Overview of Managing Management Information Systems on Supply Chain Management : A Bibliometric Study

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Abstract

Changes already moved on to manage Management Information System (MIS) in Supply Chain Management (SCM) in business and industry. It coerces an organisation to be competitive in an intense competition. This study aimed to examine the visual map and international research status of the MIS' impact on SCM on Scopus search engines. This study used bibliometric and Scopus with the assistance of Vosviewer to identify and analyse relevant research. There were 381 articles issued between 1994 to 2020. The result showed that the most prolific affiliation was Hong Kong Polytechnic University, and the area that most discussed the impact of MIS on SCM was Computer Science. This study proposed a convergent classification of the MIS effect to SCM into 5 clusters, i.e. Supply Chain Management (SCM), Enterprise Resources Planning (ERP), Decision Support System (DSS), Informatic Management System (IMS), and Knowledge Management (KM).

Keyword: Management Information System (MIS), Supply Chain Management (SCM), Bibliometric

Abstrak

Perubahan telah beralih pada pengelolaan Sistem Informasi Manajemen (MIS) dalam Supply Chain Management (SCM) dalam bisnis dan industri. Ini memaksa organisasi untuk menjadi kompetitif dalam persaingan yang ketat. Penelitian ini bertujuan untuk mengkaji peta visual dan status penelitian internasional dampak MIS terhadap SCM di mesin pencari Scopus. Penelitian ini menggunakan bibliometrik dan Scopus dengan bantuan Vosviewer untuk mengidentifikasi dan menganalisis penelitian yang relevan. Terdapat 381 artikel yang diterbitkan antara tahun 1994 hingga 2020. Hasilnya menunjukkan bahwa afiliasi paling produktif adalah Universitas Politeknik Hong Kong, dan bidang yang paling banyak membahas dampak MIS pada SCM adalah Ilmu Komputer. Penelitian ini mengusulkan klasifikasi konvergen pengaruh MIS terhadap SCM menjadi 5 cluster, yaitu Supply Chain Management (SCM), Enterprise Resources Planning (ERP), Decision Support System (DSS), Informatic Management System (IMS), dan Knowledge Management (KM).

Kata Kunci: Sistem Informasi Manajemen (SIM), Supply Chain Management (SCM), Bibliometrik

INTRODUCTION

In all life aspects, management is crucial in supporting planning, organising, actuating, and controlling to achieve an optimum result, no exception in Management Information System (MIS). Careful planning would set clear business direction and goals. Thus, the company could choose a suitable strategy, manage the resources, and set the

achievement standard (Hartikayanti et al., 2018), Organising is regulating and managing the resources in the same direction in achieving the goal (Heinrich et al., 2005; Mukasa et al., 2017). Hence, tasks delegation, specialisation, and job information can be implemented following the company' condition. Directing strive to create a dynamic and conducive work environment for effective and efficient performance (Chanias et al., 2019). The last, controlling, assess the achieved performance's conformity with the objective' standard and makes necessary improvement (Puspita et al., 2019).

Management is a source of information to make decisions by processing and utilising data by MIS (Tang & Liu, 2020). Modern information technology has been growing, innovating, and strengthening supply chain management in the information era. (Y. C. Chen et al., 2015; Dao et al., 2011; Dehgani & Jafari Navimipour, 2019). Companies use modern industrial technology to strengthen supply chains, make efficiency, establish rapid strategies, reduce operating costs, and deal with diverse consumers (Avanesova & Shamliyan, 2019; Burns et al., 2009; Changiz & Mohsen, 2015; Mangalaraj et al., 2020). Dynamic environment and ever-changing consumer' tastes cause demand shifting. Thus, the market becomes hard to predict and increasingly competitive, force the company to maintain its position in the market (S. L. Chen et al., 2014; Seth et al., 2017).

In maintaining its position in a competitive environment, the company should adopt modern information technology by managing supply chain management (Chanias et al., 2019; Clemons et al., 2008; Mangalaraj et al., 2020). Hence, information can be accurately shared and transformed to all interested supply chain nodes to respond to customer needs faster and provide better service (Amaye et al., 2016; Egharevba et al., 2019; Goswami et al., 2013).

In building the organisation' competitiveness of the organisation, supply chain management (SCM) is the prominent supporter of the organisation' survival (Jayakrishnan et al., 2020). Thus, it requires capable, knowledgeable, and skilled human resources to work efficiently to enhance the output quality (Rojas, 2020; Tang & Liu, 2020; Ibrahim et al., 2019; Košíček et al., 2012).

The organisations must have information and resources to meet the consumer's needs and enhance their value. Thus SCM could support all activities process from upstream to downstream (Roetzel, 2019; Tang & Liu, 2020; Sitek et al., 2017). It demands the organisation to have a reliable management information system. Therefore, the operational activity aligns with its target (S. L. Chen et al., 2014; Yoon, 2011). An effective SCM requires reliable MIS support (Soroor et al., 2009).

