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Global Supply Chain Management Research: A Bibliometric Analysis

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Abstract

This paper aims to reduce the information overload in the field of global supply chain management (GSCM) by performing a literature review using Scopus as the database and VOSviewer to visualize the results. Global supply chain management is one of the most expansive and diverse fields in the business sector. Graduates with this degree will be in high demand since there is not only a shortage of individuals with supply chain knowledge, but the field of supply chain itself is ever-expanding (Gradovska, 2020). They will have many career opportunities and will be able to enter many different positions in a firm.

Since there are myriad aspects and applications in the field of supply chain, these ever-expanding possibilities could create a challenge for graduates looking to enter the workforce. When doing the bibliometric analysis, the objective is to determine what the many topics of GSCM are, what the current trends in these topics are, and which countries are publishing the most research literature in the field. The main keywords in supply chain are sustainability and sustainable development, logistics, international trade, commerce, and public policy. However, the current trends since 2017 are focused mostly on sustainability and sustainable development. Most of the research done on these topics is from the United States, China, the United Kingdom, and India. When determining the countries producing the majority of research in this field, it could imply that those countries are the most knowledgeable in the subject. They would also have the best education and universities to study GSCM, which can serve as a guide to individuals interested in continuing their studies in supply chain.

Introduction

Global supply chain management (GSCM) is an expanding interdisciplinary field. It covers not just business, but it also covers subjects such as math, environmental science, psychology, and many other areas of study. GSCM is the process of improving a business process, making it more resilient, agile, and competitive. Graduates with a degree in this area of study will be in high demand due to the expansive and diverse fields in the business sector. There is also a shortage of skilled supply chain managers in the United States and parts of Asia (Gradovska, 2020).

The purpose of this paper is to reduce the information overload about GSCM through a bibliometric analysis, which is a qualitative way to summarize and give a general overview of a topic. It uses informal or subjective methods to collect and interpret studies. As opposed to a systematic review, a literature review has the purpose of clarifying a broad general topic and providing a summary of the extant literature on the subject (Kysh, 2013). With this bibliometric analysis, undergraduates can have a better understanding of the possibilities to continue their GSCM studies as well as the current trends in this field to know their employment opportunities.

The Future of GSCM

Global supply chain management is the process of improving a business process, making it more resilient, agile, and competitive. It can often be related to logistics management, value chain management, and operations management and connects with areas such as management, demand, sourcing, and procurement management. GSCM also investigates the interrelationship and links between different functions, processes, and chain members. It then analyses the impact of their interactions on value additions and profit maximization (Parkhi, 2015).

Graduates with a degree in GSCM can take jobs as supply chain managers, logisticians, purchasing agents, industrial production managers, distribution managers, or operations research analysts. They can enter manufacturing, data analysis, procurement, transportation, and customer service industries. Since supply chains are an integral part of the economy, and new supply chains are coming up every day, the possibilities with this degree are vast. "Supply professionals manage resources to ensure lower overall cost, increase efficiency and transparency in processes, and shrink the asset base" (Cavinato, 2010). GSCM is also among the most expansive and diverse fields in the business sector. Supply chain job opportunities are expanding since there is a shortage of skilled supply chain managers in the USA and parts of Asia (Gradovska, 2020). It is a growing industry with job opportunities all over the world, and a degree in this field applies to multiple sectors (Gradovska, 2020).

Institute for Supply Chain Management (ISM) (Cavinato, 2010) field research reveals that the scope of supply chain management is an integration of 14 components:

- Disposition/Inventory Recovery: Disposition is moving goods out of the internal organization to other organizations due to loss of value, obsolesce, excess inventory, or product damage. Inventory recovery is a systematic, centralized organizational effort to manage the surplus material and scarp recovery activities in a manner that recovers as much of the original capital as possible.
- Distribution: This refers to a business established to buy goods from manufactures and resell them to a broad customer base, to the process in which goods move to the final customer, activities such as storing, transacting, packaging and shipping, and to the relative arrangement of the elements of a statistical population on distinctive characteristics.
- Inventory control: Is the management of inventories such as decisions about which items to stock at each location, how much stock to keep at hand, when and how much to buy, managing shortages, and backorders.
- Logistics: Process of planning, implementing and controlling the efficient, cost-effective flow and storage of materials, in-process inventory, and finished goods and related information.
- Manufacturing Supervision: Planning, managing, and performing the processing of material into intermediate or final products.
- Materials Management: It involves planning, acquisition, flow, and distribution of production materials from the raw material stage to the finished product stage. It is related to activities such as inventory management, receiving, in-plant materials handling, production planning and control, and surplus and salvage.
- Packaging: Includes activities such as containment, protection, apportionment, convenience, and communication.
- Procurement and Purchasing: Procurement is a function that includes specification development, value analysis, supplier market research, negotiation, buying activities, inventory control, receiving, and stores. Purchasing is the activity responsible for the acquisition of required materials, services, and equipment.
- Product and Service Development: This is a series of an integrated process in new product development from idea to commercialization.
- Quality: Conformance and efficiency, design, and measured conformance with no waste, performance at an acceptable price, satisfying customer needs throughout the life of the product.
- Receiving: Function responsible for verifying that the goods received are the goods ordered. This involves inspecting and accepting incoming shipments.
- Strategic Sourcing: This involves the selection and management of suppliers.
- Transportation/Traffic/Shipping: Management activity that controls buying, scheduling, auditing, and billing of common and contract carriers.
- Warehousing/Stores: Material management activities that involve shipping, receiving, internal movement, and storage of raw materials and finished goods.

Jobs

The United States Bureau of Labor Statistics (BLS) predicts that there will be a 7% increase (7,800 new jobs) in career opportunities for supply chain management jobs over the next decade. Jobs for general and operations managers will increase by 9% (205,200 jobs). Purchasing manager job opportunities will increase by 5% (4,000 new jobs). Currently, the number of jobs for buyers and purchasing agents is decreasing. Still, the BLS is expecting that there will be more job opportunities in these entry-level positions more so than in senior-level purchasing manager roles (Dodge, 2020). In 2017, there was an increase of 12.6% of supply chain management undergraduate degrees (Data USA, 2018).

Education

The education level in the US in increasing steadily in the early 2000s with more university graduates earning master, professional and doctoral degrees. The number of people 25 years old and over with a master's degree as the highest level of education has doubled to 25 million in the last decade (America Counts Staff, 2019). The number of individuals with a Ph.D. has more than increased to 4.5 million in the same period (America Counts Staff, 2019). In 2018, 13.1% of US adults had an advanced degree compared to 8.6% in 2000 (America Counts Staff, 2019). Some of the benefits of obtaining a master's degree include specialized knowledge, career advancement, increased earning potential, an increase in a professional network, and others. Table 1 lists the top ten highest-ranking universities worldwide in GSCM studies (Pierce, 2013).

Table 1. Top 10 universities for GSCM studies

Rank	University	Faculty/Department/ Schools	Concentrations/Specializations
1	WU (Vienna University of Economics and Business) (WU Vienna, 2020)	Information Systems & Operations, Socioeconomics, and Global Business & Trade	Business analytics in supply chain, location analytics & geospatial data, retain marketing, supply chain finance & risks, sustainable & humanitarian supply chains, and transport & logistics
2	BEM – KEDGE Business School ISLI (Kedge Business School, 2020)	International business	Management of logistics in production and distribution, performance analysis, global supply chain architecture, and business network building
3	Erasmus University Rotterdam	Management	Decision analytics, logistic management, purchasing &

	(Erasmus University, 2020)		supply management, and distribution networks
4	Copenhagen Business School (CBS) (CBS, 2020)	International Management	Designing supply chain, building networks, and technics for decision making
5	Bocconi University (Bocconi University, 2020)	Economics & Management	Logistics & supply chain, economics & transport policy, and planning & management skills
6	ESSEC Business School (ESSEC Business School)	Business	Logistics, decision making, and strategy & operations
7	HEC Montreal – Business School (HEC Montreal, 2020)	International Logistics	Distribution management, analytics, operations planning, and logistics & transportation
8	Maastricht University (Maastricht University, 2020)	Business and Economics	Supply chain operations & relations and business & supply chain strategy
9	University of British Columbia (The University of British Columbia, 2020)	Commerce and Business Administration	Transportation and Logistics
10	Purdue University (Purdue University, 2020)	Management	Operations & supply chain management and business analytics

The following sections of this paper will answer the research questions about the current trends in global supply chain management and where the information in this subject is being produced. These results will provide valuable information for undergraduate students majoring in GSCM who are deciding whether to enter the labor market or continue their students and who are deciding in which subfield to specialize.

