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DEMÉTRIUS RIBEIRO DE ARAÚJO

A BIBLIOMETRIC ANALYSIS OF THE EVOLUTION OF THE INFORMATION SYSTEMS BUSINESS VALUE TOPIC IN THE LAST 40-YEARS

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A dissertation presented to the Sao Paulo School of Business Administration at Fundação Getulio Vargas, as a requirement for the degree of Master's in Management for Competitiveness.

Research Line: Information Technology

Advisor: Professor Otávio Próspero Sanchez, PhD

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Academic Jury:

_____

Prof. Otávio Próspero Sanchez, PhD
(Advisor)
Fundação Getulio Vargas

_____

Prof. Alberto Luiz Albertin, PhD
Fundação Getulio Vargas

_____

Prof. Alexandre Cappellozza, PhD
Universidade Presbiteriana Mackenzie

This work is dedicated to the memory of my grandmother Maria Pereira de Albuquerque, the most enthusiastic defender of university education, even though she never had the opportunity to study herself.

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ABSTRACT

The business value of investments in information systems (IS) has been a major concern for IS researchers and practitioners in the last forty years. However, the use of different synonyms to refer to the same term in a discipline makes it difficult to have an overview of a topic and to identify the emergent themes, crucial to address practical issues and to the planning and evaluating processes performed by practitioners to create value in the context of organizations. Researchers must be aware of the power of the keywords to increase access to studies. Through an in-depth literature review, nine synonyms for value in the context of organizations have been identified being used in the IS discipline in the last forty years. A dataset of published documents using these nine terms was retrieved from the Web of Science core collection. After refining, cleansing and classifying, a final dataset of 2.208 documents (articles, proceedings and reviews) was analysed with bibliometric techniques to map the topic based on numbers of documents (productivity) and citations impact (influence). Results show that IS business value publications increased twentyfold between 1980 and 2019. “Performance” is the most used synonym (in 35% of the analysed documents) followed by “value” (20%), “success” (15%) and “impact” (11%). The findings indicate stabilization in the use of terms in the last decade evidencing the maturity of the topic. The United States is the most productive (27% of the publications) and influential (59% of the citations) country, whereas Georgia State University is the most productive and influential publishing institution, confirming the hegemony of the United States. The African continent appears last in our rankings, which countries grouped sum 2% of the documents and 0,21% of the citations, confirming the high grade of concentration in academic production and warning for the opportunities. These findings provide an overview of the evolution of the IS business value topic over the last forty years and remark opportunities for strengthening research networks to promote diversification. All in all, this research provides practitioners with useful tools for mapping a topic and identifying emergent themes.

Keywords: Information systems; information technology; business; value; bibliometric analysis; Web of Science.

RESUMO

O valor de investimentos em sistemas de informação (SI) nas organizações tem sido um tópico de grande interesse para acadêmicos e profissionais nos últimos quarenta anos. Entretanto, o uso de diferentes sinônimos para se referir ao mesmo termo em uma disciplina faz com que seja difícil ter uma visão geral de um tópico e identificar temas emergentes, crucial para endereçar problemas práticos e para os processos de planejamento e avaliação executado por profissionais para crear valor no contexto das organizações. Investigadores precisam estar cientes do poder das palavras-chave para aumentar o acesso aos estudos. Através de uma revisão aprofundada de literatura, nove sinônimos de valor no contexto das organizações foram identificados em uso na disciplina de SI nos últimos quarenta anos. Uma amostra de documentos publicados usando estes nove termos foi obtida da coleção principal da Web of Science. Após refinar, limpar e classificar, uma amostra final de 2.208 documentos (artigos, artigos de conferências e revisões) foi analisada com técnicas bibliométricas para mapear o tópico baseado no número de documentos (produtividade) e impacto de citações (influência). Os resultados mostram que as publicações em valor de SI nas organizações cresceram vinte vezes entre 1980 e 2019. “Desempenho” é o sinônimo mais usado (em 35% dos documentos analisados), seguido de "valor" (20%), "sucesso" (15%) e "impacto” (11%). Os achados indicam estabilização no uso dos termos na última década evidenciando a maturidade do tópico. Os Estados Unidos são o país mais produtivo (27% das publicações) e influente (59% das citações), enquanto a *Georgia State University* é a instituição mais produtiva e influente. O continente africano aparece em último lugar em nossos *rankings*, cujos países agrupados somam 2% dos documentos e 0,21% das citações, confirmando o alto grau de concentração na origem das publicações e alertando para oportunidades. Esses resultados fornecem uma visão geral das publicações e dos termos usados como sinônimos de valor no tópico de valor SI nas organizações ao longo dos últimos quarenta anos e destacam oportunidades para fortalecer as redes de pesquisa e assim promover a diversificação. Em suma, este trabalho fornece ferramentas para ajudar profissionais a mapear um tópico e identificar temas emergentes.

Palavras-chave: Sistemas de informação; tecnologia da informação; valor; organizações; análise bibliométrica; Web of Science.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIS	Association for Information Systems
EJIS	European Journal of Information Systems
ICIS	International Conference in Information Systems
IS	Information systems
IT	Information technology
JCR	The Journal Citation Report
MIS	Management Information systems
SJR	SCImago Journal and Country Rank
TQM	Total Quality Management
WOS	Web of Science core collection

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1. INTRODUCTION

Information systems (IS) researchers are aware of the relevance of putting IS practitioners in the center of the academic debate to address practical issues (Rosemann & Vessey, 2008). Szajna (1994)'s findings suggest that IS researchers have been focusing on important practical issues since the early 1980s, despite not in a constant way. While researchers have been engaged in many recurrent calls to turn research more accessible and oriented to solving practical issues, this knowledge dissemination is not a simple task. Nowadays, besides doing relevant research, a successful researcher should also be able to publish a practically-language adapted paper in specific practitioners' outlets. Given the limited number of recognized practitioner-oriented outlets, not all relevant research can reach this venue. In consequence, to articulate new knowledge in practice, target practitioners should be able to search and find relevant literature.

However, nothing warrants that researchers uniformly keep keywords when adding knowledge to a topic. Usually, there is a multiplicity of terms used to designate related studies in a stream. Using multiple terms to refer to similar aspects in a topic has been a critical issue for practitioners as it may prevent them from adequately overviewing IS scientific publications and consequently identifying relevant works in the field.

This is true when we consider the topic of business value derived from Information Systems. Since proposed as an applied discipline in the late 50s (Stoller & Van Horn, 1960) researches and managers were concerned with the difficulties of measuring *the business value of Information Systems* (*IS Business Value*) in terms of semantics and techniques (Gallagher, 1974).

Despite its recognized importance, there is no plain agreement about the terms used to refer to IS business value as we can conclude from the previous literature reviews. The clarifying literature review made by Schryen (2013) reinforces the importance of finding a consensus for the IS business value construct and presents terms such as productivity, performance, profit and efficiency used as synonyms of value. However, in the terms included in the search string to retrieve the 327 documents of the review, Schryen (2013 p. 168) did not include for instance the term success, which was used as a synonym of IS business value in one of the all times most cited articles in the IS field (DeLone &

McLean, 1992). Another comprehensive review was made by Melville et al. (2004) including terms such as performance, effectiveness, impact and benefits, but again the term success is not explicitly presented as a synonym of value in the review.

Some important studies focus on the economic dimension of IS business value and use the term 'performance' as a synonym of value, referring to the organizational financial return but not differentiating it from the organizational performance as a whole (Zhu & Kraemer, 2005) as proposed by Melville et al., (2004, p. 293). Aligned with the value creation approach from the strategic management literature, other authors use the term 'value' (Kahli & Grover, 2008). Some studies differentiate value from performance, remarking the strong relationship between them (Malaquias & Albertin, 2018). Influenced by the Total Quality Management (TQM) models, some authors use the term 'success' (Popovič, Hackney, Coelho, & Jaklič, 2012) based on DeLone & McLean (1992)'s IS Success model. Some studies also use the term 'impact' (Zhang, Lu, Gupta, & Zhao, 2014) as a synonym of value to refer to a more generical technical term.

These numerous semantic terms used as synonymous of value in the IS discipline increases complexity and makes it difficult to track the evolution of the topic and identify emergent themes. For instance, if you are searching for new variables affecting the IS business value creation process you could miss hot topic such as agility (Sambamurthy, Bharadwaj, & Grover, 2003), technological diversity (Huang & Chen, 2010) or alliances (Chellappa & Saraf, 2010) if you use the term value instead of performance in your search, in the title field. The use of different semantic terms as synonyms to refer to IS business value over the active last 40-years of academic production increase the gap of a comprehensive overview of the publications on the topic which is especially critical in times of great change such as the current revolution in IS discipline motivated by the digital economy (Fichman, Santos, & Zheng, 2014).

The main metrics used to evaluate the relevance of academic production are the number of publications and citation impact. Despite the controversial debate around the use of citations to measure impact, it is wildly used worldwide (Leung, 2007) to rank and compare countries, journals, institutions, documents and authors. This study uses these two metrics to evaluate academic publications: (1) productivity to refer to the number of published documents and (2) influence to refer to the citation impact of the publications.

1.1. RESEARCH OBJECTIVE

To contribute to facilitating the understanding of the IS business value topic, the purpose of this research is to provide an overview of the publications of the topic, its evolution in terms of the academic productivity (number of published documents) and influence (citation impact) in the last forty years by addressing the following questions:

(1) What are the semantic terms used as synonyms of IS business value by researchers in the last 40 years?
(2) How the academic production in the IS business value topic has evolved in the last 40 years?
(3) What are the most productive and influential countries and institutions in the IS business value topic?

