

SUPPLY CHAIN RISK MANAGEMENT: A BIBLIOMETRIC ANALYSIS CONSIDERING HEALTHCARE SUPPLY CHAINS

GESTÃO DE RISCOS EM CADEIAS DE SUPRIMENTOS: UMA ANÁLISE BIBLIOMÉTRICA CONSIDERANDO CADEIAS DE SUPRIMENTOS DA SAÚDE

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ABSTRACT

Bibliographic research reveals that there are few papers that apply concepts of Supply Chain Risk Management (SCRM) to Healthcare Supply Chains. Therefore, to better understand the state of the art about SCRM, the article consists of performing a bibliometric analysis on regarding the number of publications per year, the number of publications and citations by country, the top ten authors on the researched theme, citation number by article, publication number by journal, by segment and according to the techniques used, bibliographic coupling, co-citation and collaboration, word cloud and multiple correspondence analysis. For this purpose, the search terms, the databases (Web of Science and Scopus), the research period (from Jan/2004 to Jan/2019) and the procedures were conducted according to the Prisma Protocol. The results reveal that the number of articles published has grown over the years, the US leads with 16% of total articles published and the International Journal of Production Research takes the lead in total publication. The automotive segment comes first, the most commonly used technique is simulation, and the most frequently used keywords are “risk assessment”, “supply chain management” and “supply chain risk”.

Keywords: Supply Chain Risk Management. Bibliometric. Systematic Review.

RESUMO

Pesquisas bibliográficas revelam que existem poucos trabalhos que aplicam conceitos de Gestão de Risco da Cadeia de Suprimentos (SCRM) às Redes de Suprimentos de Saúde. Portanto, para conhecer melhor o estado da arte sobre o SCRM, o artigo consiste em realizar uma análise bibliométrica em relação ao número de publicações por ano, número de publicação e citação por país, os dez principais autores no tema pesquisado, número de citação por artigo, número de publicação por periódico, por segmento e de acordo com as técnicas utilizadas, análise de redes de co-citação, colaboração de artigos, palavras-chave e correspondência múltipla. Para esse alcance, foram definidos os termos de buscas, os bancos de dados (*Web of Science* e *Scopus*), o período da pesquisa (Jan/2004 a Jan/2019) e os procedimentos foram conduzidos conforme o Protocolo Prisma. Os resultados revelam que o número de artigos publicados tem crescido ao longo dos anos, os EUA lideram com 16% o total de artigos publicados e o periódico *International Journal of Production Research* assume a liderança no total de publicação. O segmento automobilístico aparece em primeiro lugar, a técnica mais utilizada é a simulação e as palavras-chave que aparecem com maior frequência são “*risk assessment*”, “*supply chain management*” e “*supply chain risk*”.

Palavras-chave: Gestão de Risco da Cadeia de Suprimentos. Bibliometria. Revisão sistemática.

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1 INTRODUCTION

Since Supply Chain Risk Management emerged formally as a concept in the early 2000's significant literature has emerged with studies in different segments such as automotive (ELANGO VAN et al., 2010; COLICCHIA; DALLARI; MELACINI, 2011; THUN; DRÜKE; HOENIG, 2011), Food industry (DANI; DEEP, 2010; ROBINSON et al., 2012; SONG; ZHUANG, 2017) and Electronics industry (KUMAR; HARRISON, 2012; CHATTERJEE; KAR, 2016). Bibliographic research reveals that there are few papers that apply concepts of Supply Chain Risk Management (SCRM) to Healthcare Supply Chains (HCSC). Supply Chain Risk techniques applied to Healthcare segment become important to increase service level in a Supply Chain impacted by a growing and ageing population. To further investigate the literature concerning SCRM, a Systematic Literature Review was conducted through an already well-consolidated methodology known as Bibliometrics, which consists in using quantitative statistical analysis to describe patterns of publications, i.e. a general picture of the literature (KILUBI, 2016). Therefore, the objectives of this paper are threefold: (1) Set a complete picture of SCRM research field; (2) Identify which segments and techniques are more approached to set trends (3) Identify how SCRM is being applied to HCSC.

This paper is composed by 5 sections (including this introductory one). Section 2 brings theoretical background, Section 3 brings the methodology of this paper, Section 4 brings the bibliometric results and Section 5 discusses the results and closes the paper with conclusions and further research opportunities.

2 THEORETICAL BACKGROUND

2.1 Supply chain risk management

Supply Chain Risk Management is a concept that started to be formally coined in the early 2000's by papers such as Juttner, Peck and Christopher (2003), Norrman and Jansson (2004), Juttner (2005), Sorensen (2005) and Tang (2006). However, even before the concept became popular, the subject was already studied. For example, Bowersox, Stank and Daugherty (1999) preconized Lean Launch of products to mitigate the risks of higher inventory levels that a push strategy would generate. Lonsdale (1999) presented a model for mitigating risks associated with outsourcing practices. Zsidisin, Panelli and Upton (2000) presented inbound supply risks such as quality, design, cost, availability, manufacturability, supplier, legal, environmental, health and safety. Hallikas, Virolainen and Tuominen (2002) studied risks concerning a supplier, a buying company and asses risks related to networking. Furthermore, Hallikas et al. (2004) expanded the conceptual analysis brought by Hallikas, Virolainen and Tuominen (2002) presenting methods for risk management in complex network environments.

In this sense, conceptual basis for establishing the building blocks of the SCRM concept were complete. Risks concerning inbound and outbound logistics were studied in a way that already transcended companies' functional barriers. Therefore, SCRM came as a concept that considered the Supply Chain as a set of cross functional business processes allowing managers to identify, assess and mitigate risks that impact the whole supply chain.