A rapidly changing dynamic environment causes the company to keep getting accurate, relevant, and on-time information (Choi & Choe, 2016; Campos, 2016; Kim et al., 2020). Besides, the company needs to have reliable SCM support to maintain its competitive advantage (Akyuz & Rehan, 2009).

This research aimed to review visual maps and international research status of the MIS effect on SCM based on literature data obtained by Scopus with extensive bibliometric to answer research questions, i.e.

RQ1: How was the productivity trend on the MIS effect on SCM research based on the number of publications produced per year?

RQ2: What were the journal that publishes the most research on managing MIS on SCM?

RQ3: Who were the most prolific individual researchers and affiliate-based researchers in this field?

RQ4: What were the most prolific countries in this field?

RQ5: What were the types of documents and fields of study that contribute?

RQ6: Who were the most contributive sponsors in this field?

RQ7: How was the collaboration pattern between researchers or authors?

RQ8: How were the main topics mapping in this field of study?

RQ9: What were the potential research topic opportunities in MIS managing on SCM?

This study uses the bibliometric to illustrate and support previous research on the body literature by providing an extensive visualised overview of various periods, authors, affiliations, subject areas, document types from all international publications..

LITERATURE REVIEW

An information system is a system that has the ability to collect information from sources and using various media to display information (Wulandari, 2004). An information system consists of several components, namely blocks input, model block, output block, technology block, control block, and database block. Gordon B. Davis in his book entitled "Management Information Systems", expressed his opinion "management information system is a human system or an integrated machine to present information to support management operations functions and decision making in an organization". Information systems are used to support management processes, especially for the need for the availability of structured report information and periodic conclusions.

The benefits of management information systems include: 1. Increase the accessibility of data that is presented in a timely and accurate manner for its users. 2. Can be used to develop an effective planning process. 3. Can guarantee the availability of good quality information data.

The definition of supply chain according to James (2012, p. 195) is a value that is put into a product by sending the product from one place to another, the product can be changed during the processing stage. This chain is also a network of various interconnected organizations that have the same goal, namely to organize the procurement or distribution of goods as best as possible. Bridgefield Group (2006) defines Supply Chain as a set of connections of sources and processes that begins with sourcing raw materials and extends to the delivery of finished goods to final consumers. Pienaar (2009, p. 438) defines Supply Chain as a general description of the integration of processes that evolve organizations to transform raw materials into finished goods and deliver them to their final consumers. Lu (2011, p. 9) defines Supply Chain as a group of interrelated company participation that adds value to the flow of input changes from their source of origin to the final product or service demanded by the intended final consumer.

Supply Chain is formed and can only be formed if there is more than one company participating. From the definition above, it can be concluded that Supply Chain is a group or supply chain that forms each other from changes in input and sends products to the final intended consumer. Dr. Dawei Lu revealed that there are 4 basic flows in the Supply Chain, namely: 1) Material Flow, namely that all factories have a supply chain from raw materials at the beginning of the supply chain to finished goods at the end of the supply chain. 2) Information Flow, namely that all supply chains have

and use information flow. Although in the supply chain there are many flows of information such as information about demand, information about forecasting, information about production, and scheduling and design. 3) Finance Flow That is, all supply chains have financial flow. And in general, the flow of money is like the flow of blood in a supply chain. Without financial flows, it is certain that the supply chain will not run. 4) Commercial Flow, namely that the flow of material through the supply chain can take the form of ownership from one company to another, from supplier to buyer. Where, these commercial flow transactions can only be taken from the supply chain if there is more than one company.

Supply Chain is a repetitive business and information process providing products or services from suppliers through the manufacturing process and distribution to consumers (Schroeder, 2007). Supply Chain is a network of partners who collectively convert basic (upstream) commodities into finished products (downstream) that are of value to the end customer, and who manage back at each stage. The following is a picture of the supply chain model (Kearney, 2008).

RESEARCH METHODS

This research uses the Bibliometric approach to analyse and visualise data using the Scopus features. It could identify trends and the growth patterns of knowledge, the novelty and even obsolescence following the distribution of scientific references and become a baseline to conduct research in the future and prevent researchers from repeating others' studies (Rodríguez-Ruiz et al., 2019; Khatib et al., 2021).
This research addresses explicitly research positioning in MIS' managing on SCM globally at Scopus search engines from year to year. The stages were
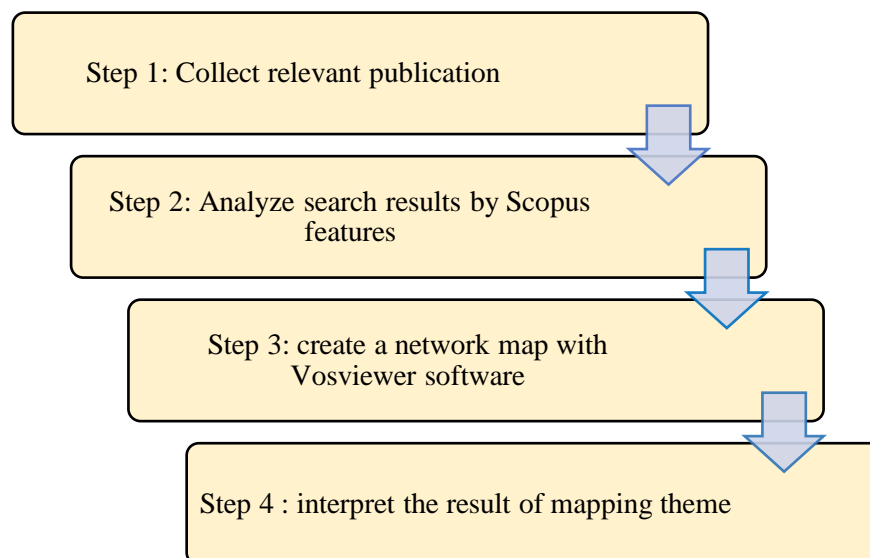
Step 1: Collect relevant publication