Methodology

A bibliometric analysis is a qualitative way to summarize and give a general overview of a topic, using informal or subjective methods to collect and interpret studies (Kysh, 2013). This type of analysis is receiving increasing attention and is becoming a fundamental methodology for analyzing research (Merigó & Yang, 2017). Some of the advantages of using a bibliometric analysis include analysis based on quantitative and reliable data, tangible results in the form of publications, and the analysis of extensive global data sets (Zemigala, 2019). For this analysis, the information has been extracted from the Scopus

database. Scopus is the largest "abstract and citation database of peer-reviewed literature" (Muñoz-Villamizar, Solano, Quintero-Araujo, & Santos, 2019). Only publications in the form of articles and conference papers will be used, as these are the most reliable peer-reviewed sources.

Selection of Key Words

To ensure the proper filter of publications inside this study when searching the keyword "Global Supply Chain Management" in the Scopus database, it was limited to article title, abstract, or keywords. This procedure resulted in 7,256 documents. To ensure that the information was up to date with the trends in supply chain, the time period of publications was set from 2010 until the present moment in 2020, which resulted in 5,049 documents. The publications were then filtered to document type, article and conference paper, resulting in 4,020 documents. With this limitation in place, the sources are reliable since they are peer-reviewed sources.

GSCM is an expanding interdisciplinary field and covers not just business but also subjects such as math, environmental science, psychology, and many others. Because of this, the search was limited only to the subject areas of business, management, and accounting, resulting 1,645 documents. This was done because the scope of this manuscript is only to aid business students. And lastly, the languages were limited to English, Spanish, and French, with a total of 1,628 documents found. The reasoning behind this limitation was to ensure that the sources found were related to my area of study since I am minoring in French and am already fluent in English and Spanish.

With those limitations in place, the 1,628 sources were exported as an Excel CV sheet so that the references would be compatible with VOSviewer. Using VOSviewer, the three research questions (RQ1: What are the main topics studied in the field of global supply chain management? RQ2: What are the current trends within the topics studied? RQ3: Where is the research on global supply chain mostly being produced?) will be answered by doing a keyword cluster analysis and co-authorship analysis based on the country the document was published in.

Findings

Main Topics

In order to visualize the main topics or keywords used in GSCM articles and documents, a keyword co-occurrence cluster analysis was done using VOSviewer. To get a more accurate analysis of what the most used keywords are, the minimum number of co-occurrences per keyword was established to be five. The number of keywords found when doing this was 516 words. Figure A represents those results.

Figure A. Keyword co-occurrence GSCM with no limitations
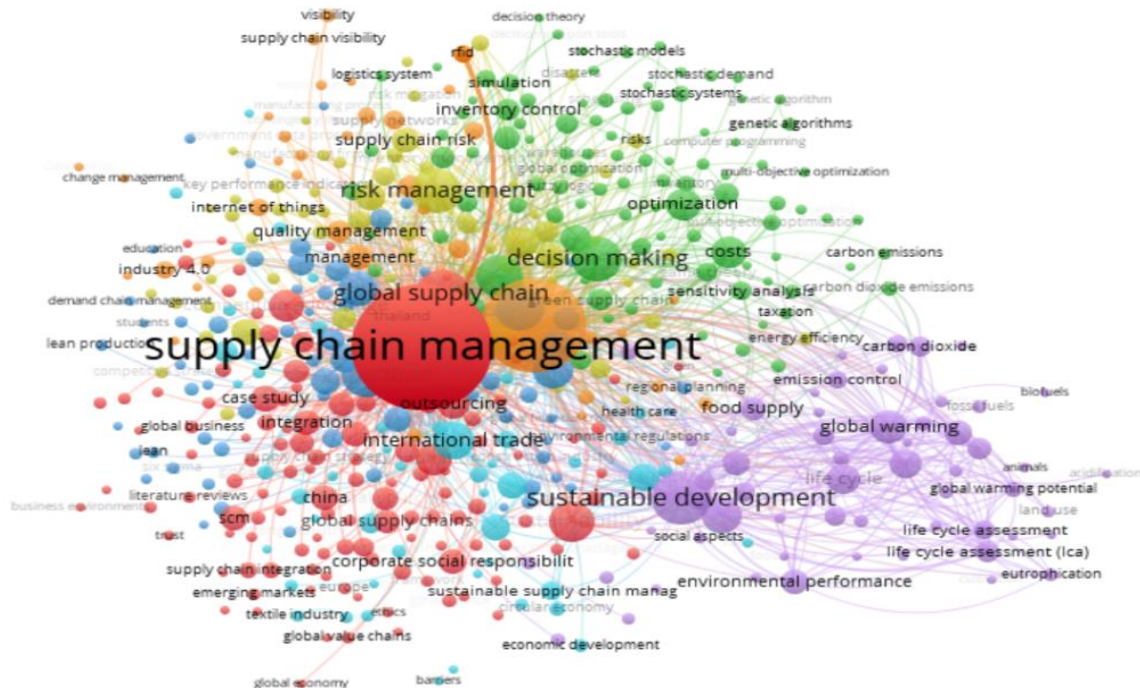
This initial result, however, was somewhat inaccurate due to the fact that many of the keywords were variations of global supply chain. For example, supply chains, global supply chain management, scm, global supply chain management, gscm, supply chain management, and many other variations. To gain a better and more accurate result of the keywords or topics in GSCM, such words were excluded from the list of keywords to be selected. Nevertheless, words such as green supply chain management, sustainable supply, supply framework, supply risk, and other similar words were left as part the keyword list, since they are an important indicator of topics in the GSCM field. After the placing the limitations on the keyword list, there are 478 words left. Figure B represents the co-occurrence of the keywords separated by different colored clusters.