2.2 Supply chain risk management in healthcare

Literature on risks presents a great variety of techniques, nonetheless, they have considered to be scarcely adapted to the needs of Supply Chain management and even more scarcely considering Healthcare Supply Chains (KHAN; BURNES, 2007). SCRM have been largely studied with many different approaches and applications, however, regarding specific HC SCRM applications, just a few papers are found. Vanvactor (2011) approach HC SCRM and highlights the importance of disaster mitigation to prevent SC breakdown, drawing attention to crisis mitigation concepts. Thus, based on Vanvactor (2011) Healthcare Supply Chain Resilience (HC SCRes) can be defined as a capability to be responsive to disasters, as well as SC breakdowns and still being able to provide a full continuum of services to all patients arriving at a facility for care. Zepeda, Nyaga and Young (2016) highlights the risks concerning mismatch between supply and demand and risks of higher inventory costs. Rakovska and Stratieva (2017) mention that pharmaceuticals and medical devices are of special interest because they must meet specific requirements of several clinical departments and therefore, present great risks of stockout. Mandal and Jha (2017) and Niemsakul et al. (2018) analyze the role of collaboration considering hospital-supplier, which helps mitigate risks related to demand changes. Syahrir, Suparno and Vanany (2015) highlight how a Healthcare Supply Chain plays a major role in natural disasters mitigation. Mandal (2017) uses Structural Equation Modeling (SEM) to confirm the hypothesis that group and rational cultures contributes positively to HC SCRes while hierarchical culture inhibits it. There are still limited systematic research to identify practices and strategies for improving hospital Supply Chain performance (ZEPEDA; NYAGA; YOUNG, 2016). Lack of proper studies concerning risks in Healthcare are specific hazardous. For hospitals, a shortage of supply or unanticipated demand spike can lead to catastrophic consequences beyond poor instock metrics (RILEY et al., 2016). When a hospital experiences an unanticipated demand spike or supply shortage, supply managers must have the means to alter and/or reconfigure the Supply Chain (RILEY et al., 2016).

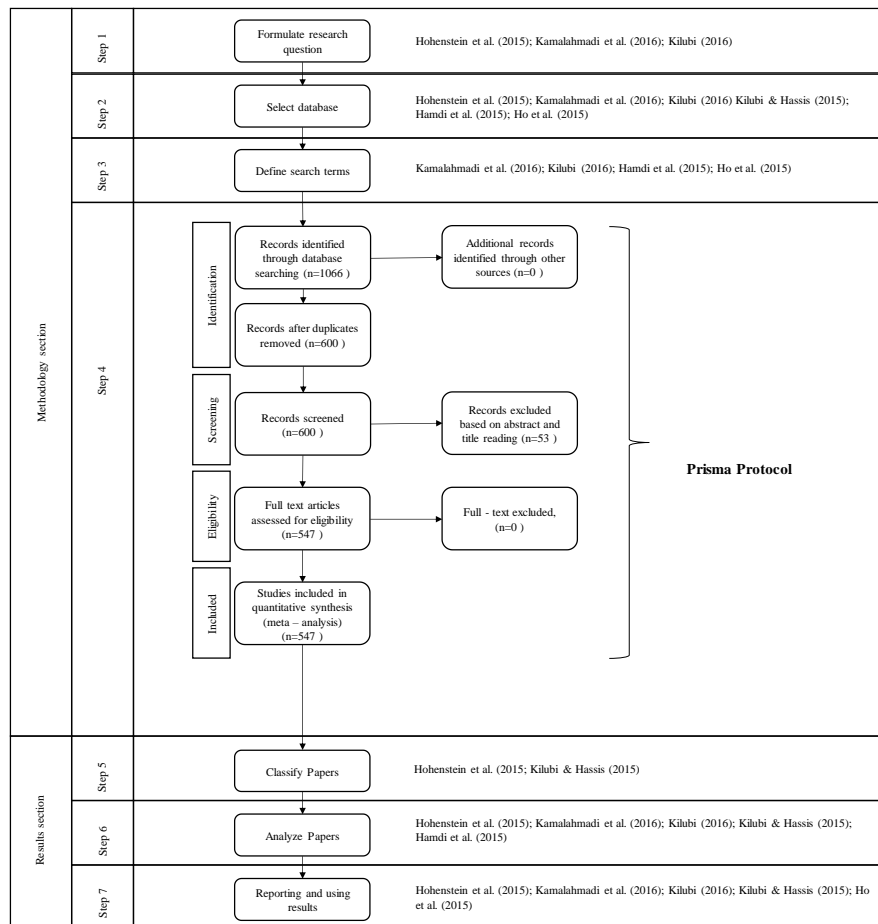
3 METHOD

The Systematic Literature Review (SLR) was based on the search for “Supply Chain Risk Management” and “Supply Chain Resilience”. The search was conducted using two search engines; Scopus and ISI Web of Science (WoS). Elsevier’s Scopus is the largest database of peer-reviewed literature and recovers journals from all major databases such as Emerald, Taylor & Francis, Science Direct, PubMed, and is the largest searchable citation and abstract source (CHADEGANI et al., 2013). WoS from Thomson Reuters (ISI) was the only citation database and publication which covers all domains of science for many years (CHADEGANI et al., 2013). the advantage of one database over another one depends on what explicitly will be analyzed, the scientific field and period of analysis (CHADEGANI et al., 2013). WoS is the oldest citation database, therefore it has strong coverage with citation data and bibliographic data going back to 1900 (BOYLE; SHERMAN, 2006). Vieira and Gomes (2009) reveal that 2/3 of the studies can be found in both databases and 1/3 only in one database. In addition, both databases provide “. bib” files providing full search data (such as references, article authors, etc.) that can be further analyzed in bibliometric packages. Bibliometric analysis was conducted using MS Excel and the package “Bibliometrix” present in R studio software. Nevertheless, even conducting the research in both databases it would not be possible to guarantee that all relevant literature was covered and so, it can be considered a limitation. The second limitation is that only published papers (only journal articles and reviews) in English language were considered (congress papers, doctoral thesis

and articles in press were not considered). This decision was taken based in: i) Most review articles (and all review articles in this thesis) use this criterion, therefore, it has literature methodological support, ii) English is the main language used to communicate scientific research, iii) To guarantee that any researcher can understand any paper selected for this bibliometric study. Nevertheless, this procedure may disregard relevant studies published in other idioms. The third limitation is that this chapter was not exhaustive or had the pretention of covering all definitions and frameworks presented in literature. This limitation is a direct consequence of the first two, since there is no assurance as whether this paper accessed or not all existent relevant literature.

PRISMA protocol was developed after a three – day meeting in Ottawa, Canada, in June 2005 with 29 participants including review authors, methodologists among other Healthcare professionals (Moher et al. 2009). Due to the notoriety and importance of the PRISMA protocol it was incorporated in the step 4 of this SLR methodology workflow. The search was conducted in both Scopus and ISI databases. A “. bib” file was generated for each search and analyzed in R software where a single database file was generated with duplicates removed to generate the complete bibliometric analysis presented in this study. Nevertheless, R software could not conduct all important analyzes, for example, identifying whether the paper was conceptual or analytical, the segment applied and other classifications that needed a more “artisanal” approach. The research methodology workflow is presented in Figure 1.