Step 2: Analyze search results by Scopus features

Step 3: create a network map with Vosviewer software

Step 4 : interpret the result of mapping theme

Figure 1. Bibiometric study steps

Step 1: Collect relevant publication
At this stage, it measured the status of publication maps in 26 years from 1994 to 2023. It obtained 381 arcticles about MIS related to SCM from the Scopus search engine. The key commands in Scopus search engines were TITLE-ABS-KEY "Management Information System" AND "Supply Chain Management".

Step 2: Analyse search results by Scopus features
After obtaining relevant publications, the next step was to analyse the document based on year, author, source, affiliation, country or territory, subject area, type, and sponsor.

Step 3: Create a network map with Vosviewer software
There were 381 publications, with the assistance of Voswiewer software, based on author collaboration network and document by theme mapping.

Step 4: Interpret the result of mapping theme
After obtaining a complete picture of the author collaboration network and theme mapping, data interpretation was made to deliver an understanding of the body of literature

RESULT AND DISCUSSION
This section describes the results based on documents per year, sources, state affiliations, citation, types, and subject areas in MIS and SCM studies

a. Productivity of research documents delivered from 1994-2023 (RQ1)
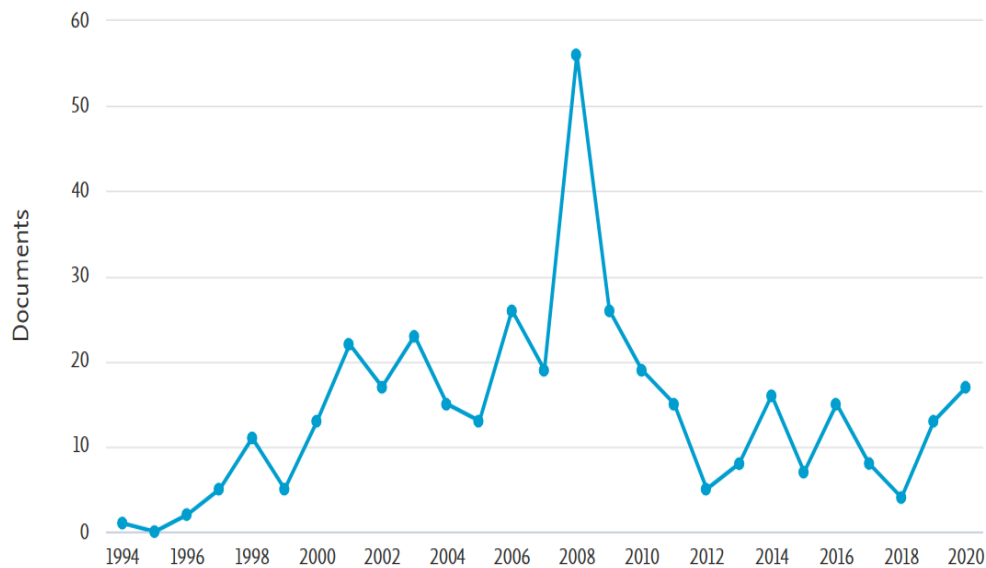

Figure 1. The document by year from managing MIS in SCM Study

The first research related to MIS and SCM was in 1994 by Zweben with the title Automated Supply Chain Management in the form of proceedings at Electro International. It stated that manufacturers are facing a new era in information systems. Monolithic databases are no longer the only operational support since a computing decision support system has been used to construct and evaluate companies' acts. Using this system, the company can downsize operations, lower costs, lower inventory and facilitate customer services. Users can use information simultaneously through a distributed computing connection. This application assists company in planning the operations while handling unexpected things.

Since 2000, the trend was increasing yearly and peaked in 2008 with 56 arcticles. While in 2021, there were 4 documents, in 2022 were 16, and in 2023 was 17 documents. Furthermore, future studies in the subject are still possible.

