, adoption factors, competitiveness and, decision-making process. The RQ₂ about which types of IS used to support the decision-making process in SMEs, the most used IS are BIS and ERP, in some studies two types of IS are used simultaneously as ERP and BIS or ERP and PSS. Regarding RQ₃, the benefits perceived through the use of IS in the decision process are related to efficiency and quality. Finally, the RQ₄ that aimed to impact the use of IS on organizational performance, there is evidence in the researched articles that occur mostly at strategic level, in the organization as a whole, but the financial, productive and supply chain sectors were also mentioned. As regards the performance measures influenced by the use of IS in SMEs, only 6 studies mentioned some indicator, such as financial, operational, overall effectiveness, control of revenues and expenses, productivity employees, user satisfaction and, individual productivity.

From the point of view of SMEs, this document contributes to analysis and comprehensive review, how the type of IS (e.g. BIS, ERP, CRM, DSS, KMS and, PSS) can aid in the decision-making process and the impact of their use on organizational performance.

4.1. Limitations and Future research

Although this study uses a standard research design, it has some limitations that the reader should consider while interpreting the results, as the use of three databases (B-on, Science Direct and Web of Science) in a given period, as well as key words, study objectives, inclusion, exclusion and quality criteria. Although extensive research is carried out, due to the criteria mentioned above, some article could not have been included in the selective process carried out in this study. The inclusion of other sources of information, such as magazines and organizations' internal documents, should be considered in future, due to the difficulty of finding some information mainly to measure the organizational performance.

Based on the insights provided by this study, the following future research directions are recommended:

- Research objectives and methods: the model development and application should be better exploited in future studies, in view of the fourth industrial revolution that is underway. The focus on case studies or mixed methods that allow both quantitative research (questionnaires) and qualitative research (interviews) for information triangulation purposes, would make it possible to identify more clearly aspects such as the areas where IS are implemented, the most used indicators and the impacts on the organization with the use of IS for the decision-making process.
- Theoretical background: could expand this research by offering a comparative research approach to distinguish particularities in the use of IS to improve the decision-making process in SMEs among other countries, continents or even developed or developing countries.

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Appendix 1

Table A.20. Application Quality Assessment.

Order	Author, Year	QA ₁	QA ₂	QA ₃	QA ₄	QA ₅	Total	QA (%)
P01	Lee & Know, 2014	1,00	1,00	-	-	-	2,00	40,00%
P02	Nguyen, Newb & Macaulay, 2015	1,00	1,00	-	-	-	2,00	40,00%
P03	Franco & Garcia, 2017	1,00	1,00	1,00	-	0,50	3,50	70,00%
P04	Voss & Brettel, 2014	1,00	1,00	-	-	-	2,00	40,00%
P05	Seethamraju , 2015	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P06	Ifinedo & Olsen, 2015	1,00	1,00	-	-	-	2,00	40,00%
P07	Nouri & Soltani, 2017	1,00	-	-	-	-	1,00	20,00%
P08	Ada & Ghaffarzadeh , 2015	1,00	-	-	-	-	1,00	20,00%
P09	Taylor & Taylor, 2014	1,00	1,00	-	-	-	2,00	40,00%
P10	Oliver, Sempere & Moll, 2016	1,00	1,00	-	-	-	2,00	40,00%
P11	Bititcia, Coccab & Atesc, 2016	1,00	1,00	-	-	-	2,00	40,00%
P12	Ghobakhloo &Tang, 2015	1,00	-	-	-	-	1,00	20,00%
P13	Leja ´rraga & Oberhofer, 2015	1,00	-	-	-	-	1,00	20,00%
P14	Ainin, et al., 2015	1,00	1,00	-	-	-	2,00	40,00%
P15	Renatus & Geldermann, 2016	1,00	1,00	1,00	0,50	-	3,50	70,00%
P16	Lejarraga & Martinez-Ros, 2014	1,00	1,00	-	-	-	2,00	40,00%
P17	Hanclova, et al., 2015	1,00	1,00	-	-	-	2,00	40,00%
P18	Neyoy, Rodríguez & Castro, 2017	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P19	Andres & Poler, 2016	1,00	1,00	1,00	-	-	3,00	60,00%
P20	Guillemette, Laroche & Cadieux, 2014	1,00	1,00	-	-	-	2,00	40,00%
P21	Rezvania, Dongb & Khosravia, 2017	1,00	1,00	-	-	-	2,00	40,00%
P22	Neirottia & Raguseob, 2017	1,00	-	-	-	-	1,00	20,00%
P23	Cha, et al., 2017	1,00	1,00	-	-	-	2,00	40,00%
P24	Hernández, Lyons & Stamatopoulos, 2016	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P25	García, Romero & Raventós, 2016	1,00	1,00	-	-	-	2,00	40,00%
P26	Almazán, Tovar & Quintero, 2017	1,00	-	-	-	-	1,00	20,00%
P27	Petter, DeLone & McLean, 2008	1,00	1,00	-	-	-	2,00	40,00%
P28	Ghobakhloo & Tang, 2015	1,00	1,00	-	-	-	2,00	40,00%
P29	Ceptureanu, 2016	1,00	1,00	-	-	-	2,00	40,00%
P30	Bumblauskas, et al., 2017	1,00	1,00	-	-	-	2,00	40,00%
P31	Child & Hsieh, 2014	1,00	1,00	-	-	-	2,00	40,00%
P32	Mussoa & Francioni, 2012	1,00	1,00	-	-	-	2,00	40,00%
P33	Mattiussi , Rosano & Simeoni, 2014	1,00	1,00	-	-	-	2,00	40,00%
P34	Yang, et al., 2016	1,00	1,00	-	-	-	2,00	40,00%
P35	Chalal, Boucher & Marques, 2015	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P36	He, Song & Chaudhry, 2014	1,00	1,00	0,50	0,50	-	3,00	60,00%
P37	Zach, Munkvold & Olsen, 2014	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P38	Tutunea & Rus, 2012	1,00	1,00	1,00	0,50	1,00	4,50	90,00%
P39	Chaabouni & Yahia, 2012	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P40	Aureli, Ciambotti & Savári, 2014	1,00	1,00	1,00	0,50	-	3,50	70,00%
P41	Ahani, Rahim & Nilashi, 2017	1,00	1,00	1,00	1,00	0,50	4,50	90,00%
P42	Yu, et al., 2017	1,00	-	-	-	-	1,00	20,00%
P43	Ruivo, Johansson, Oliveira & Neto, 2013	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P44	Ruivo, Oliveira, & Neto, 2014	1,00	1,00	1,00	1,00	1,00	5,00	100,00%