Figure 1 - Research Methodology workflow

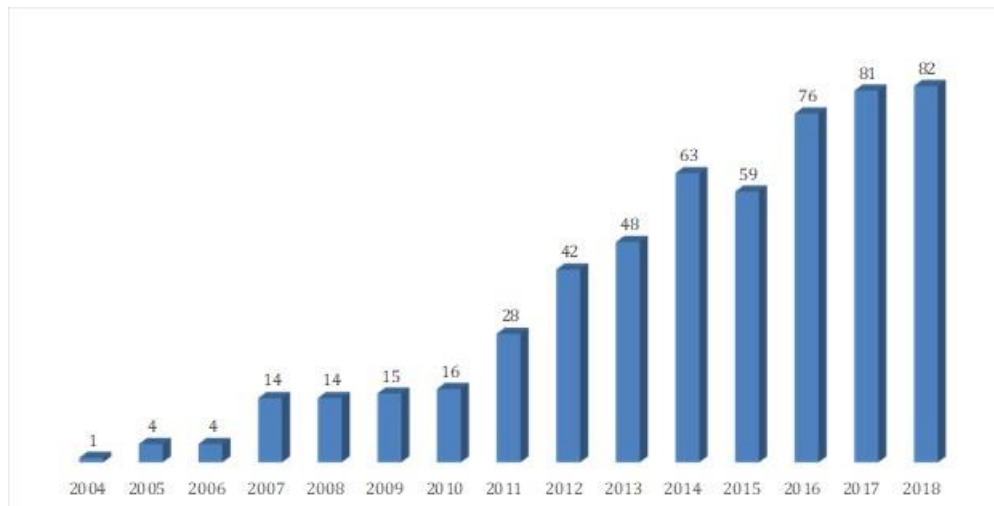


Source: Elaborated by the authors

4 RESULTS AND DISCUSSIONS

In this section we show all numerical results found in the bibliometric analysis. The first graph shown by Figure 2 shows the articles distribution along the years. The search was conducted during January/2019. There was a total of 547 papers found.

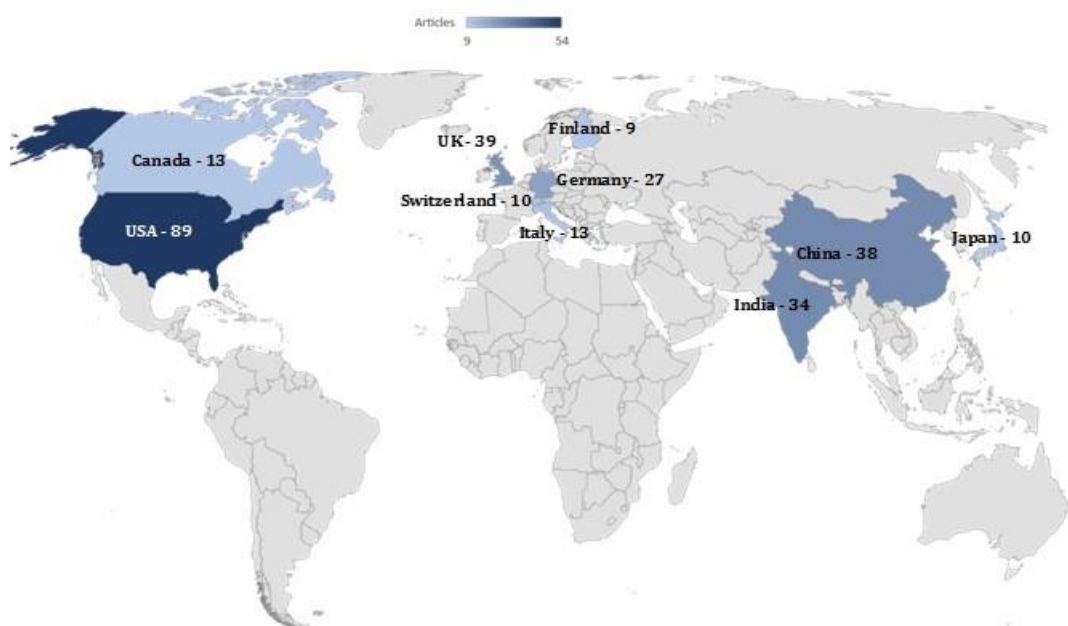
Figure 2 - Article distribution



Source: Elaborated by the authors

Figure 3 shows that the concept is being increasingly recognized by academy which is supported by the growing number of publications. Figure 4 shows the top 10 publishing countries. USA is the leader with 89 papers, representing about 16% of total papers.

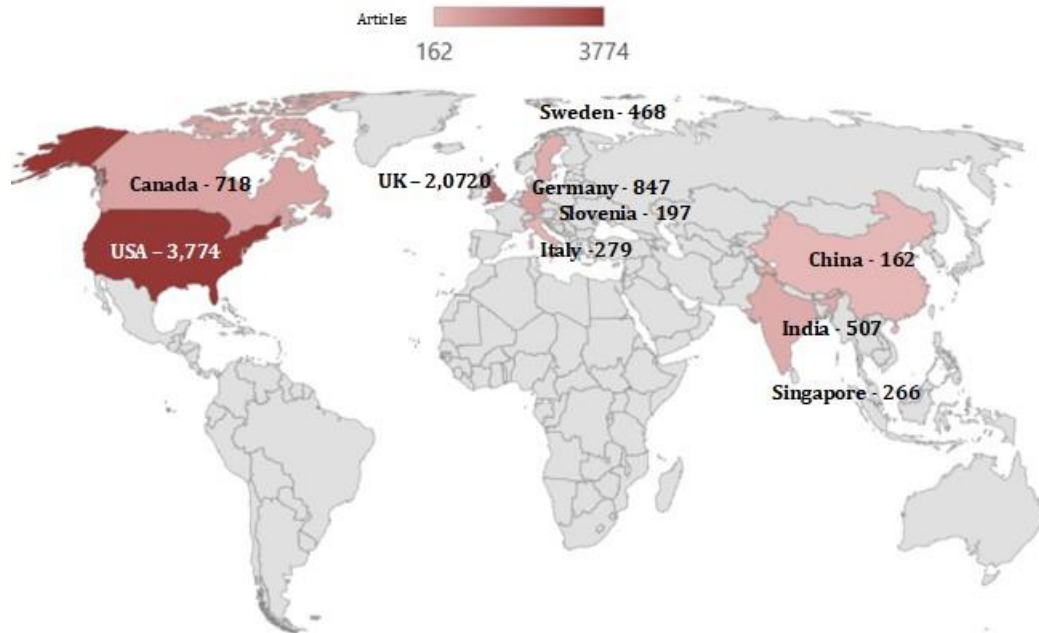
Figure 3 - Top 10 publishing countries



Source: Elaborated by the authors

Although USA continues to be the leader in terms of total citations, there is some changes in other positions as shown by Figure 4.