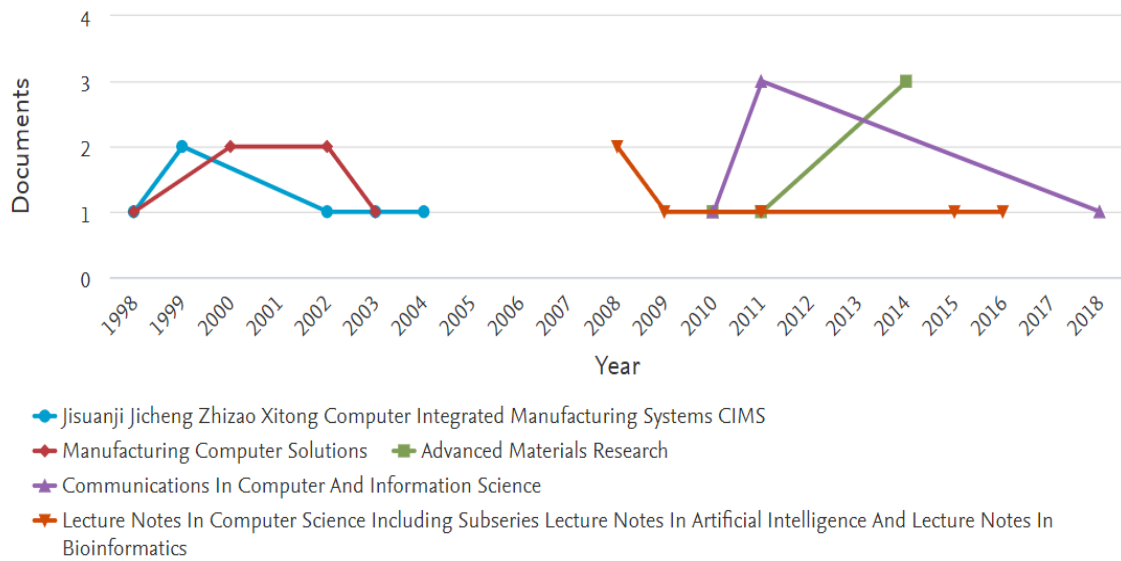**b. The most productive journal on MIS managing on SCM research' (RQ2)**

Figure 2. Document by Source from MIS and SCM Study

Research in MIS managing on SCM was widely discussed in the Journal Jisuanji Jicheng Zhizao Xitong Computer Integrated Manufacturing Systems CIMS; Lecture Notes in Computer Science Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics; Manufacturing Computer Solutions with 6 arcticles each. In comparison, Advanced Materials Research; Communications in Computer and Information Science; Manufacturing Computer Solutions; Manufacturing System; Proceedings of IEEE International Conference on System Management and Cybernetics; and Supply Chain Management each had 5 arcticles. The unnamed source was under 5 arcticles.

c. The most prolific individual researcher in MIS managing on SCM' literature (RQ3)
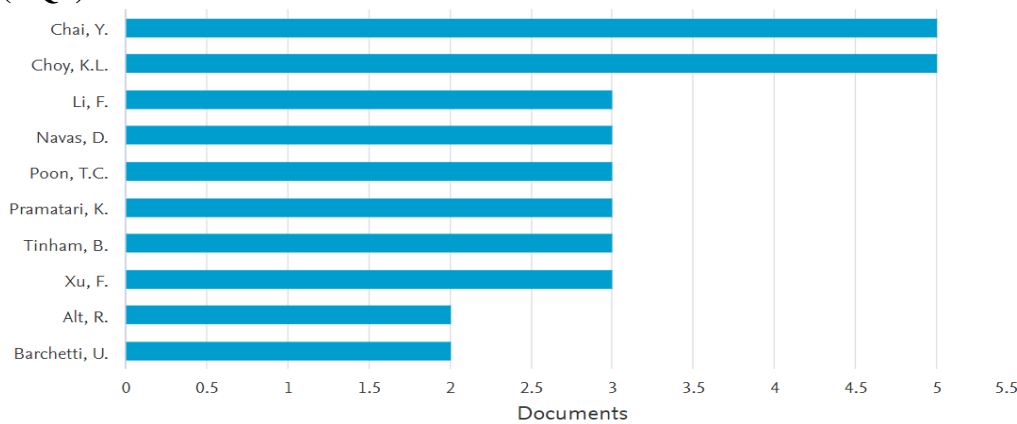

Figure 3. Documents by Author from MIS and SCM Study

Bisman (Business and Management): The Journal of Business and Management

Figure 3 display the researchers with at least 2 arcticles. The most prolific researchers were Chai and Choy, with 5 arcticles each. The next was Li, Navas, Poon, Pramatari, Tinham and Xu with 3 arcticles each, while Alt and Barchetti with 2 arcticles each.