Figure B. Keyword co-occurrence GSCM with limitations
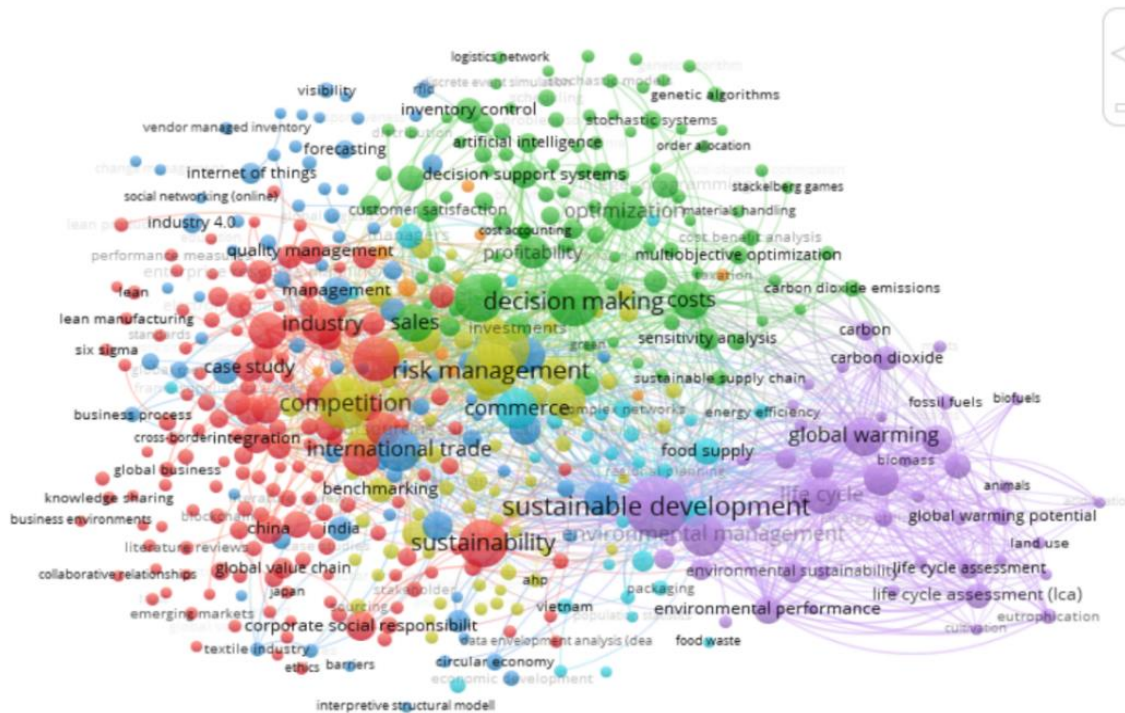
It is important to note that even though there are 7 clusters, they all have various links with one another. The connections between topics is due to the fact that research is adopting a global perspective, which lead to a "degree of globalness" between topics (Hernandez & Pedersen, 2017). Table 2 represents the number of words per cluster, the main topic of each cluster, and the color of each cluster.