The first question was addressed through an in-depth literature review, an important tool to analyze the past (Webster & Watson, 2002), to identify terms used as synonyms of value in the IS discipline. The questions two and three were addressed through bibliometric methods. A research outline based on the five-steps approach method proposed by Wolfswinkel et. al (2013) is presented in Figure 1.1 was the roadmap for this research, and is composed by the phases: design, search, cleanse, analyze and present.

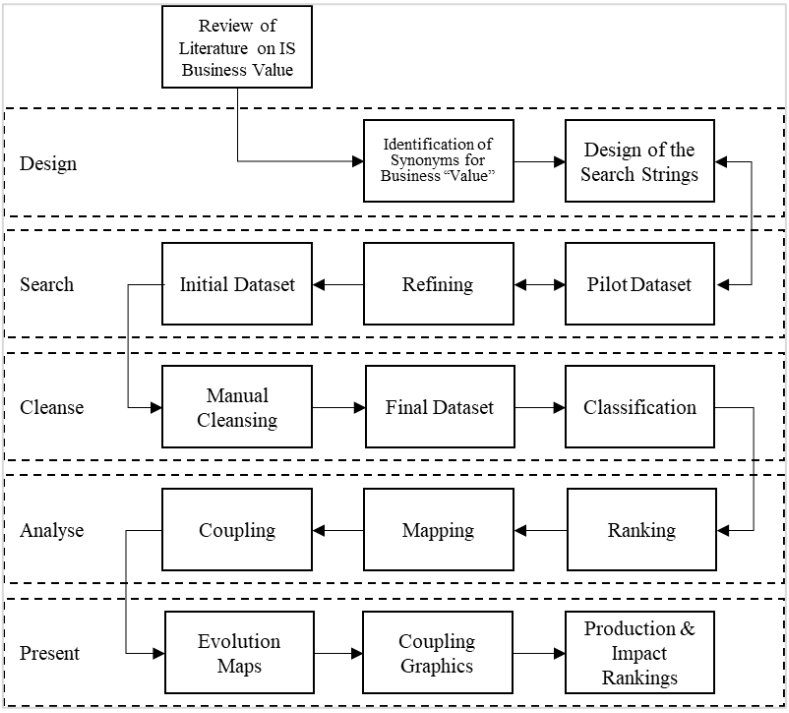

Figure 1.1 Research outline

The paper is structured as follows: In the next section, the literature review presents the semantic terms identified to refer to business value in the IS discipline. The methodology section depicts the search strategies, the dataset scoping, collection, and cleansing until obtaining the final dataset. In sequence, the sample was analyzed. The results are presented and discussed. We then present the limitations and opportunities for future research. Finally, the conclusion section summarizes the main contributions.

2. LITERATURE REVIEW

This section has three aims: (1) to give an overview on the IS discipline academic production as a whole, (2) to identify terms used as synonyms of IS business value based on an in-depth literature review and finally (3) to give an overview on the use of bibliometric methods in social sciences.

2.1. ACADEMIC PRODUCTION IN THE INFORMATION SYSTEMS FIELD

To have a general overview, we performed a search in the whole Web of Science core collection (WoS) and Scopus databases using the string: "information systems" OR “information technology” in the title, abstract and keywords fields with no other limitation. The WoS results retrieved over 147.000 documents published between 1954 and 2020 while in Scopus the search retrieve more than 565.000 documents published since 1945 until 2020 (searches performed in April 2020), in both databases the results are distributed in several document types and subject areas. This amount of publication confirms the growing interest in IS discipline in almost every research area. The difference between both databases is a consequence of the sources from secondary databases included as remarked by Mongeon & Adèle Paul-Hus (2016).

Identify the main publication sources in each discipline is the first step to go further on a topic. There is no a unique list of recommended sources of publications in IS discipline (Gallivan & Benbunan-Fich, 2007) mostly accepted, instead, we have some propositions of a list of IS journals with high intensity of publication in the area following different evaluation criteria. First, a list of eight sources is recommended in the Senior Scholars' Basket of Journals by the Association for Information Systems (AIS)[1]. This list

[1] Retrieved from: https://aisnet.org/page/SeniorScholarBasket. Access in May 2020

was extensively evaluated by Lowry et al. (2013) and it is commonly used as a reference to the bibliographic review and trend searching (Sørensen & Landau, 2015). The main critics to the AIS list of journals point out that it left behind well-known high-intensity IS-related journals such as *Decision Support Systems, Information and Management and Information & Organization* (Fitzgerald, Alan R. Dennis, An, Tsutsui, & Muchala, 2019). Chan et al. (2015)' article published in the *Information and Management* journal proposes a comprehensive method for identifying journals in a discipline. Karanja et al. (2019) presented the 15 mainstream IS journals including diversity as evaluation criteria to analyze the sources identified through a survey with experts.

Other rankings are based on impact factor calculated from the citations over the years of the documents in a particular database. The Journal Citation Report (JCR)[2] is based on Web of Science citations, and SCImago Journal and Country Rank (SJR)[3] uses citation data from Scopus database. Contrary to SJR and Scopus, Web of Science and consequently JCR has not a specific category for IS discipline, and the IS-related journals are included mainly in this three WoS categories: *Information Science & Library Science, Computer Science Information Systems* and *Management*. Table 2.1 presents a comparison between AIS list of 8 journals and SJR and JCR rankings.

There is only one journal is contained in the three lists: *MIS Quarterly*. AIS list match with SJR ranking in only two additional journals: *Information Systems Research* and *Journal of Management Information Systems* while the match between AIS and the JCR ranking it´s even smaller, with only one more: *Journal of Strategic Information Systems*. Finally, SJR and JCR rank coincide only in one additional journal: *Information and Management*. The composition of the three lists are widely different and makes it difficult to select a list of publication's sources in the IS discipline to limit our search.

The inexistence of a unique accepted list of publication source in IS field led us to the decision of not limiting our research to a particular pool of sources.

[2] Retrieved from: https://jcr.clarivate.com/. Access in May 2020
[3] Retrieved from: https://www.scimagojr.com/. Access in May 2020

Table 2.1. Comparison AIS 8 journals with top 8 ranked MIS-related journals in SJR and JCR

8 Journals (in alphabetical order) listed by the Association for Information Systems (AIS)	Top 8 ranked SJR journals in subject category: Management Information Systems (year: 2018)	Top 8 ranked JCR journals in category: Information Science & Library Science (year: 2018)
European Journal of Information Systems	Journal of Supply Chain Management	International Journal of Information Systems
Information Systems Journal	**MIS Quarterly**	Journal of Computer-Mediated Communication
Information Systems Research	Information Systems Research	Journal of Knowledge Management
Journal of Information Technology	Journal of Management Information Systems	**MIS Quarterly**
Journal of Management Information Systems	Public Management Review	Government Information Quarterly
Journal of Strategic Information Systems	Information and Management	Journal of the American Medical Informatics Association
Journal of the Association for Information Systems	Decision Support Systems	Information and Management
MIS Quarterly	Knowledge-Based Systems	Journal of Strategic Information Systems

2.2. TERMS USED AS SYNONYMS OF 'VALUE' IN THE IS DISCIPLINE

This section presents the results of the in-depth literature review performed to identify the semantic terms used as synonyms of value in the IS documents indexed in the WoS over the last 40 years. The starting point was the synonyms for value presented in two literature review papers on business value.

Before identifying the synonyms, it is important to define 'value' as treated in this work. In this sense, we take the Schryen (2013, p. 141)'s definition for IS business value as "[…]the impact of investments, in particular, IS assets on the multidimensional performance and capabilities of economic entities at various levels, complemented by the ultimate meaning of performance in the economic environment."

The first literature review was made by Schryen (2013) and includes the following terms in the search strings as synonyms of business value: 'productivity', 'performance' and 'profit'. The paper debates the importance of the IS 'success' model proposed by

DeLone & McLean as a process-oriented model for performance but does not include the term success in the search string (Schryen, 2013 p. 168). Considering that the string was applied only to the title field, the resulting dataset of 327 documents in this review should not contain the DeLone & McLean (1992) article, once it does not satisfy the string used terms presented by the author.

The second work is a comprehensive review made by Melville et al. (2004) including terms such as performance, effectiveness, impact and benefits, but again the term success is not explicitly presented as a synonym of value in the review.

The article from DeLone & McLean (1992) is one of the most cited articles in the IS discipline. The model uses the term success to refer to the whole value creation process and ‘impact’ to the dependent variable. However, due to the high impact of this work, the term ‘success’ is found in several works being used to value. Figure 2.1 summarizes the identified terms.

Additional synonyms were identified from a second literature review made by Melville et al. (2004): 'impact’, ‘efficiency and ‘effectiveness’, ‘benefit’, ‘outcomes’ and ‘returns’.