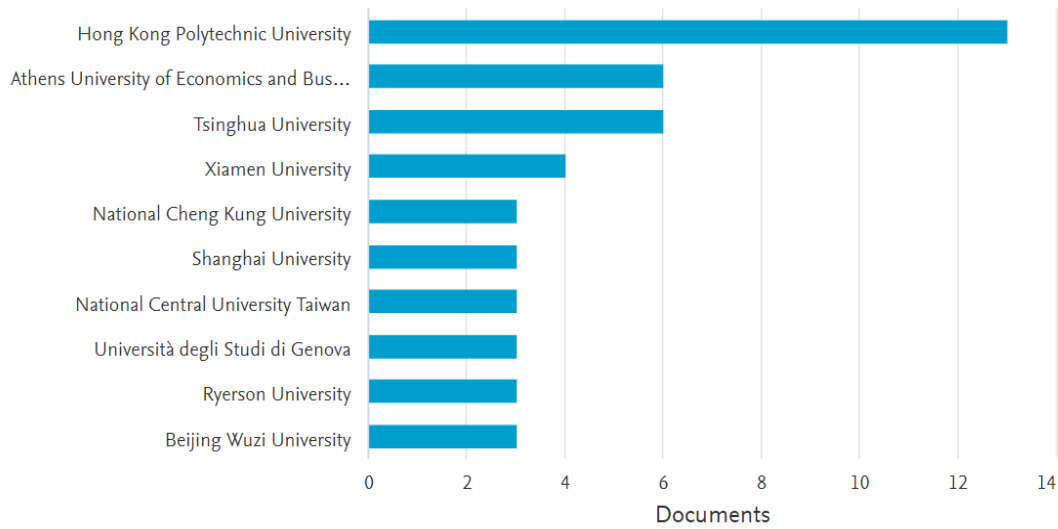**d. The most prolific affiliation in managing MIS on SCM' literature (RQ 3)**

Figure 4. MIS and SCM Articles by Affiliation

Figure 4 shows researchers based on affiliation. Hong Kong Polytechnic University produced 13 arcticles, Athens University of Economics and Business and Tsinghua University had 6 arcticles each, Xiamen University with 4 arcticles, while National Cheng Kung University; Shanghai University; National Cheng Kung University, Shanghai University, National Central University Taiwan, Degli University studies in Genoa, Ryerson University and Beijing Wuzi University with 3 articles for each.

e. The most prolific country in Managing MIS on SCM research (RQ4)
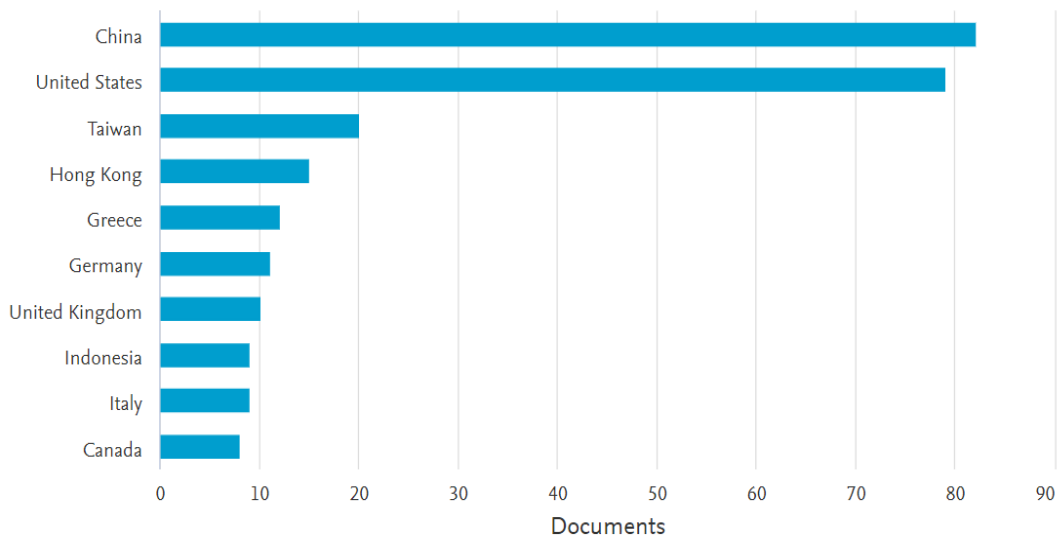

Figure 5. MIS and SCM Articles by Countr

The countries with the most research were China (82 articles), the United States (79 articles), Taiwan (20 articles), Hong Kong (15 articles), Greece (12 articles), Germany (11 articles), The United Kingdom (10 articles), Indonesia and Italy (9 articles each), Canada, France, India, Korea (8 articles each). For other countries, produce fewer than 8 articles.

f. Articles by type (RQ5)