Table 2. Keyword co-occurrence by cluster, topic, and color

Cluster Number	Items per Cluster	Main Topic (s)	Color
1	149	Sustainability	Red
2	99	Decision-Making Costs & Logistics	Green
3	77	International Trade	Dark Blue
4	67	Competition & Risk Management	Yellow
5	46	Sustainable Development	Purple
6	31	Commerce	Light Blue
7	9	Public Policy & Taxation	Orange

Topic Timeline

To understand what the most recent topics or trends in GSCM are, the keywords were analyzed using an overlay visualization. Figure C shows a timeline from 2013 to 2017 of the main topics studied in those years. The topics developed or researched in 2013-2014 are shown in the purple color, these would be the older topics. While the most recent trends in topics, 2016-2017, are displayed in light green and yellow. Cluster 5, sustainable development, and cluster 1, sustainability, are the most current topics both displayed in light green colors.

**Figure C.** Overlay visualization – Keyword timeline
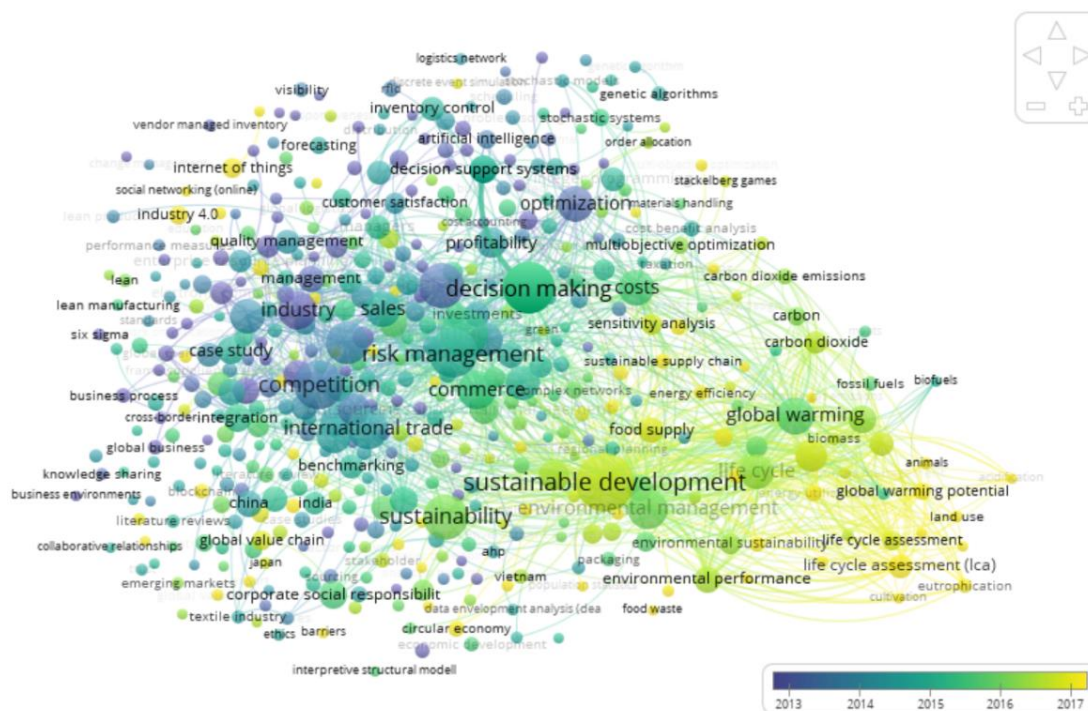
Sustainable development is a concept that was first defied in 1987 out of concern for the future of the earth and humankind in the face of increasingly visible depletion of resources. Still, it was not until 2007 that research in this topic spiked with the most amount of research on sustainable development occurring over the last three years. Sustainable development is associated with green supply chain management and strategic management, as well as with sustainability. It is often, however, that the two terms, sustainable development and sustainability, are interchangeable (Zemigala, 2019). However, sustainability is more commonly thought of as a long-term goal, while sustainable development refers to the different processes to achieve it, such as sustainable agriculture and forestry, production and consumption, technology transfer, education, etc. (UNESCO, 2019).