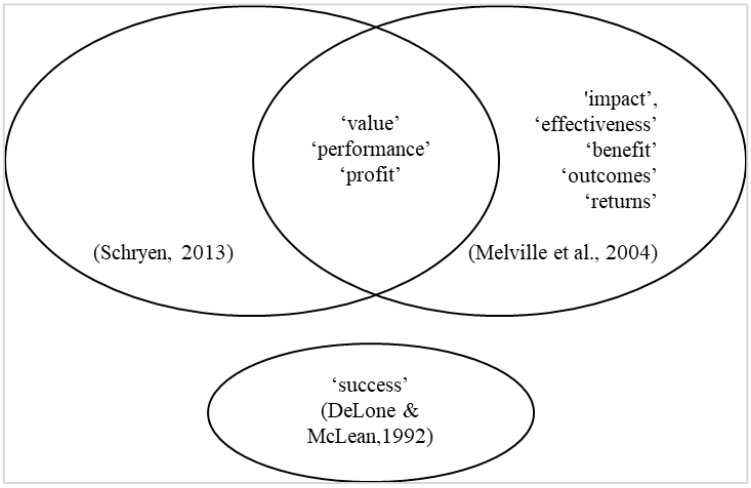

Figure 2.1 Identified synonyms for ‘business value’ used in the IS/IT field

A brief review of the identified terms detailing some characteristics is presented as follows. This section is not concerned in definitions, once all of the identified terms are synonyms of value.

2.2.1. Value

The term ‘value’ is widely applied to refer to IS business value in IS literature. Ahituv (1980) summarized three different approaches for evaluating IS value: in terms of additional value gained, process optimization, economic value added by control, as well as five different types of value: perceived, monetary, normative, revealed and intangible that grouped in a multiattribute utility value concept consists of economic returns and also those related to perception from the use of IS. He also highlights the importance of defining the level of analysis, once the concept of value differs from an individual to a group, and also at the organizational level. The concept of value has been also used to refer to profiting (Teece, 1986), and also to productivity and consumer surplus (Hitt & Brynjolfsson, 1996).

2.2.2. Performance

Another commonly used term to refer to IS business value is ‘performance’. Melville et al. (2004) define information technology (IT) business value as the impact in terms of efficiency and competitiveness of IT at both processes and organizational performance levels. The authors highlight the importance of defining IT, once it is their object of research. However, the paper does not differentiate IT from IS, they assume IS as a component of the operationalization of IT resources, as remarked: “IT is frequently operationalized using aggregate variables measured in dollars or counts of systems (proxy view)[…]” (Melville et al., 2004, p. 286).

2.2.3. Impact

‘Impact’ is a general term used as a synonym of value (Chou, Chuang, & Shao, 2014), normally without any distinction, as an alternative term for consequences or effects over the investments in IS, but sometimes it is applied to refer to a particular characteristic of the IS such as resources and capabilities produced by IS investments (Kawakami, Barczak, & Durmuşoğlu, 2015), the technological changes that are faced by organizations (S. J. Kim, Kara, & Kayis, 2014) and also related to quality (Joshi & Rai, 2000) of the information systems in terms of attending users expectations.

2.2.4. Effectiveness

'Effectiveness' is another term used to refer to the business value of IS, as proposed by Hamilton & Chervany (1981) as a complex concept that can be used to refer both to the efficiency in which the resources are applied to systems to provide expected results to users (individual level) and also in terms of accomplishing organizational objectives. The term effectiveness has been also used to refer to user satisfaction and user acceptance of systems (Srinivasan, 1985).

2.2.5. Success

The next term identified as a synonym of IS business value is 'success' as proposed in the influential DeLone & McLean (1992)'s IS success model in which the system quality is related to the use as antecedents of individual and organizational impacts. This model was extended (Pitt, Watson, & Kavan, 1995) and updated (DeLone & McLean, 2003). The model is widely accepted as a measurement scale for user satisfaction, despite few criticisms regarding its ability to measure the use of systems (Iivari, 2005). The review of 90 empirical papers done by Petter, Delone, & McLean (2008) is evidence of the extensive use of the model.

2.2.6. Benefits, outcomes, returns and profit

All of the terms listed above are most commonly used to refer to the measurement and evaluation of the returns over IS investments. However, other terms are less frequently used to refer to IS business value such as 'benefits' (Daulatkar & Sangle, 2016), 'outcomes' (Makri, Hitt, & Lane, 2009), 'returns' (Brynjolfsson & Hitt, 1996) and 'profit' (Teece, 1986) were also considered in this research.

2.3. BIBLIOMETRIC METHODS IN THE IS FIELD

Pritchard (1969) defines bibliometrics as the application of mathematical and statistical methods to evaluate bibliographical data. This quantitative approach is extensively used by scientific databases such as Web of Science and Scopus to construct indicators to documents, as a measure of productivity and influence to analyse scientific publications (Moed, 2000) also including patents (Van Raan, 1997). It is also a useful tool to draw the evolution of the discipline, the collaboration between researches

(Subramanyam, 1983) and the performance of research programs (Narin & Hamilton, 1996). Scientific publication is estimated to duplicate every 10-15 years motivating the increase of indicators and methods to measure productivity and impact (Larsen, 2010).

Despite the rapid increase in numbers of publications in the IS discipline, few studies use statistics to analyze the IS research topics regarding productivity and impact and bibliometric methods were developed in the information science discipline (Glanzel & Schubert, 2003; Waltman, 2016) and *Scientometric* journal is a specialized publication source in these statistical techniques. These methods are useful to have a general overview of a discipline or a research topic. Most of the existent bibliometric studies related to the IS field are focused in solving specific gaps, such as helping scholars in choosing publishing sources (Lowry et al., 2013) or analyzing hot topics (H. Chen, Chiang, & Storey, 2012; Nobre & Tavares, 2017). Grover et al (2006) investigate the evolution of the IS field in terms of the reference disciplines that helped its construction as a discipline.

Despite being a widely used method in the 70s and 80s, Blümel & Schniedermann (2020) point out the decreasing in the use of bibliometric, while reinforces the utility of this method to analyze academic documents. However, researchers in the IS discipline are aware of the importance of reviewing previous academic production to head the way forward (Webster & Watson, 2002). Hassan & Loebbecke, (2017) engage the use of bibliometric analysis to evaluate publications in the IS field as an important tool to gather an overview of a topic.

3. METHODOLOGY

We chose bibliometric methods (coupling, citation analysis, network mapping, clustering) following the tendency of its use in social science (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2011; Waltman, van Eck, & Noyons, 2010), and also because it is a systematic method that provides powerful tools to analyze and quantify the evolution of scientific publications (El-Alfy & Mohammed, 2020).

As this research is focused on published and indexed documents related to IS business value the first challenge was to select the sources of publication to be included in our search once the topic appears to be relevant to Management, Business, Information Science, Computer Science and several others disciplines.

The identified terms used as synonyms of value were used to compose the search strings. Then the retrieved results were refined, cleansed, classified, and analyzed with the help spreadsheets and a mapping system.

3.1. SEARCH STRATEGY

The search strategy presented in Table 3.1 summarizes the combination of searches by key terms applied to the complete WoS database, following the search strategy used by Nobre & Tavares (2017). Refer to Appendix A for the detailed search history.

Web of Science core collection all databases was the selected database to extract the dataset used in this research, due to its higher level of restriction and also because it is a well-accepted indexing reference in social science (Meho & Yang, 2007). All the searches used and presented in this research were held between April and May 2020.

Table 3.1 Search strategy

Database	All databases included in the Web of Science core collection (WoS)	
WoS Categories	Management; Business; Computer Science Information Systems; Information Science Library Science	
Population threshold	Fields:	Title, abstract, author keywords, and keywords plus[1]
	Search terms[2,3]:	'Information systems'; 'Information technology'
Dataset search terms	Fields:	Title
	Search terms[2,4]:	'Performance' OR 'Value' OR 'Success' OR 'Impact' OR 'Effectiveness' OR 'Benefits' OR 'Outcomes' OR 'Returns' OR 'Profit'
Document types	Articles; Proceeding Papers and Reviews	
Language	English	
Timespan	01/01/1980 - 31/12/2019	

Notes: [1] Keyword plus is a WoS classification for enhancing searches
[2] Wildcards (* $?) were used to include variations of the terms
[3] The population is composed of 54.500 documents
[4] Identified as described in the Literature Review section of this research

To assure the consistency of the database with the management and IS disciplines, the searches were restricted to Web of Science categories: *Management, Business, Computer Science Information Systems and Information Science Library Science* once these categories comprise the main sources related to the IS discipline.

Additionally, to the threshold set for the population, the dataset searches were limited to the title field, to retrieve only those documents in which the searched terms play a central role. The advanced search tool provided by WoS were used in combination with search operators (AND, OR, NEAR) and wildcards (* $?).

Editorial material, books, books chapters, letters and all those documents that follow the scientific method to introduce new knowledge were not considered in the dataset. The sample contains only articles, proceeding papers and reviews published in the English language.

The period was set to the last forty years, from 01/01/1980 until 31/12/2019 because of intense growth of publications related to the IS business value topic during this period. There are a few relevant previous studies (Gallagher, 1974), but not representative in terms of quantity of publications. Increase in the IS business value publication confirms the relevance highlighted earlier by Matlin (1979) and also by Ahituv (1980). Documents published in 2020 were excluded to facilitate comparisons between years.

A pilot dataset composed of 4.653 documents was collected and evaluated to help to refine the dataset-specific search strings. The biggest difficulty was the inexistence in WoS of an operator which differentiate capital letters, essential in this research to differentiate two acronyms widely used in the title of the researches: ‘IS’ for information systems an ‘IT’ for information technology. This problem was reduced by including specific terms in our string, such as ‘IS business value’, ‘IS value’, ‘value of IS’, etc to differentiate them from the verb ‘is’ and the pronoun ‘it’. The search and cleansing stages are summarized in Figure 3.1.