The articles type was 178 conference documents (46.7%), 159 articles (41.7%), 18 review documents (4.7%), 12 conference review (3.1%), 6 book chapters (1.6%), 3 books (0.8%), 2 article notes (0.5%), 1 short survey (0.3%), and 2 undefined articles (0.5%).
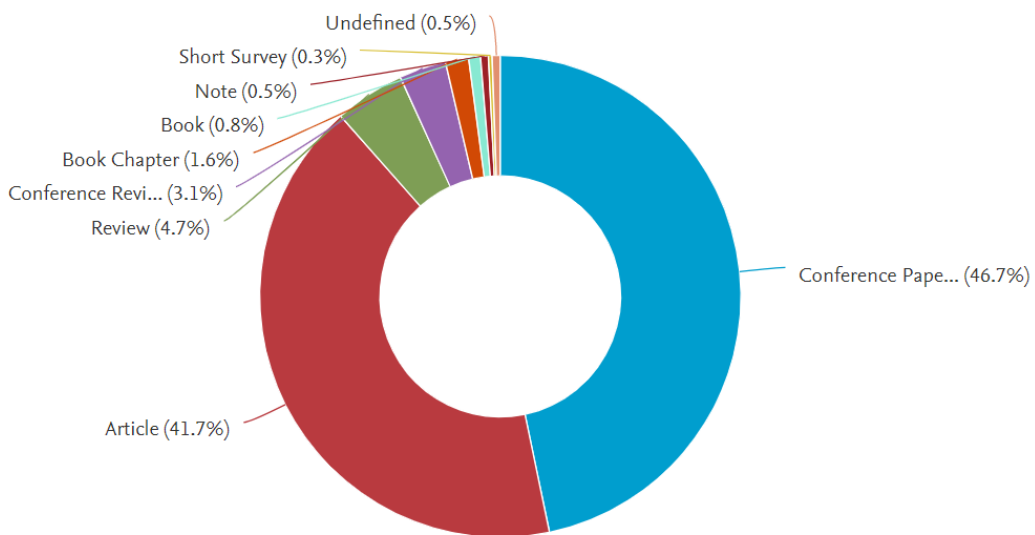

Figure 6. MIS and SCM Documents Type
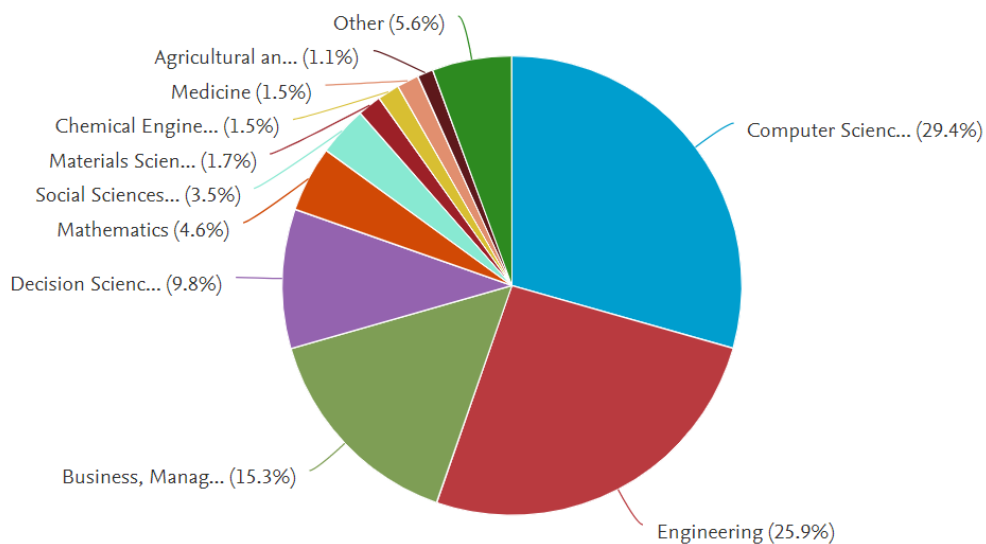
g. Documents by subject area (RQ5)

Figure 7. MIS and SCM Documents by Subject Area

Based on the subject area, the articles could be divided into computer science 210 documents (29.4%), 185 engineering articles (25.9%), 109 business, management and accounting documents (15.3%), 70 decision sciences (9.8%), 33 mathematics articles (4.6%), 25 social sciences articles (3.5%), 12 materials science articles (1.7%), 2 chemical engineering articles(1.5%), 2 medicine arcticles (1.5%), 8 agricultural and biological sciences documents (1.1%), and others 5.6%.
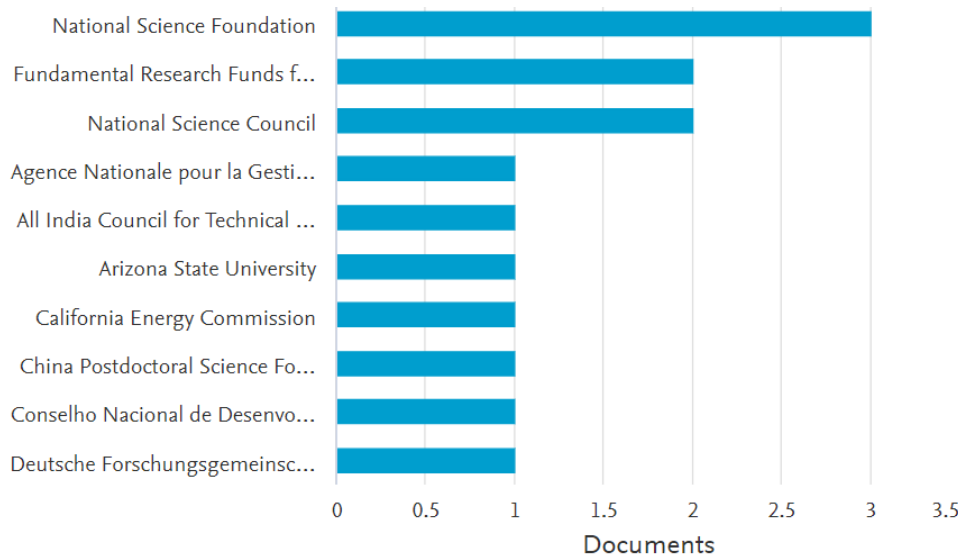
h. Documents by the sponsor (RQ 6)

Figure 8. Documents on MIS and SCM Study by The Sponsor

Based on the sponsors, the National Science Foundation funded 3 studies. Meanwhile, Fundamental Research Funds for The Central Universities and National Science Council were 2 studies each and the remaining 1 research.