Sustainability can be defined as expanding the corporate perspective to one that considers environmental, social, and economic aspects. The concept was first introduced in 1987 along with sustainable development. However, it was not until 1992 that the first

paper on sustainability was published and since then the number of published papers has grown. A significant year for this topic was 2017 since it was in this year that the greatest number of manuscripts was published (33% of the total sample). Sustainability can also be related to life cycle analysis, and energy related technology. (Muñoz-Villamizar et al., 2019). In general, sustainable supply chain management has emerged in recognition of the strategic importance of achieving the firm's long-term performance and addressing sustainability issues within business capabilities. Even though both concepts, sustainability and sustainable development, were developed in the late 1980s, at the time they were not defined as an integral concept but simply provided the terms' definitions (Touboulic & Walker, 2014).

Clusters 1 and 5 (sustainable development and sustainability) have connections to all others, meaning that the new trends in GSCM also have connections to older topics. An example of this is cluster 5 since it has links with competitiveness, decision-making costs, and optimization (all three of those keywords are displayed in purple and dark green colors) as shown in Figure D.

Figure D. Keyword co-occurrence – Links between clusters
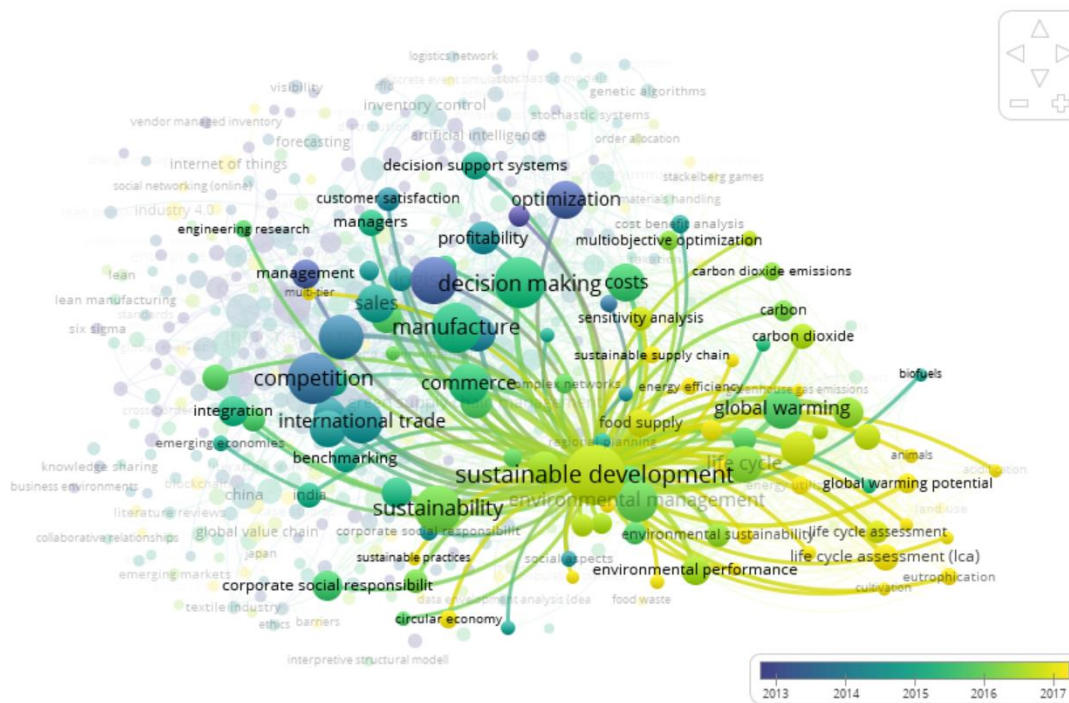
It is important to note that even though some clusters are made mostly of "old" topics, some of their keywords are connected to one or both of the most recent clusters, sustainability and sustainable development. Figure E is an example of this, circular economy (keyword belonging to cluster 3 – international trade) has connections to cluster 5 – sustainable development. This implies that, as new research occurs in current GSCM topics, clusters with older subjects are developing new information as well.

There are links between old and new topics because from an institutional base view each new topic will have influence over the old ones, and the new topics will have been adaptations from the old ones. Meaning all past and future topics of global supply chain will have various levels of collectivity with one another and will act as interrelated to each other (Borgatti & Li, 2009).