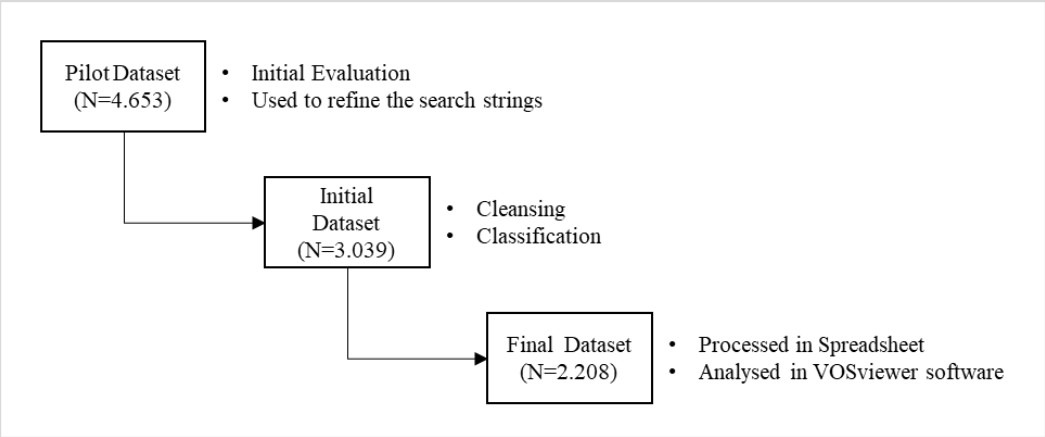

Figure 3.1 Search, refining, cleansing and classification stages

3.2. CLEANSING AND CLASSIFICATION

The initial dataset was composed of 3.039 unique documents that were submitted to manual cleansing to eliminate the searched terms used in other semantic meaning, for instance, those using performance referring ‘technical performance’ or value to refer to ‘numerical output value’.

27 documents classified as a proceeding paper and as a journal article at the same time was classified as articles. The documents with more than one of the searched terms were classified by the term most related to the results over the IS investments.

Spreadsheets were used to filter, summarize, classify, and rank the results and to generate pivot tables for presentation. Additionally, VOSviewer was the selected tool to conduct bibliographic mapping and coupling analysis (Eck & Waltman, 2010), as it is a free tool with several bibliometric data combination possibilities, including analysis by documents, authors, countries, organizations and citations.

4. RESULTS

The final dataset is composed of 2.208 documents, distributed in articles (63%), proceeding papers (34%) and reviews (3%). A comparison between the initial results and the revised dataset is presented in Table 4.1. A total of 707 documents were eliminated during the cleansing process, representing a reduction of 24% comparing to the initial dataset. The documents using the terms ‘performance’ and ‘value’ to refer to IS business value sum 55%, while the documents using the terms ‘benefits’, ‘outcomes’, ‘returns’ and

'profit' together represent 10% of the final dataset. No changes in the position of terms in the ranking were observed after cleansing.

Table 4.1 Comparison between initial and final dataset and composition of the final dataset

Semantic term	Initial dataset	Final dataset (after cleansing)				
		Articles (63%)	Proceedings (34%)	Reviews (3%)	Total	% of Total
Performance	1.053	499	249	16	764	35%
Value	501	275	161	12	448	20%
Success	462	210	121	10	341	15%
Impact	341	162	74	6	242	11%
Effectiveness	239	87	62	5	154	7%
Benefits	207	73	49	0	122	6%
Outcomes	103	43	18	6	67	3%
Returns	91	28	10	1	39	2%
Profit	83	24	6	1	31	1%
Total	3.039*	1.401	750	57	**2.208**	

Note: * The total documents of the initial dataset was obtained by the combination tool provided by WoS, which do not correspond to the sum of the individual results, due to 41 documents using more than one term and consequently satisfying more than one search string.

The evolution of published documents by year is presented in Figure 4.1. To facilitate visualizing the graphic was divided in four decades: the 1st Decade represents the 1980s, in which the IS business value is emerging as an academic topic, the 2nd Decade (the 1990s) is a phase of intense linear growth with a four-time increasing in numbers of publication, the 3rd Decade represents the 2000s in which is possible to observe a turning point in the numbers of documents starting from 2004 as the publications start to grow exponentially. Finally, in the 4th Decade (the 2010s) it is possible to observe a trend of stabilization in the curve indicating a possible saturation representing the maturity of the IS business value as a topic. The IS publications have increased more than twenty times in the analyzed period.

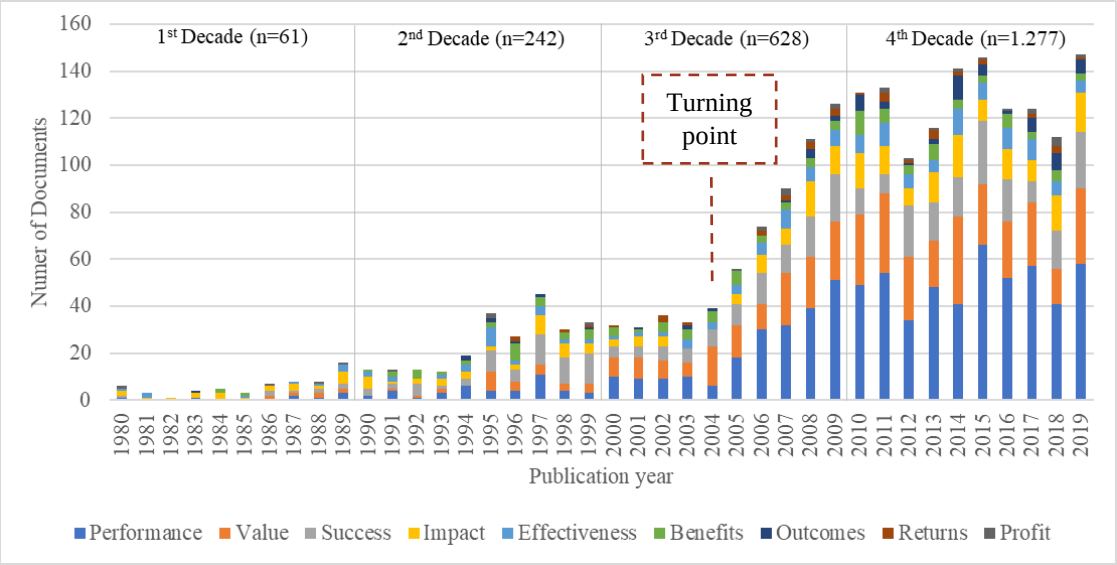

Figure 4.1 Evolution of publications on the IS business value topic (N=2.208)

The final dataset is composed of documents published by 1.611 institutions from 89 countries. Figure 4.2 a-d depicts the global trends in terms of productivity and impact of the top 10 countries and organizations. The top 10 countries together are responsible for 67% of the total publications (1.481 documents). The United States holds the larger number of documents as observed in Figure 4.2 a, while Malaysia appears at the bottom of the rank.

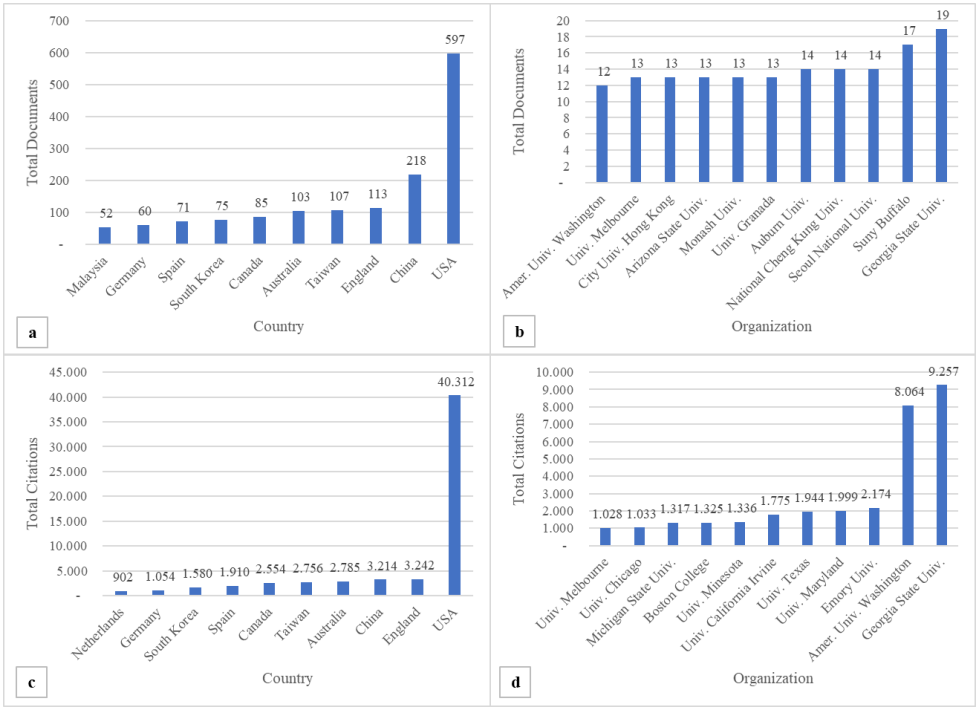

Figure 4.2 a-d Global trends in terms of productivity (total numbers of documents) and impact (total numbers of citations) by country and organization on IS business value

The productivity of the top institutions is more equally distributed into the top 10 leading organizations as observed in Figure 4.2 b. The difference in the number of publications from first to the last positioned organizations is around fifty per cent. Most of the top institutions are from the top-ranked countries. Georgia State University is the most productive institution, followed by Suny Buffalo, both located in the United States. Seoul National University appears in the third position, followed by National Cheng Kung University. The University of Granada is the only organization representing Europe in this ranking.