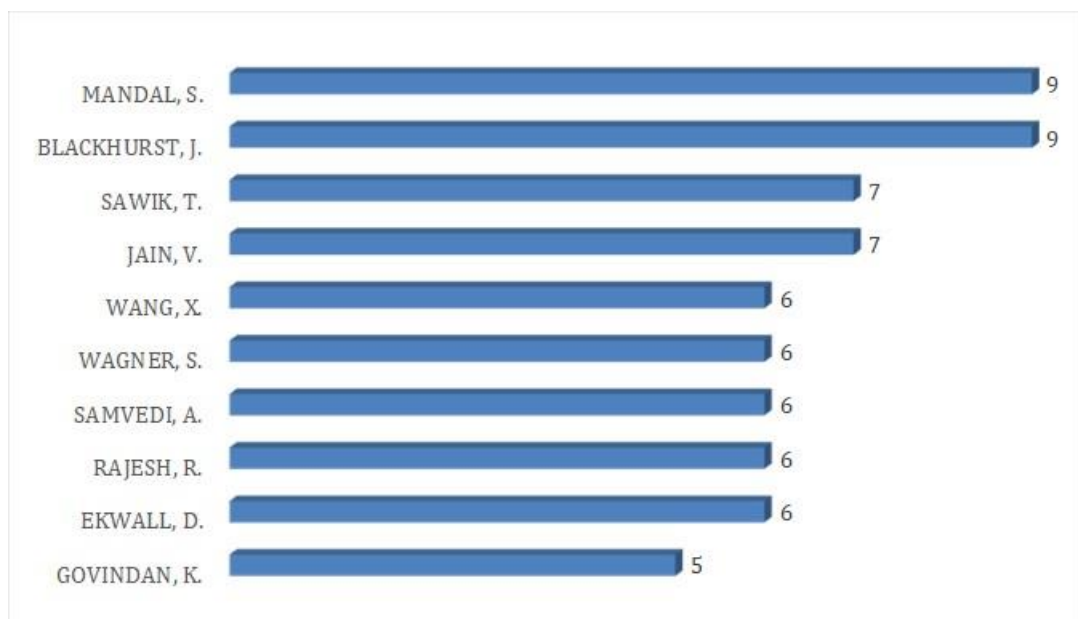
Figure 4 - Top 10 countries with more citations



Source: Elaborated by the authors

Figure 5 shows the top 10 most productive authors during the researched period. In this category Santanu Mandal and Jennifer Blackhurst stand out with 9 publications.

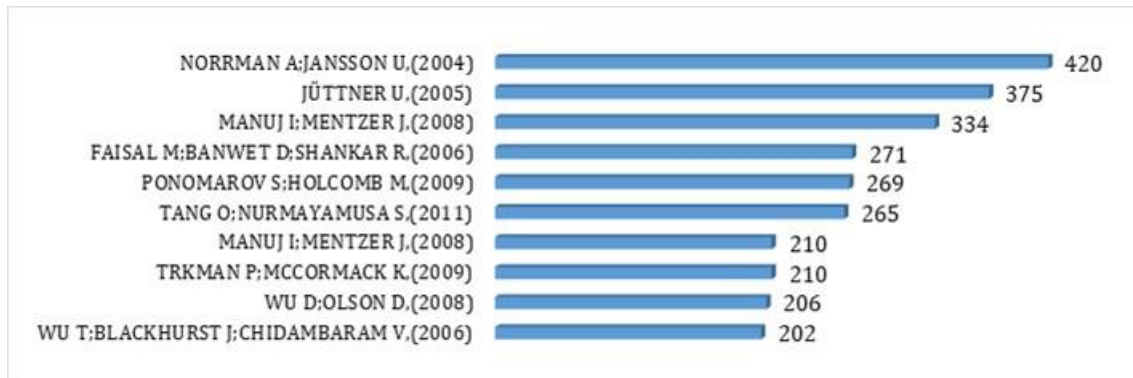
Figure 5 - Most productive authors



Source: Elaborated by the authors

Figure 6 shows the most cited papers.

Figure 6 - Most cited papers



Source: Elaborated by the authors

The titles of the papers are: (1) Ericsson's proactive supply chain risk management approach after a serious sub supplier accident; (2) Supply chain risk management: Understanding the business requirements from a practitioner perspective; (3) Global Supply Chain risk management strategies; (4) Supply chain risk mitigation: modeling the enablers; (5) Understand the concept of Supply Chain resilience; (6) Identifying risk issues and research advancements in Supply Chain risk management; (7) Supply Chain risk in turbulent environments - A conceptual model for managing; (8) Global Supply Chain Risk Management; (9) Supply Chain Risk, Simulation, and Vendor Selection; (10) A model for inbound supply risk analysis.

The most relevant journals are summarized by Table 1.

Table 1 - Publications by journal

Journal	Quantity
International Journal of Production Research	44
International Journal of Production Economics	33
Supply Chain Management	19
International Journal of Logistics Management	14
Crosstalk	10
International Journal of Physical Distribution and Logistics Management	10
International Journal of Logistics Research and Applications	9
International Journal of Operations and Production Management	9
Computers and Industrial Engineering	8
International Journal of Logistics Systems and Management	7
International Journal of Supply Chain Management	7

Source: Elaborated by the authors

Among the applied papers the distribution by segment summarized by Table 2.

Table 2 - Distribution by segment (with at least two studies found)

Segment	Articles
Automotive	18
Electronics	9
Food	8
Agriculture	7
Maritime	7
Aviation	5
Pharmaceutical	5
Oil	4
Transportation	3
Healthcare	3
Fast Moving Consumer Goods	2
Clothing	2
Textile	2
Telecommunications	2
Beer	2
Semiconductors	2

Source: Elaborated by the authors

Considering Healthcare and Pharmaceutical segments there is a total of 7 studies. Table 3 shows which are the most used techniques.