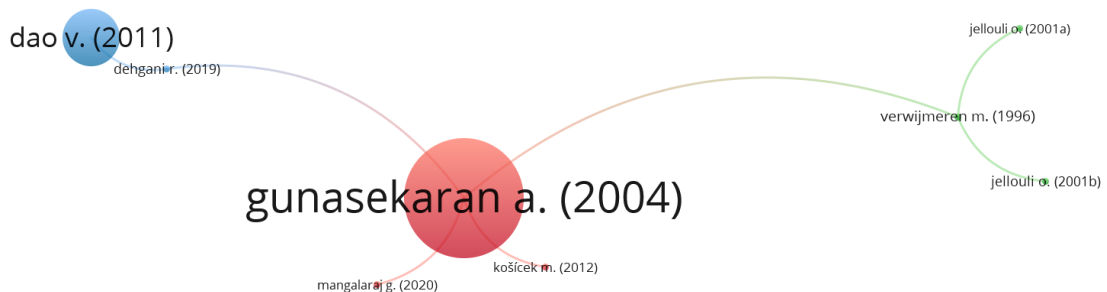## i. Document based on Author Collaboration Network (RQ 7)

Figure 9. Document by author collaboration network

Figure 9 showed 3 collaboration network patterns among authors in the MIS and SCM studies with three minimum documents per author. Thus, out of 529 authors, 7 authors met the criteria. There are three collaboration groups between researchers in the field of MIS and SCM :

1. The Red cluster consists of 3 authors i.e., Gunasekaran, A. (2004), Kosicek, M. (2012) and Mangalaraj, G. (2020).
2. The Green cluster consist of 2 authors i.e., Jellouli, O. (2001a), Jellouli, O. (2001b), Verwijmeren, M. (1996).
3. The blue cluster consists of 2 authors, i.e., Dao, V. (2011), Dehgani, R. (2019).

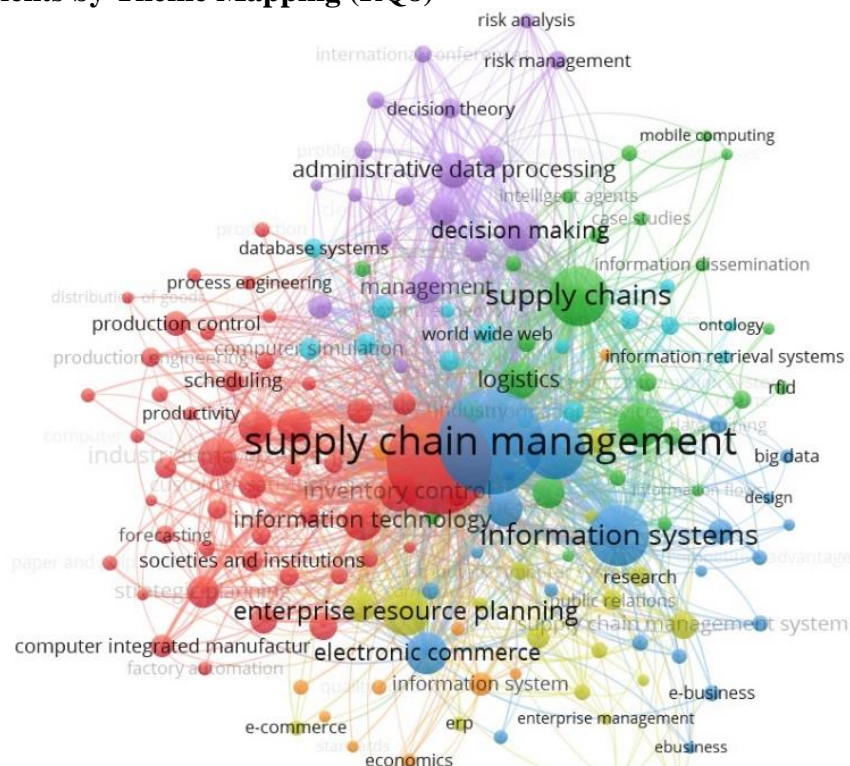**j. Documents by Theme Mapping (RQ8)**

Figure 10. Documents by theme mapping maging MIS in SCM Study

The network map formed in Figure 10 with MIS and SCM keywords by Vosviewer software 2891 keywords are using 10 divided into 5 clusters, i.e.:

1. Supply Chain Management (SCM) is red. This cluster consisted of keywords related to supply chain management, management information systems, strategic planning. Most of these keywords are related to SCM and MIS.
2. Enterprise Resources Planning (ERP) is green. This cluster consisted of keywords related to enterprise resources planning and enterprise resource management.
3. Decision Support System (DSS) is blue. This cluster consists of keywords related to administrative data process, artificially intelligence, decision making, decision support system, decision theory, knowledge-based system, management, problem-solving, project management, risk management.
4. Informatics Management System (IMS) is yellow. This cluster consists of keywords related to information analysis, information services, mathematical models, optimization, system analysis, technology, world wide web, computer simulation, database systems, industrial economics.
5. Knowledge Management (KM) is purple. It consisted of keywords related to knowledge management, industry, competition, logistics, manufacture.