Respect to the citations by country, Figure 4.2 c shows that the United States has more than twelve times citations than the second country, England. China holds the third place in this ranking, followed by Australia. Spain is the seventh most influential country, followed by South Korea, Germany, and the Netherlands.

Figure 4.2 d presents the most influential institutions in terms of total numbers of citations. Confirming its leadership in the rankings, Georgia State University owns the largest amount of citations. The American University of Washington D.C. holds the second place in terms of citations, despite being the last in the ranking of productivity, with 12 documents.

The documents and citations grouped by continent are presented in Table 4.2. America and Europe together are responsible for more than 62% of the documents to which over 81% of the citations are attributed to. Oceania is the most balanced in the two dimensions with 5% of the documents and 4% of the citations of the dataset. America has more than twice citations per document compared to the second positioned continent, Oceania.

Table 4.2 Distribution of documents and citations by the 5 Continents

Continent	Documents		Citations		Citations/ Documents
	Total	%	Total	%	
America	718	33%	43.263	63%	60
Asia	674	31%	9.773	14%	15
Europe	651	29%	12.061	18%	19
Oceania	120	5%	2.926	4%	24
Africa	45	2%	145	0%*	3

Note: *The percentage of African citations is 0,21%

Figure 4.3 illustrates the concentrations worldwide in terms of the number of documents and citations.

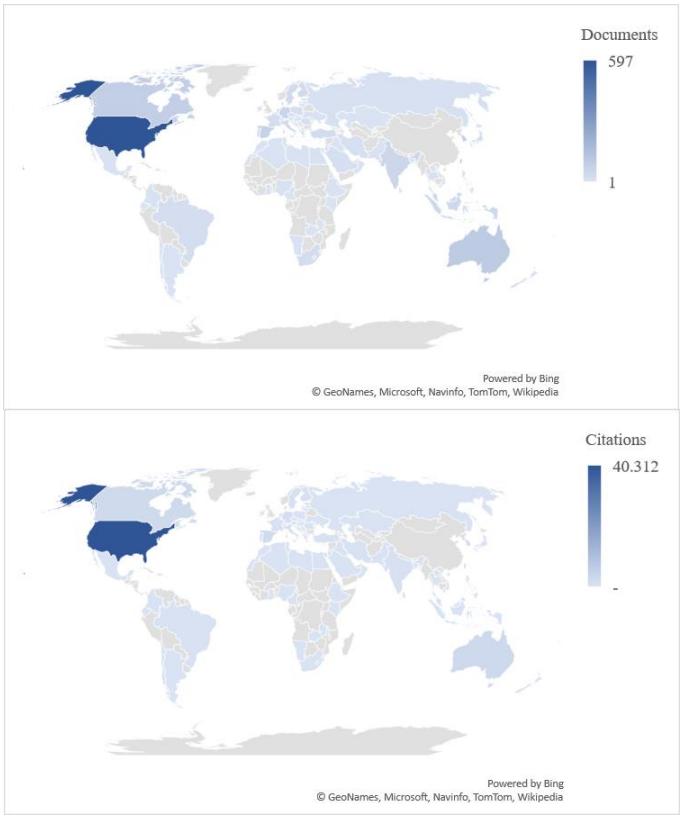

Figure 4.3 Maps of documents and citations

We normalized the citations respect to their publication year, by dividing the number of citations by the publication age. For instance, Teece, (1986) is the first most cited article with 3.988 citations, however, the second most cited article is the DeLone & McLean (1992) with 3.462 citations, published five years later. Dividing the numbers of citation by the publication age we obtain for Teece: 3.988 citations/ 34 years = 117 citations by year and for DeLone & McLean: 3.340/17 = 196 citations by year. After normalization, DeLone & McLean's is the most influential document.

To test the consistency between the documents inside the dataset, the co-citation relationship between the 1.000 most influential documents was evaluated though a bibliographical coupling map of the documents performed with the software VOSviewer and the result is presented in Figure 4.4. It is possible to identify three clusters of IS business value automatically proposed by the tool in the dataset, the 1st Cluster is composed by documents related to 'performance', the 2nd Cluster to 'value' and the 3rd Cluster presents documents related to IS 'success'.

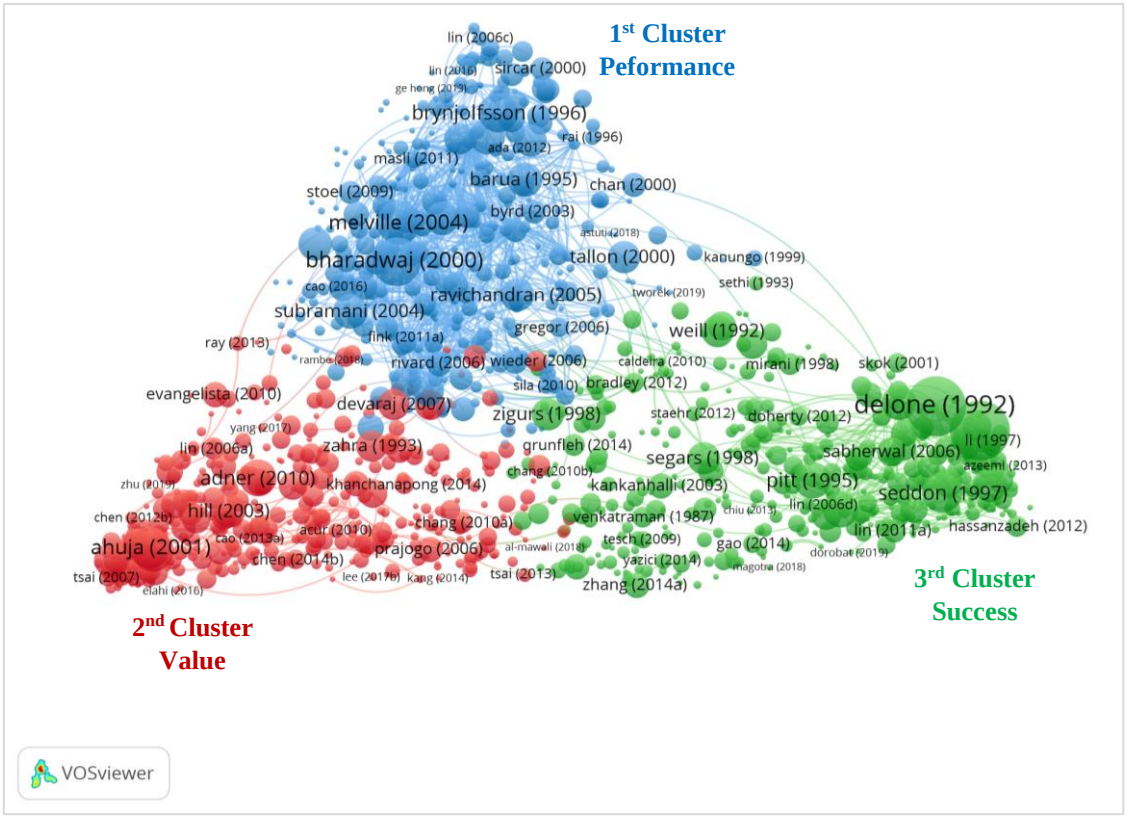

Figure 4.4 Coupling and clustering map of the 1.000 most influential (after normalization: citations/age) publications in the IS business value topic in the period 1980–2019

We also analyzed the most used keywords by authors. Figure 4.5 presents a co-occurrence map considering the threshold of 5 occurrences minimum and the 190 most representative connections as default suggested by the VOSviewer software (Eck & Waltman, 2010). It is possible to identify some clusters in the map, the central ones are related to performance. Other clusters related to innovation, patents, resources, success, user satisfaction are also observed.