Table 3 - Most used techniques (2 or more outcomes)

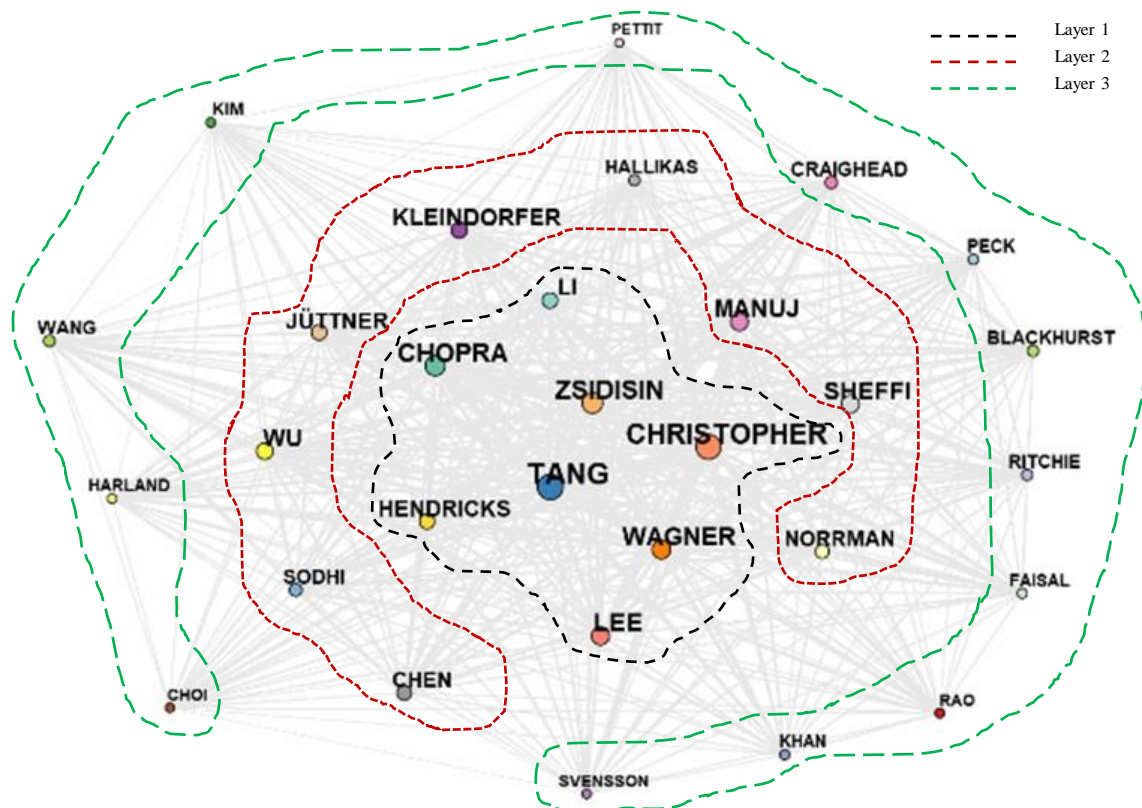
Technique	Articles
Simulation	25
Fuzzy	15
SEM	13
Survey Analysis	11
Stochastic Programming	10
CFA	9
Qualitative Interviews	6
Statistical Analysis	6
AHP	6
Bayesian Networks	5
DEMATEL	5
System Dynamics	4
Game Theory	4
Mixed Integer Linear Programming	3
FAHP	3
Mathematical Model	3
Stochastic Optimization	3
Graph Theory	2
Heuristic Algorithm	2
Interpretive Structural Modeling	2
FMEA	2
Behavioral Study	2
Linear Programming	2
Econometric Methods	2
Empirical Analysis	2
ANOVA	2
Mathematical Programming	2
Forecasting	2

Source: Elaborated by the authors

Simulation, Fuzzy, SEM, Survey Analysis and Stochastic programming are the most used techniques. Confirmatory Factorial Analysis (CFA) also deserves a mention as most papers using this technique have procedures that are similar SEM.

Attributes of a specific paper are connected to each other, for example, through the manuscript itself: author(s) to journal, keywords to publication date, etc. Such connections of different attributes generate networks that are represented as rectangular matrices Manuscripts \times Attributes (Aria and Cuccurullo 2017). Furthermore, scientific publications usually references other scientific works, generating networks that can be either co-citation or coupling networks (Aria and Cuccurullo 2017). These networks are analyzed to capture meaningful properties of the underlying research system, and in particular to determine the influence of bibliometric attributes such as scholars and journals (Aria and Cuccurullo 2017). A unit of coupling was defined by Kessler (1963) as any single item of reference that is used by two papers. Two documents are bibliographically coupled if at least one cited source appears in the bibliographies or reference lists of both articles (Kessler 1963). For example, A is a Document \times Cited reference Matrix and $B_{coup} = A \times A^T$. The strength of the coupling of two articles, i and j is defined simply by the number of references that the articles have in common, as given by the element b_{ij} of matrix B . Articles with only a few references, would tend to be weaker bibliographically coupled, if coupling strength is measured simply according to the number of references that articles contain in common (Aria and Cuccurullo 2017). Figure 7 shows the bibliographic coupling.