Table A.20. *Cont.*

Order	Author, Year	QA ₁	QA ₂	QA ₃	QA ₄	QA ₅	Total	QA (%)
P45	Kossai & Piget, 2014	1,00	1,00	1,00	0,50	-	3,50	70,00%
P46	Sebesta, 2013	1,00	1,00	-	-	-	2,00	40,00%
P47	Laitinen, 2008	1,00	1,00	-	-	-	2,00	40,00%
P48	Harrigan, et al., 2010	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P49	Lin, Nagalingam; Kuik & Murata, 2012	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P50	Ruivo, Oliveira & Neto, 2015	1,00	1,00	-	-	-	2,00	40,00%
P51	Ruivo, et al., 2013	1,00	1,00	-	-	-	2,00	40,00%
P52	Ruivo, Oliveira & Neto, 2012	1,00	1,00	-	-	-	2,00	40,00%
P53	Valença, & Alves, 2017	1,00	1,00	-	-	-	2,00	40,00%
P54	Romeiro & Rodello, 2015	1,00	1,00	-	-	-	2,00	40,00%
P55	Mendonça, Freitas & Souza, 2008	-	-	-	-	-	-	0,00%
P56	Papachristodoulou, Moutsaki & Kirkos , 2017	1,00	1,00	-	-	-	2,00	40,00%
P57	Gauzelin & Bentz, 2017	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P58	Giotopoulos, et al., 2017	1,00	1,00	-	-	-	2,00	40,00%
P59	Xin, Ojane & Huiskonen, 2017	1,00	1,00	-	-	-	2,00	40,00%
P60	Annarellia, et al., 2017	1,00	1,00	-	-	-	2,00	40,00%
P61	Haa, Lo & Wang, 2017	1,00	-	-	-	-	1,00	20,00%
P62	Nupap, Neubert & Chakpitak, 2012	1,00	1,00	1,00	1,00	0,50	4,50	90,00%
P63	Cerchione & Esposito, 2017	1,00	1,00	1,00	-	-	3,00	60,00%
P64	Barnes & Liao, 2012	1,00	1,00	-	-	-	2,00	40,00%
P65	Teller, Kotzab & Grant, 2012	1,00	1,00	-	-	-	2,00	40,00%
P66	Boonsothonsatit, 2017	1,00	1,00	-	-	-	2,00	40,00%
P67	Hernández, et al., 2015	1,00	1,00	-	-	-	2,00	40,00%
P68	Singh, Olugu & Musa, 2016	1,00	1,00	-	-	-	2,00	40,00%

Appendix 2

Table A.21. Selected relevant papers after Quality Assessment.

Order	Author, Year	QA1	QA2	QA3	QA4	QA5	Total	QA (%)
P05	Seethamraju, 2015	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P18	Neyoy, Rodríguez & Castro, 2017	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P24	Hernández, Lyons & Stamatopoulos, 2016	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P36	Chalal, Boucher & Marques, 2015	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P38	Zach, Munkvold & Olsen, 2014	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P39	Tutunea & Rus, 2012	1,00	1,00	1,00	0,50	1,00	4,50	90,00%
P40	Chaabouni & Yahia, 2012	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P42	Ahani, Rahim & Nilashi, 2017	1,00	1,00	1,00	1,00	0,50	4,50	90,00%
P44	Ruivo, Johansson, Oliveira & Neto, 2013	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P45	Ruivo, Oliveira, & Neto, 2014	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P49	Harrigan, et al. , 2010	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P50	Lin, Nagalingam; Kuik & Murata, 2012	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P58	Gauzelin & Bentz, 2017	1,00	1,00	1,00	1,00	1,00	5,00	100,00%
P63	Nupap, Neubert & Chakpitak, 2012	1,00	1,00	1,00	1,00	0,50	4,50	90,00%