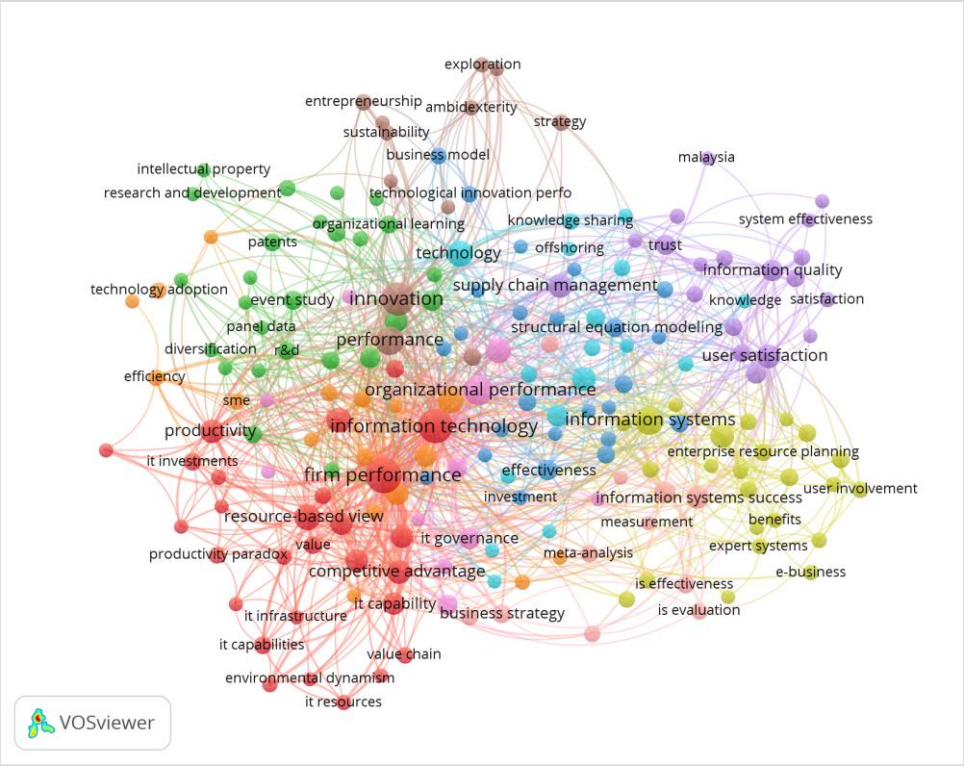

Figure 4.5 Co-occurrence network of authors' keywords

The top productive journals are presented in Table 4.3. The *Information and Management* journal presents the largest number of documents, followed by *MIS Quarterly*. Seven of the top 10 sources are based in Europe while the other three are in the United States.

Table 4.3 Top 10 most productive publication sources in IS business value topic

Publication name	Quantity	ISSN	Location
Information and Management	62	0378-7206	Netherlands
MIS Quarterly	36	0276-7783	United States
Technological Forecasting and Social Change	31	0040-1625	United States
Information Systems Research	29	1047-7047	United States
Research Policy	28	0048-7333	Netherlands
Journal of Management Information Systems	27	0742-1222	United States
International Journal of Information Management	26	0268-4012	United Kingdom
European Journal of Information Systems	25	0960-085X	United Kingdom
Technology Analysis and Strategic Management	24	0953-7325	United Kingdom
Journal of Computer Information Systems	24	0887-4417	United Kingdom

Respect to the researchers in the IS business value topics, the most productive authors with their most influential papers (article or review) after normalizing by the

publication age are presented in Table 4.4. The documents were filtered by those in which the authors are the first or second author, to assure high implication in the research. We assume that author names are ordered by the implied effort which is a commonly used criterion. The United States is the country of affiliation of the top-8 most productive authors, Spain and lastly, China completes the list. Refer to Appendix B to a list of most cited paper in each of the nine synonyms.

Table 4.4 Top 10 productive researchers in IS business value and their most influential papers

Author	N. of Papers	Current Affiliation[1]		Author's most influential paper[2]
Byrd, Terry Anthony	11	Auburn University	USA	(Byrd & Turner, 2001) An exploratory analysis of the value of the skills of IT personnel: Their relationship to IS infrastructure and competitive advantage
Lin, Winston T	11	University of Buffalo	USA	(Lin & Shao, 2000) The relationship between user participation and system success: a simultaneous contingency approach
Grover, Varun	10	University of Arkansas	USA	(Kahli & Grover, 2008) Business value of IT: An essay on expanding research directions to keep up with the times
Nevo, Saggi	8	University at Albany	USA	(Nevo & Wade, 2010) The Formation and Value of IT-Enabled Resources: Antecedents and Consequences of Synergistic Relationships
Sambamurthy, Vallabh	8	Michigan State University	USA	(Setia, Sambamurthy, & Closs, 2008) Realizing business value of agile IT applications: antecedents in the supply chain networks
William H. DeLone	7	American University	USA	(DeLone & McLean, 1992) Information Systems Success: The Quest for the Dependent Variable
Kim, Daekwan	7	Florida State University	USA	(Kim, Cavusgil, & Calantone, 2006) Information system innovations and supply chain management: Channel relationships and firm performance
Garcia-Morales, Victor Jesus	7	University of Granada	Spain	(Bolívar-Ramos, García-Morales, & García-Sánchez, 2012) Technological distinctive competencies and organizational learning: Effects on organizational innovation to improve firm performance
Chen, Yang	6	Southwestern University of Finance and Economics	China	(Chen et al., 2014) IT capability and organizational performance: the roles of business process agility and environmental factors

Notes: [1] Information about current affiliation retrieved from Google Scholar and/or institutions websites.

[2] Only articles and reviews were considered, ranked after normalizing citations by publication age and in those papers in which the researcher is the first or second author.

Finally, we analyzed the evolution of the terms used to refer to value in the IS business value topic. To facilitate analysis, the terms with less occurrence (benefits, outcomes, returns and profit) were grouped under the term 'Others'. Figure 4.6 a-d presents the evolution of the terms for each of the four decades included in this research.

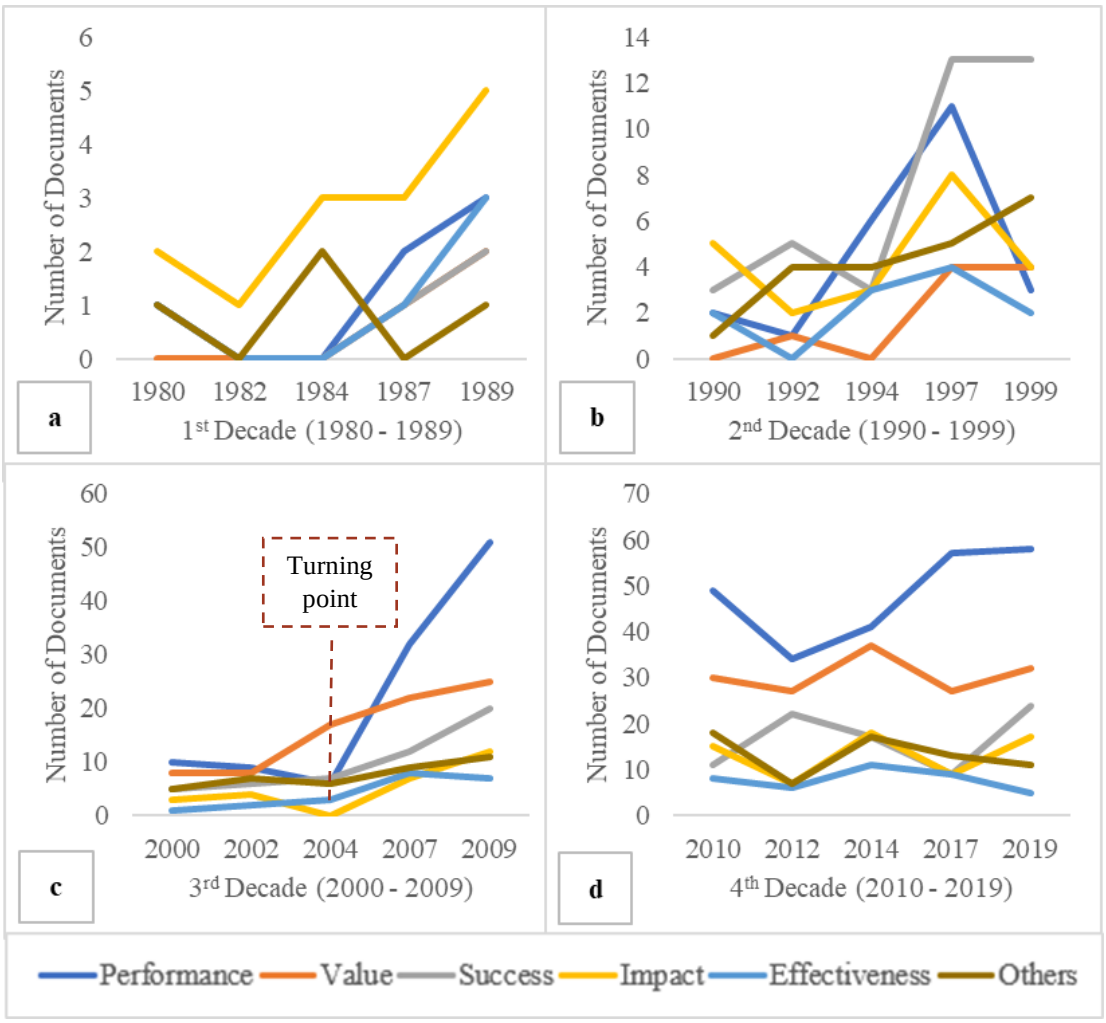

Figure 4.6 a-d Evolution of terms used to refer to IS business value by decade.
Note: the graphic is presented by decades to a better reflect the results due to the large differences in the scale.

In the 1st Decade, we observe the term 'impact' leading the documents, however, all the considered terms are present in each of the four decades. The 2nd Decade shows that as the number of publications in IS business value growth the more mixed is the use of terms to refer to it, with no significant most used term. The next decade presents the production after the year 2000 and it is possible to observe an exponential increase in the use of the 'performance' and 'value' terms, which are confirmed as the main terms used

to refer to IS business value in the 4th Decade, while the other terms tend to maintain a smaller number of publications.

5. DISCUSSION

The expressive increasing in the publications on the IS business value topic observed over the last forty years confirms the high interest on the topic. The evolution follows the behaviors commonly associated with a technology life cycle graphic (K. Chen, Zhang, & Fu, 2019) or the S-Curve (Gao et al., 2013; McNamee & Ledley, 2013).