The five clusters describe literature topics from research that have been of interest to researchers in the field of managing MIS in SCM. It can be concluded that MIS has an important role in sustainable SCM which involves the support of many parties in ensuring that the MIS runs appropriately and appropriately in supporting SCM operations.

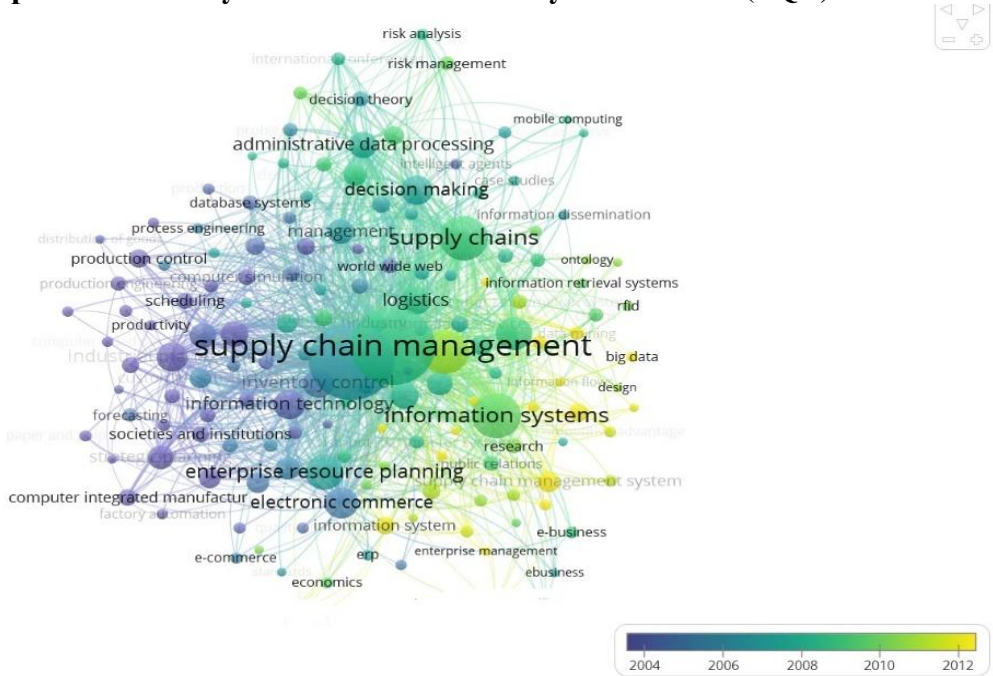### k. Topic Area Overlay Visualization and Density Visualization (RQ 9)

Figure 11. Overlay Visualization

Figure 11 describes the topic of research based on the year, but most keywords were from 2004 to 2012. Figure 12 describes a visualization of the depth density of research learned in managing MIS on SCM with the assistance of Vos viewer software depicted through color.

Figure 12. Density Visualization

More concentrated colors indicated a relatively high research development. While unconcentrated color with relatively rare keywords meant the opportunity to do more research can be done (see Figure 12). Some rare keywords included, e.g., information dissemination (6), big data (6), information flows (5), information retrieval system (6), and others. The results showed the opportunity to identify potential topics to contribute to the research of MIS managing at SCM. Another finding was the presence of specific keywords that are unrelated to other keywords.

CONCLUSION

The results illustrate the trend, the most prolific researchers both individually and by affiliation, the field of study that contributes, the pattern of author collaboration and the topic mapping based on keyword associations of research in MIS managing on SCM. This research' proposed classification on a convergent axis in MIS managing on SCM to characterise the knowledge network analysed. It is grouped into five relevant clusters, i.e. Supply Chain Management (SCM), Enterprise Resources Planning (ERP), Decision Support System (DSS), Informatic Management System (IMS) and Knowledge Management (KM), which is the domain of MIS and SCM. While the practical implications, based on the identification of critical themes in MIS and SCM, lead to the development of studies to understand contexts and topics and capture the existence of research gaps. Based on this body literature, new studies can be conducted to overcome inequalities and promote relevant knowledge in MIS.

The limitation of this research is that the data sources only use Scopus indexed. Thus, for future research, it will be preferable to use literature data sources from various electronic databases such as Springer, Web of Science (WoS), and others to enrich scientific contributions. Potential topics are discovered by identifying fewer keywords for future research as new contributions in science. Bibliometrics presents data visualization and mapping using the Vos viewer application.

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