Figure 7 - Bibliographic coupling

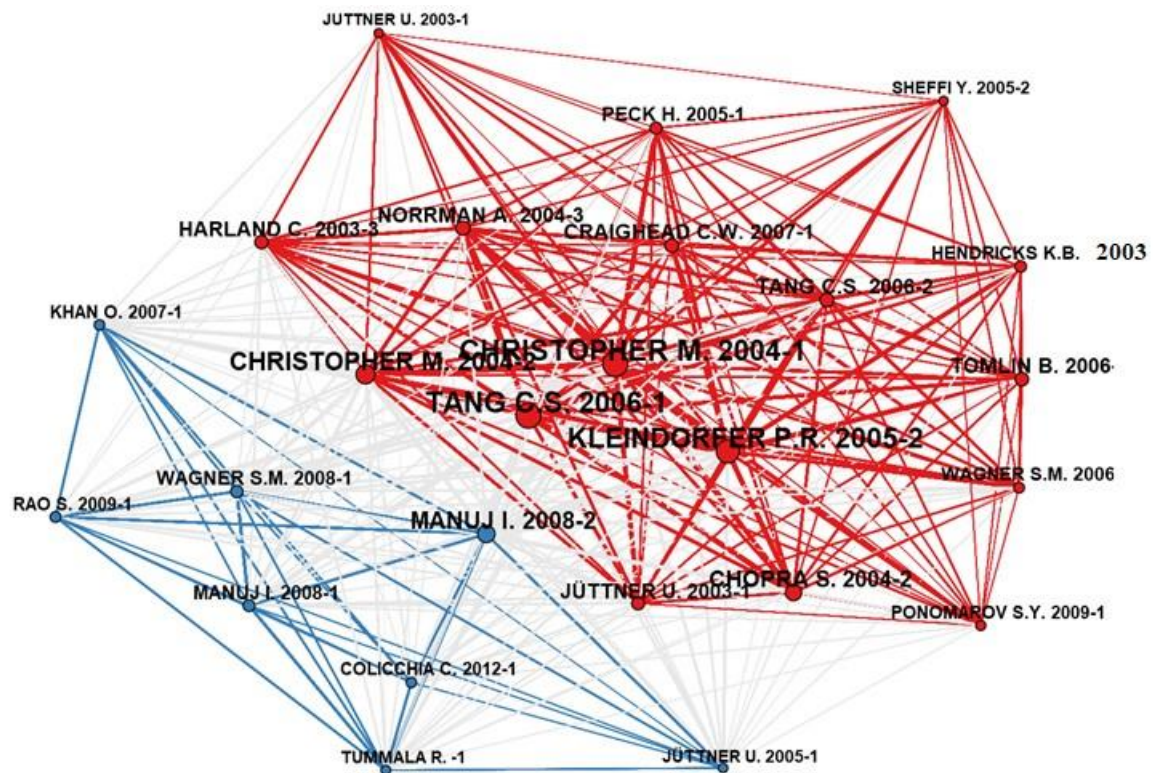


Source: Elaborated by the authors

The network shown by Figure 7 shows that these papers share a great number of references, therefore, composing a very connected network. It is noted that the network can be divided into 3 layers according to its centrality. In the Layer 1 there are the authors that are cited by most papers and started defining SCRM. The Layer 2 shows authors that are very cited, although not as much as the first layer and contributed with definitions and case studies. Layer 3 shows very relevant authors with newer papers in most cases, for example Jennifer Blackhurst appeared in the bibliometrics with a total of 9 papers, including papers from 2018, which are new and therefore not as much cited as authors in Layer 1.

The network shown by Figure 8 shows that these papers share a great number of references.

Figure 8 - Bibliographic co-citation

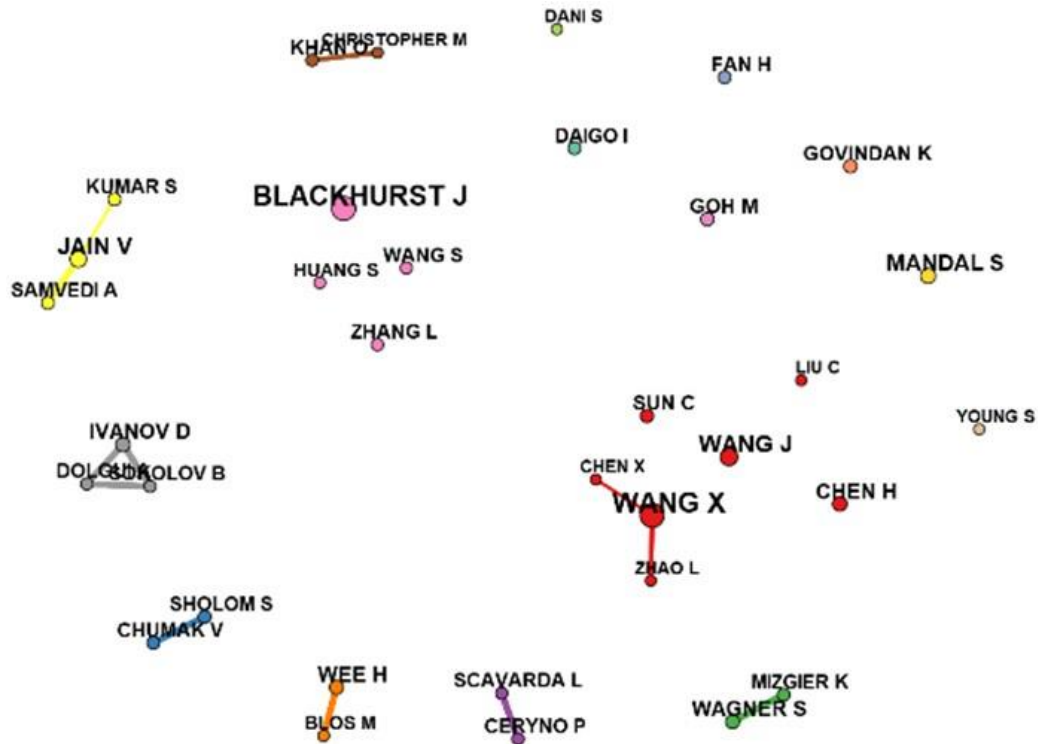


Source: Elaborated by the authors

Co-citation is defined by Small (1973) as new form of coupling and analyzes the frequency with which two documents are cited together. In general co-citation analysis is performed for mapping older papers and bibliographic coupling is used to map a current research front (ARIA; CUCCURULLO 2017). Co-citation analysis is a method for linking cited documents, is highly applied in literature because that the more frequently two articles are jointly cited, the more likely that they embody a complementary or similar intellectual stream (VERBEEK et al. 2002; KILUBI, 2016). Co-citation of two articles occurs when both are cited in a third article (ARIA; CUCCURULLO 2017).

Scientific collaboration network is a network where nodes are authors and links are co-authorships. It consists in one of the most well documented forms of scientific collaboration analysis (GLÄNZEL; SCHUBERT, 2004). The graph is shown by Figure 9.

Figure 9 - Bibliographic collaboration



Source: Elaborated by the authors

Co-word analysis aims to build a co-occurrence network to map terms extracted from keywords, titles, or abstracts in a bibliographic collection (ARIA; CUCCURULLO, 2017). The word cloud is shown by Figure 10.