The term 'performance' has been the most used, confirming the growth in the use of this term to refer to IS business value as prior reported by Melville et al. (2004) and Schryen (2013). The use of at least nine different synonyms evidence the importance of clarification and differentiating from the other components of organizational performance to facilitate the identification of studies and having an overview of the topic.

The global trends presented in Figure 4.2 a-d confirms the high productive and influential role played by the United States in this topic, while Georgia State University, is the most productive and influential institution. China holds the second place in numbers of documents published, followed by England. Respect to the citations, the United States has more than twelve times citations than England, the second place.

The most influential institutions are not necessarily the most productive. For instance, the American University of Washington D.C. holds the second place in terms of citations, despite being the last in the ranking of productivity, with 12 documents. Another example, Emory University holds the third position in terms of citations with only 4 documents in the final dataset indicating the presence of highly cited papers by both institutions.

These results highlight the importance of the debate about the amount of publication versus quality and impact, including other factors not considered to this research. Wong & Singh (2010) suggest including patent to these analyses as a dimension of productivity and influence. As this research focus on a concept, IS business value, patents are not a relevant factor.

Seven of the top 10 journals are based in Europe while the remaining three are in the United States. The United States is the country of affiliation of the top-8 most productive authors, followed by Spain and lastly China.

Georgia State University, the most productive and influential institution, does not appear as the current affiliation of any of the authors in this ranking. The remaining two positions are occupied by one Spanish and one Chinese institution as the current affiliations of the authors in the last positions.

The results presented in all rankings together evidence the high concentration of documents, citations, institutions and authors in America, Europe, and Asia.

No country from the African continent appears neither in top ten productive or influential country ranking, all its countries together sum 2% of the documents and 0,21% of the citations. Considering that Africa is the second-largest continent, this is an opportunity of diversification through an IS research agenda to consider its adoption and post-adoption particularities in the generic models for IS business value, as already highlighted in the agenda proposed by Mbarika et al. (2005).

The top productive publication source *Information and Management*, confirming the high intensity of production in the IS field as reported by Fitzgerald et. al (2019) and pointing out that this journal might be considered in IS searches. The second place is occupied by *MIS Quarterly*, the only one journal also present in all the AIS, SJR and JCR lists of IS journals presented in Table 2.1. Also, four of the IS business value publications sources ranked by us in Table 4.3 are not present in any of the three lists: *Technological Forecasting and Social Change, Research Policy, Journal of Computer Information Systems* and *Technology Analysis and Strategic Management*. However, it is important to consider that the lists previously presented in Table 2.1 are related to IS and MIS discipline while the ranking presented in Table 4.3 is specific for the IS business value topic. Despite these lists are related, they cannot be compared.

The bibliometric analysis provided information about relationship and trends, confirming the importance of using these methods to provide an overview of the publications of a topic.

6. LIMITATIONS AND RESEARCH OPPORTUNITIES

Although the high numbers of documents analyzed to give an overview of the IS business value topic, this research is subject to several limitations. First, the dataset was limited to documents included in the *Web of Science core collection* databases and not considered documents indexed in other databases, such as *Scopus, Science Direct, ProQuest* and *EBSCO*. Second, the dataset was limited to the English language, excluding documents published in other languages including by some countries and organizations top-ranked in our results, such as China, Spain, and Germany. Third, bibliometric analysis is based on the assumption that bibliographical data can be used to map a research discipline or topic, however, it does not necessarily reflect the definitions used by the authors in the publications, which is important to this research once it identities and analyses semantic terms. Fourth, the restrictions to only four WoS categories due to the manual cleansing process limited the results. Finally, the terms used in the research were defined based on the initial literature review of previous researches, which can leave behind additional relevant semantic terms.

The main opportunity identified during this research is to deepen the study of the dataset to identify theories and methods used and the proposed models to construct an integrated framework for the IS business value topic, including the variables that compose the dependent construct. Additional study to evaluate the use of ‘performance’ as a synonym of IS business value is a need, as we found it is the top current used term and most of the authors do not restrict of differentiates it from organizational performance, indeed, Melville et al. (2004) explicitly define IT business value as organizational performance, evidencing the need for more clarification in the definitions of IT/IS business value. Then, additional analysis can be performed to refine the results, Rodríguez-Salvador et. al. (2017) used data mining software to analyses documents and generate clusters of semantic terms. Because of the absence of a consensus in the terms used to refer to IS business value, expert evaluation might be combined with bibliometric analysis to extend this research as recommended by Iivari (2008).

7. CONTRIBUTIONS

We provide an overview of the IS business value topic that contributes to practitioners and academic to have an overview of the topic, be aware of nine used synonyms and by this helping to improve their search criteria, essential to enhance search strategies in the process of identifying publications and therefore the important and emerging themes included in the publications of the topic. The presented results give also an overview of the evolution of the publications and also of the synonyms to refer to business value in each one of the last four decades.

Practitioners can use it as a tool in their search for new models to apply to specific business needs. This research alerts to the importance of including synonyms of the term ‘value’ in order to retrieve the maximum amount of publications, avoiding missing emergent themes inside the topic.

In the academic context, this research contributes to clarifying the topic and highlights the importance of standardizing the term used in order to make the researches in the field more accessible.

To academic institutions, research centers, and government agents responsible for public policy this research highlights the importance of including African countries in their agenda to promote diversification in the IS business value topic.

8. CONCLUSIONS

This study provides IS researches and practitioners an overview of the IS business value topic that can be helpful to understand the different terms used as synonyms of value and useful during the strategy, planning and measurement stages of the value creation and realization process. Our novel approach combined structured literature review to identify nine used synonyms of business value used in the IS literature over the last forty years with a bibliometric analysis of the documents and citations at the country, institution and author levels.

From the literature review, nine terms used as synonyms of value was identified as the most used in the following order: performance, value, success, impact, effectiveness, benefits, outcomes, returns and profit.

Classification and bibliometric analysis were used to depict the evolution of the publications. Showing that the exponential increase in the publications over the last four decades follows an S-curve that appears to be currently in a mature stage. A turning point observed in 2004, with an increase in both numbers of publication and the use of the term ‘performance’, was possibly motivated by the dot com bubble (2000-2002).

The results also confirm the leadership of the United States in three of the four analyzed dimensions, holding the majority of documents, citations and institution of affiliation of the top researchers, while the majority of the top-10 journals are located in Europe. African countries appeared at the bottom of all our rankings, even if considered as grouped at the continent level, have an insignificant influence on the topic.

Improving diversification in academic networks by inclusion of countries with low publication intensity represents a great opportunity to increase the generalization power of IS business value models.

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APPENDIX A – WOS SEARCH HISTORY

12/06/2020 Web of Science [v.5.35] - Web of Science Core Collection Advanced Search

Search History:

Save History / Create Alert | Open Saved History

Set	Results		Edit Sets
# 11	3,039	#10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4 OR #3 OR #2 *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=1980-2019*	Edit
# 10	83	(TI= (("IS profit*" OR "IT profit*" OR "IS business profit*" OR "IT business profit*") OR (("system$" OR "technolog*" OR "of IT" OR "of IS" OR "on IT" OR "on IS" OR "in IT" OR "in IS" OR "from IT" OR "from IS" OR "IS investment$" OR "IT investment$" OR "IS resource$" OR "IT resource$" OR "IS capabilit*" OR "IT capabilit*" OR "IT asset$" OR "IS asset$" OR "IT applicat*" OR "IS applicat*") NEAR/2 ("profit*"))) AND WC=("MANAGEMENT" OR "BUSINESS" OR "COMPUTER SCIENCE INFORMATION SYSTEMS" OR "INFORMATION SCIENCE LIBRARY SCIENCE")) *AND* LANGUAGE: (English) *AND* DOCUMENT TYPES: (Article OR Proceedings Paper OR Review) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=1980-2019*	Edit
# 9	91	(TI= (("IS return$" OR "IT return$" OR "IS business return$" OR "IT business return$") OR (("system$" OR "technolog*" OR "of IT" OR "of IS" OR "on IT" OR "on IS" OR "in IT" OR "in IS" OR "from IT" OR "from IS" OR "IS investment$" OR "IT investment$" OR "IS resource$" OR "IT resource$" OR "IS capabilit*" OR "IT capabilit*" OR "IT asset$" OR "IS asset$" OR "IT applicat*" OR "IS applicat*") NEAR/2 ("return$"))) AND WC=("MANAGEMENT" OR "BUSINESS" OR "COMPUTER SCIENCE INFORMATION SYSTEMS" OR "INFORMATION SCIENCE LIBRARY SCIENCE")) *AND* LANGUAGE: (English) *AND* DOCUMENT TYPES: (Article OR Proceedings Paper OR Review) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=1980-2019*	Edit
# 8	103	(TI= (("IS outcome$" OR "IT outcome$" OR "IS business outcome$" OR "IT business outcome$") OR (("system$" OR "technolog*" OR "of IT" OR "of IS" OR "on IT" OR "on IS" OR "in IT" OR "in IS" OR "from IT" OR "from IS" OR "IS investment$" OR "IT investment$" OR "IS resource$" OR "IT resource$" OR "IS capabilit*" OR "IT capabilit*" OR "IT asset$" OR "IS asset$" OR "IT applicat*" OR "IS applicat*") NEAR/2 ("outcome$"))) AND WC=("MANAGEMENT" OR "BUSINESS" OR "COMPUTER SCIENCE INFORMATION SYSTEMS" OR "INFORMATION SCIENCE LIBRARY SCIENCE")) *AND* LANGUAGE: (English) *AND* DOCUMENT TYPES: (Article OR Proceedings Paper OR Review) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=1980-2019*	Edit
# 7	207	(TI= (("IS benefit$" OR "IT benefit$" OR "IS business benefit$" OR "IT business benefit$") OR (("system$" OR "technolog*" OR "of IT" OR "of IS" OR "on IT" OR "on IS" OR "in IT" OR "in IS" OR "from IT" OR "from IS" OR "IS investment$" OR "IT investment$" OR "IS resource$" OR "IT resource$" OR "IS capabilit*" OR "IT capabilit*" OR "IT asset$" OR "IS asset$" OR "IT applicat*" OR "IS applicat*") NEAR/2 ("benefit$"))) AND WC=("MANAGEMENT" OR "BUSINESS" OR "COMPUTER SCIENCE INFORMATION SYSTEMS" OR "INFORMATION SCIENCE LIBRARY SCIENCE")) *AND* LANGUAGE: (English) *AND* DOCUMENT TYPES: (Article OR Proceedings Paper OR Review) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=1980-2019*	Edit
# 6	239	(TI= (("IS effectiveness" OR "IT effectiveness" OR "IS business effectiveness" OR "IT business effectiveness") OR (("system$" OR "technolog*" OR "of IT" OR "of IS" OR "on IT" OR "on IS" OR "in IT" OR "in IS" OR "from IT" OR "from IS" OR "IS investment$" OR "IT investment$" OR "IS resource$" OR "IT resource$" OR "IS capabilit*" OR "IT capabilit*" OR "IT asset$" OR "IS asset$" OR "IT applicat*" OR "IS applicat*") NEAR/2 ("effectiveness"))) AND WC=("MANAGEMENT" OR "BUSINESS" OR "COMPUTER SCIENCE INFORMATION SYSTEMS" OR "INFORMATION SCIENCE LIBRARY SCIENCE")) *AND* LANGUAGE: (English) *AND* DOCUMENT TYPES: (Article OR Proceedings Paper OR Review) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=1980-2019*	Edit
# 5	341	(TI= ("IT impact$" OR "IS impact$" OR "impact$ of technolog*" OR "technolog* impact$" OR "impact of system$" OR "impact$ of system" OR "systems impact$") AND WC=("MANAGEMENT" OR "BUSINESS" OR "COMPUTER SCIENCE INFORMATION SYSTEMS" OR "INFORMATION SCIENCE LIBRARY SCIENCE")) *AND* LANGUAGE: (English) *AND* DOCUMENT TYPES: (Article OR Proceedings Paper OR Review) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=1980-2019*	Edit
# 4	462	(TI= (("IS success" OR "IT success" OR "IS business success" OR "IT business success") OR (("system$" OR "technolog*" OR "of IT" OR "of IS" OR "on IT" OR "on IS" OR "in IT" OR "in IS" OR "from IT" OR "from IS" OR "IS investment$" OR "IT investment$" OR "IS resource$" OR "IT resource$" OR "IS capabilit*" OR "IT capabilit*" OR "IT asset$" OR "IS asset$" OR "IT applicat*" OR "IS applicat*") NEAR/2 ("success"))) AND WC=("MANAGEMENT" OR "BUSINESS" OR "COMPUTER SCIENCE INFORMATION SYSTEMS" OR "INFORMATION SCIENCE LIBRARY SCIENCE")) *AND* LANGUAGE: (English) *AND* DOCUMENT TYPES: (Article OR Proceedings Paper OR Review) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=1980-2019*	Edit
# 3	501	(TI= (("IT value" OR "IS business value" OR "IT business value") OR (("of system$" OR "technolog*" OR "of IT" OR "of IS" OR "on IT" OR "on IS" OR "in IT" OR "in IS" OR "from IT" OR "from IS" OR "IS investment$" OR "IT investment$" OR "IS resource$" OR "IT resource$" OR "IS capabilit*" OR "IT capabilit*" OR "IT asset$" OR "IS asset$" OR "IT applicat*" OR "IS applicat*") NEAR/4 ("value"))) AND WC=("MANAGEMENT" OR "BUSINESS" OR "COMPUTER SCIENCE INFORMATION SYSTEMS" OR "INFORMATION SCIENCE LIBRARY SCIENCE")) *AND* LANGUAGE: (English) *AND* DOCUMENT TYPES: (Article OR Proceedings Paper OR Review) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=1980-2019*	Edit
# 2	1,053	(TI= (("IS performance" OR "IT performance" OR "IS business performance" OR "IT business performance") OR	Edit

https://apps.webofknowledge.com/WOS_AdvancedSearch_input.do?search_mode=AdvancedSearch&product=WOS&product=WOS&combineO… 1/2

		(("system$" OR "technolog*" OR "of IT" OR "of IS" OR "on IT" OR "on IS" OR "in IT" OR "in IS" OR "from IT" OR "from IS" OR "IS investment$" OR "IT investment$" OR "IS resource$" OR "IT resource$" OR "IS capabilit*" OR "IT capabilit*" OR "IT asset$" OR "IS asset$" OR "IT applicat*" OR "IS applicat*") AND (("organi?ation*" OR "firm$" OR "company*" OR "enterprise$" OR "business" OR "venture$" OR "operational" OR "innovat*") NEAR/2 ("performance")))) AND WC= ("MANAGEMENT" OR "BUSINESS" OR "COMPUTER SCIENCE INFORMATION SYSTEMS" OR "INFORMATION SCIENCE LIBRARY SCIENCE")) *AND* **LANGUAGE**: (English) *AND* **DOCUMENT TYPES**: (Article OR Proceedings Paper OR Review) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=1950-2019*	
# 1	54,500	(TS= ("information systems" OR "information technology") AND WC= ("MANAGEMENT" OR "BUSINESS" OR "COMPUTER SCIENCE INFORMATION SYSTEMS" OR "INFORMATION SCIENCE LIBRARY SCIENCE")) *AND* **LANGUAGE**: (English) *AND* **DOCUMENT TYPES**: (Article OR Proceedings Paper OR Review) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=1950-2019*	Edit

APPENDIX B – TOP 10 MOST CITED ARTICLES FOR THE NINE IDENTIFIED TERMS USED AS SYNONYM OF VALUE

Synonym of 'value'	Times cited WoS	Autor(s)	Publication Year	Title	Publication Name	DOI
Performance	1637	Bharadwaj, AS	2000	A resource-based perspective on information technology capability and firm performance: An empirical investigation	MIS QUARTERLY	10.2307/3250983
Performance	944	Ahuja, G; Katila, R	2001	Technological acquisitions and the innovation performance of acquiring firms: A longitudinal study	STRATEGIC MANAGEMENT JOURNAL	10.1002/smj.157
Performance	914	Stuart, TE	2000	Interorganizational alliances and the performance of firms: A study of growth and innovation rates in a high-technology industry	STRATEGIC MANAGEMENT JOURNAL	10.1002/1097-0266(200008)21:8<791::AID-SMJ121>3.0.CO;2-K
Performance	521	Sampson, RC	2007	R&D alliances and firm performance: The impact of technological diversity and alliance organization on innovation	ACADEMY OF MANAGEMENT JOURNAL	Not found
Performance	451	Bharadwaj, AS; Bharadwaj, SG; Konsynski, BR	1999	Information technology effects on firm performance as measured by Tobin's q	MANAGEMENT SCIENCE	10.1287/mnsc.45.7.1008
Performance	447	Ravichandran, T; Lertwongsatien, C	2005	Effect of information systems resources and capabilities on firm performance: A resource-based perspective	JOURNAL OF MANAGEMENT INFORMATION SYSTEMS	10.1080/07421222.2005.11045820

Synonym of 'value'	Times cited WoS	Autor(s)	Publication Year	Title	Publication Name	DOI
Performance	435	Hill, CWL; Rothaermel, FT	2003	The performance of incumbent firms in the face of radical technological innovation	ACADEMY OF MANAGEMENT REVIEW	Not found
Performance	419	Santhanam, R; Hartono, E	2003	Issues in linking information technology capability to firm performance	MIS QUARTERLY	Not found
Performance	386	HAGEDOORN, J; SCHAKENRAAD, J	1994	THE EFFECT OF STRATEGIC TECHNOLOGY ALLIANCES ON COMPANY PERFORMANCE	STRATEGIC MANAGEMENT JOURNAL	10.1002/smj.4250150404
Performance	380	Weill, P	1992	The Relationship Between Investment in Information Technology and Firm Performance: A Study of the Valve Manufacturing Sector	INFORMATION SYSTEMS RESEARCH	10.1287/isre.3.4.307
Value	1172	Melville, N; Kraemer, K; Gurbaxani, V	2004	Review: Information technology and organizational performance: An integrative model of IT business value	MIS QUARTERLY	Not found
Value	636	Adner, R; Kapoor, R	2010	VALUE CREATION IN INNOVATION ECOSYSTEMS: HOW THE STRUCTURE OF TECHNOLOGICAL INTERDEPENDENCE AFFECTS FIRM PERFORMANCE IN NEW TECHNOLOGY GENERATIONS	STRATEGIC MANAGEMENT JOURNAL	10.1002/smj.821

Synonym of 'value'	Times cited WoS	Autor(s)	Publication Year	Title	Publication Name	DOI
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