Figure E. Keyword co-occurrence – Link between keyword and cluster
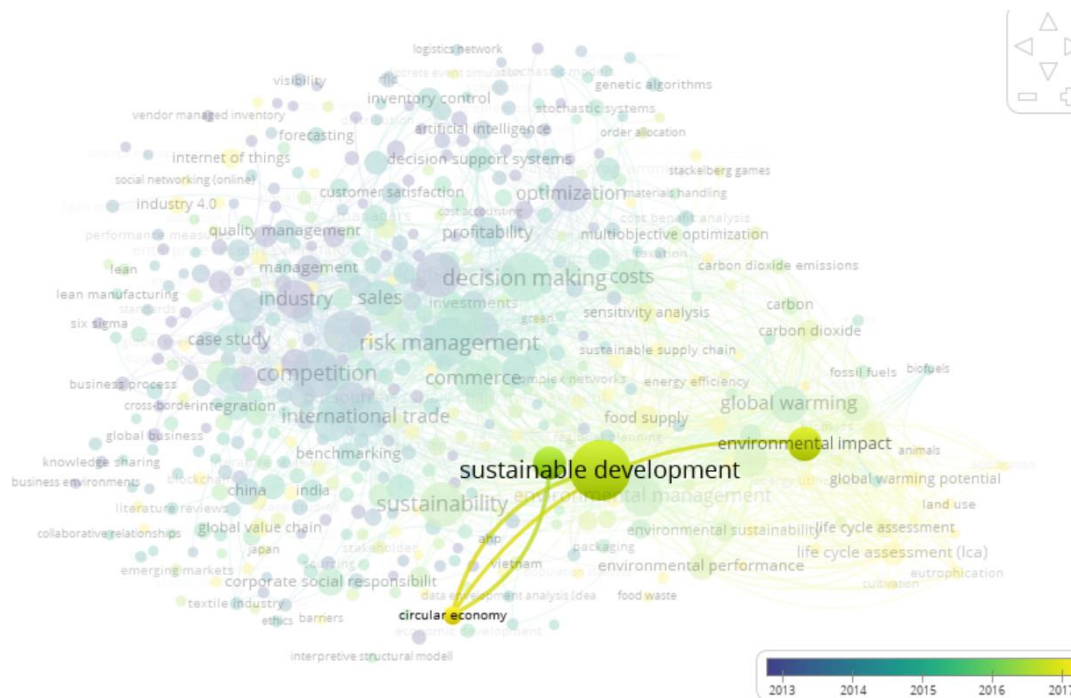

Topic Density

Even though development and sustainability are the two most recent topic clusters, they do not have as much quantity of research as some of the other cluster such as clusters 2 and 4, decision-making costs & logistics and competition & risk management. As shown in figure F, the density is more concentrated around older topics. This could mean that the research has been saturated in these older topics and is now moving towards more current ones.

Figure F. Topic Density
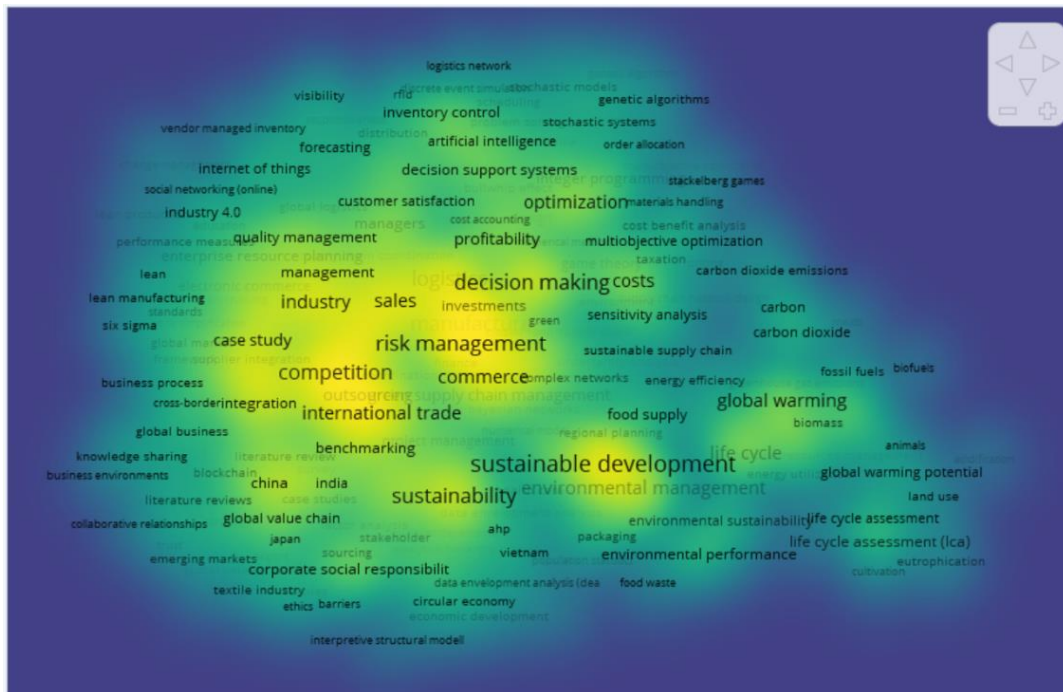
So, topics of sustainability, sustainable development, and others similar could have many under-explored aspects granting more growth opportunities. For example, there is a "certain gap around social and human dimensions of sustainability. Research has been primary focused on economic and environmental aspects, and has yet to address the full complexity of systemic sustainability research" (Touboulic & Walker, 2014). However, it is important to remember that due to the levels of connectivity, all topics of GSCM can be interrelated (Borgatti & Li, 2009); new opportunities can come about in topics that show a high density of research already.