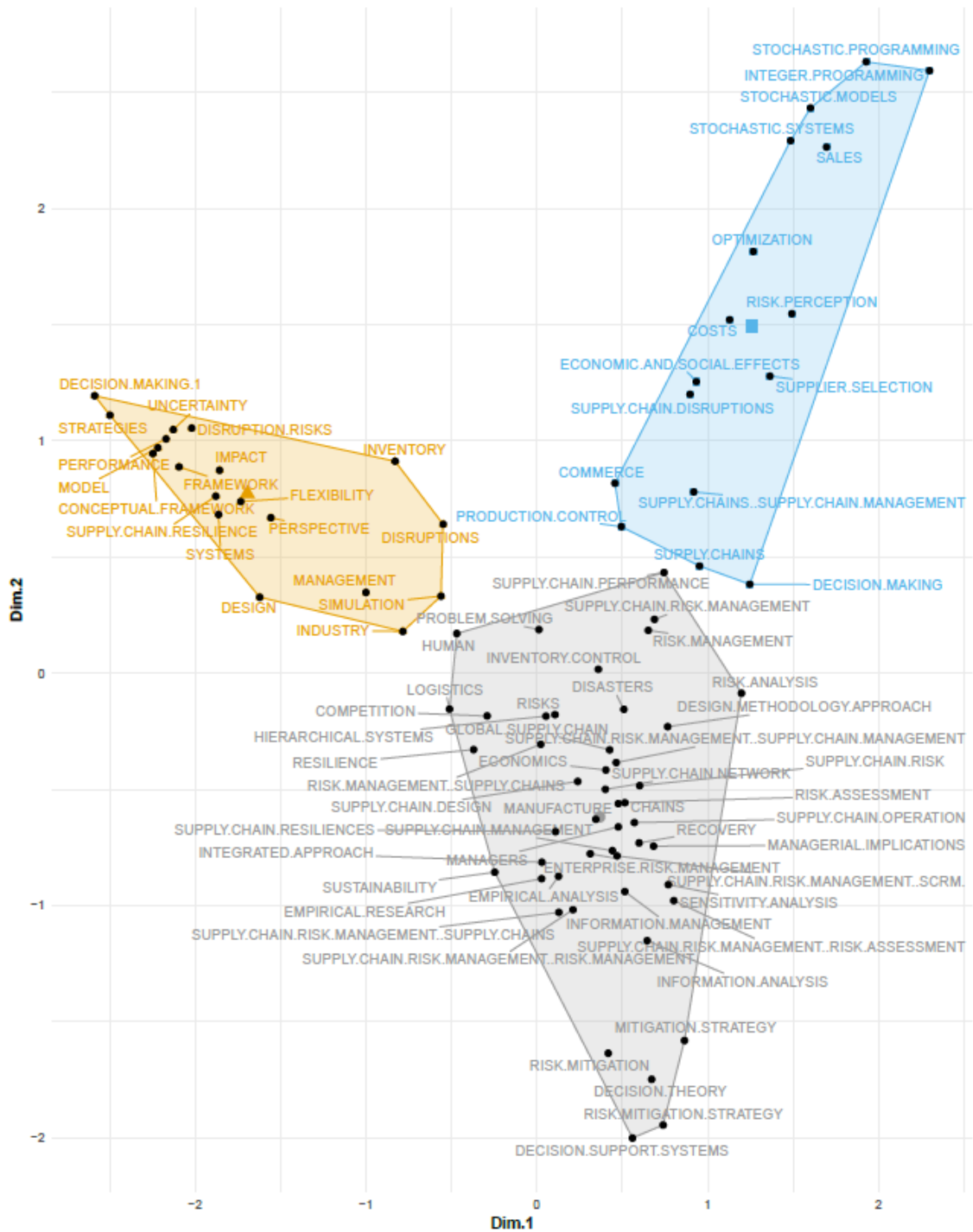
Figure 10 – Word cloud



Source: Elaborated by the authors

Multiple correspondence analysis (MCA) is used to draw a conceptual structure of the field and k-means clustering to identify clusters of documents that express common concepts, additionally, MCA consists in a multivariate technique for categorical data (ARIA; CUCCURULLO 2017). The more similar the words are in distribution, the closer they are represented in the map in Figure 11.

Figure 11 - Conceptual map



Source: Elaborated by the authors

5 FINAL CONSIDERATIONS

The objectives of this paper were threefold: (1) Set a complete picture of SCRM research field; (2) Identify which segments and techniques are more approached to set trends (3) Identify how SCRM is being applied to HCSC. To approach these objectives, we conducted a bibliometric analysis using Scopus and WoS databases. Our bibliometric results identified the most cited papers, authors and the main research groups concerning this research stream. In terms of segments, it is noted that the Healthcare sector is indeed still very unexplored, having only 3 studies found by this research. Although this SLR have revealed segments that are even less studied than Healthcare segment, can be seen that this is a field with many opportunities for researchers and hospital managers to explore for reducing costs and improving service quality. We also highlight that our co-word analysis did not show “Healthcare” or any health-related keyword, which is substantial evidence that this field of research is poorly approached. Additionally, papers composing the “Pharmaceutical” segment did not show a broader picture of how they contribute to HCSC. As an essential part of HCSC, pharmaceutical industry should identify, assess and mitigate risks considering themselves as part of the process of providing Healthcare. Even though a SLR was conducted (analyzing 547 papers) this research has limitations. First limitation is that only published journal articles were analyzed, for example, conference papers could possibly have showed more studies concerning Healthcare segment. Scopus database and ISI Web of Knowledge were selected as our search engines; therefore, it is possible that not all the papers that could fit in this research were assessed. As another limitation, we analyzed only papers that were written in the English language. The expectation is that this research helps scholars in future research and investigation. As future studies opportunities, we highlight the possibility of applying in Healthcare studies the techniques largely used in other segments, such as Simulation and Fuzzy logic.

6 REFERENCES

- ARIA, M.; CUCCURULLO, C. Bibliometrix: an r-tool for comprehensive science mapping analysis. **Journal of Informetrics**, v.11, n.4, p. 959–975, 2017.
- BOWERSOX, D.; STANK, T.; DAUGHERTY, P. Lean Launch: Managing Product Introduction Risk Through Response Based Logistics. **Journal of Product Innovation Management**, v. 16, n. 6, p. 557–568, 1999.
- BOYLE, F.; SHERMAN, D. Scopus: The product and its development. **The Serials Librarian**, v. 49, n. 3, p. 147-153, 2006.
- CHADEGANI, A. et al. A comparison between two main academic literature collections: Web of science and scopus databases. **Asian Social Science**, v. 9, n. 5, p. 18-26, 2013.
- CHATTERJEE, K.; KAR, S. Multi-criteria analysis of supply chain risk management using interval valued fuzzy TOPSIS. **Opsearch**, v. 53 n. 3, p. 474–499, 2016.
- COLICCHIA, C.; DALLARI, F.; MELACINI, M. A simulation-based framework to evaluate strategies for managing global inbound supply risk. **International Journal of Logistics Research and Applications**, v. 14, n. 6, p. 371–384, 2011.

- DANI, S.; DEEP, A. Fragile food supply chains: reacting to risks. **International Journal of Logistics: Research and Applications**, v. 5567, p. 37–41, 2010.
- ELANGOVA, D. et al. Analysis of time delays for loss reduction in an automobile components manufacturing organisation using a proactive supply chain risk management model. **International Journal of Services, Economics and Management**, v. 2, n. 3/4, p. 385, 2010.
- GLÄNZEL, W.; SCHUBERT, A. **Analysing Scientific Networks Through Co-Authorship**. In: MOED Henk; GLÄNZEL Wolfgang.; SCHMOCH Ulrich. Handbook of Quantitative Science and Technology Research. Springer, Dordrecht, 2004.
- HALLIKAS, J.; VIROLAINEN, V.; TUOMINEN, M. Risk analysis and assessment in network environments: A dyadic case study. **International Journal of Production Economics**, v. 78 n. 1, SI, p. 45–55, 2002.
- HALLIKAS, J. et al. Risk management processes in supplier networks, **International Journal of Production Economics**, v. 90, n. 1, p. 47–58, 2004.
- JUTTNER, U. Supply chain risk management: Understanding the business requirements from a practitioner perspective. **The International Journal of Logistics Management**, v. 16, n. 1, p. 120-141, 2005.
- JUTTNER, U.; PECK, H.; CHRISTOPHER, M. Supply chain risk management: outlining an agenda for future research. **International Journal of Logistics: Research & Applications**, v. 6, n. 4, p. 197-210, 2003.
- KHAN, O.; BURNES, B. Risk and Supply Chain Management: Creating a Research Agenda. **International Journal of Logistics Management**, v. 18, n. 2, p. 197–216, 2007.
- KILUBI, I. Investigating current paradigms in supply chain risk management – a bibliometric study. **Business Process Management Journal**, v. 22, n. 4, p. 662–692, 2016.
- KUMAR, S.; HARRISON, G. Expect the Unexpected: Supply Chain Disruption and Opportunity for US Companies — A Business Case. **Transportation Journal**, v. 51, n. 1, p. 118–136, 2012.
- LONSDALE, C. Effectively managing vertical supply relationships: a risk management model for outsourcing. **Supply Chain Management: An International Journal**, v. 4, n. 4, p. 176–183, 1999.
- MANDAL, S. The influence of organizational culture on healthcare supply chain resilience: moderating role of technology orientation. **Journal of Business & Industrial Marketing**, v. 32, n. 8, p.1021-1037, 2017.
- MANDAL, S.; JHA, R. R. Exploring the importance of collaborative assets to hospital-supplier integration in healthcare supply chains. **International Journal of Production Research**, v. 56, n. 7, p. 2666-2683, 2017.
- MOHER, D.; LIBERATI, A.; TETZLAFF, J.; ALTMAN, D. G. Preferred reporting items for systematic reviews and meta-analyses: **The PRISMA statement**. **PLoS Medicine**, v. 6, n. 7, p. 1-9, 2009.
- NIEMSAKUL, J. et al. Cost-benefit sharing in healthcare supply chain collaboration. **International Journal of Logistics Systems and Management**, v. 30, n. 3, p. 406-420, 2018.

- NORRMAN, A.; JANSSON, U. Ericsson's proactive supply chain risk management approach after a serious sub-supplier accident. **International Journal of Physical Distribution & Logistics Management**, v. 34, n. 5, p. 434–456, 2004.
- RAKOVSKA, M.; STRATIEVA, S. A taxonomy of healthcare supply chain management practices. **Supply Chain Forum: An International Journal**, v. 19, n. 1, p. 4-24, 2018.
- RILEY, J. et al. How internal integration, information sharing, and training affect supply chain risk management capabilities. **International Journal of Physical Distribution & Logistics Management**, v. 46, n. 10, p. 35–43, 2016.
- ROBINSON, S. et al. SimLean: Utilising simulation in the implementation of lean in healthcare. **European Journal of Operational Research**, v. 219, n. 1, p. 188-197, 2012.
- SONG, C.; ZHUANG, J. Modeling a Government-Manufacturer-Farmer game for food supply chain risk management. **Food Control**, v. 78, p. 443–455, 2017.
- SORENSEN, L. B. How risk and uncertainty is used in supply chain management: a literature study. **International Journal of Integrated Supply Management**, v. 1, n. 4, p. 387–409, 2005.
- SYAHRIR, I.; SUPARNO, S.; VANANY, I. Healthcare and disaster supply chain: literature review and future research. **Procedia Manufacturing**, v. 4, p. 2-9, 2015.
- TANG, C. Perspectives in supply chain risk management. **International Journal of Production Economics**, v. 103, n. 2, p. 451–488, 2006.
- THUN, J.; DRÜKE, M.; HOENIG, D. Managing uncertainty – an empirical analysis of supply chain risk management in small and medium-sized enterprises. **International Journal of Production Research**, v. 49, n. 18, p. 5511–5525, 2011.
- VANVACTOR, J. Cognizant healthcare logistics management: ensuring resilience during crisis. **International Journal of Disaster Resilience in the Built Environment**, v. 2, n. 3, p. 245-255, 2011.
- VERBEEK, A. et al. Measuring progress and evolution in science and technology-I: the multiple uses of bibliometric indicators. **International Journal of Management Reviews**, v. 4, n. 2, p. 179-211, 2002.
- VIEIRA, E.; GOMES, J. A comparison of Scopus and Web of Science for a typical university. **Scientometrics**, v. 81, n. 2, p. 587-600, 2009.
- ZEPEDA, D.; NYAGA, G.; YOUNG, G. Supply chain risk management and hospital inventory: Effects of system affiliation. **Journal of Operations Management**. v. 44, p. 30-47, 2016.
- ZSIDISIN, G.; PANELLI, A.; UPTON, R. Purchasing organization involvement in risk assessments, contingency plans, and risk management: an exploratory study. **Supply Chain Management: An International Journal**, v. 5, n. 4, p. 187–198, 2000.