## Academic Publication by Country

To have a better insight as to where the research on GSCM is being produced, a country overview analysis was done. Figure G represent the results of this analysis.

Figure G. Country Overview Analysis
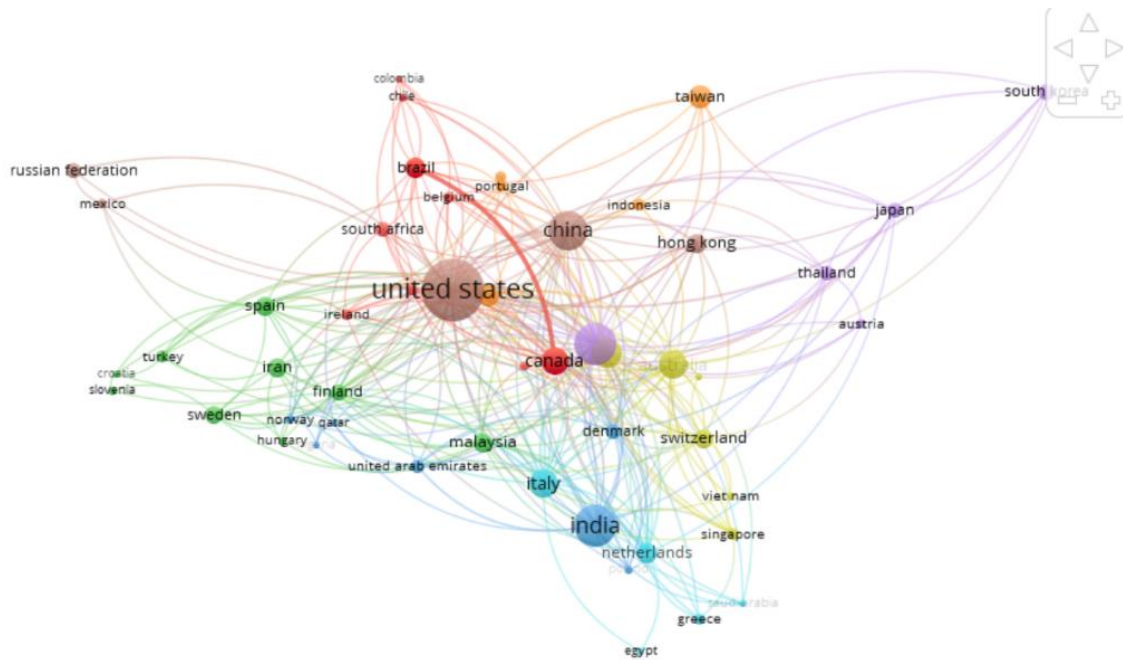
Most of the research is being done in the United States, the United Kingdom, India, Germany, and China as shown in figure H with the country density visualization. All five of the countries have strong links with one another as well as multiple other countries that do have not done as much research. However, articles affiliated with reseach centers from the US, the UK, and China make up more than 10% of the total articles on GSCM (Zemigala, 2019).

Figure H. Country Density
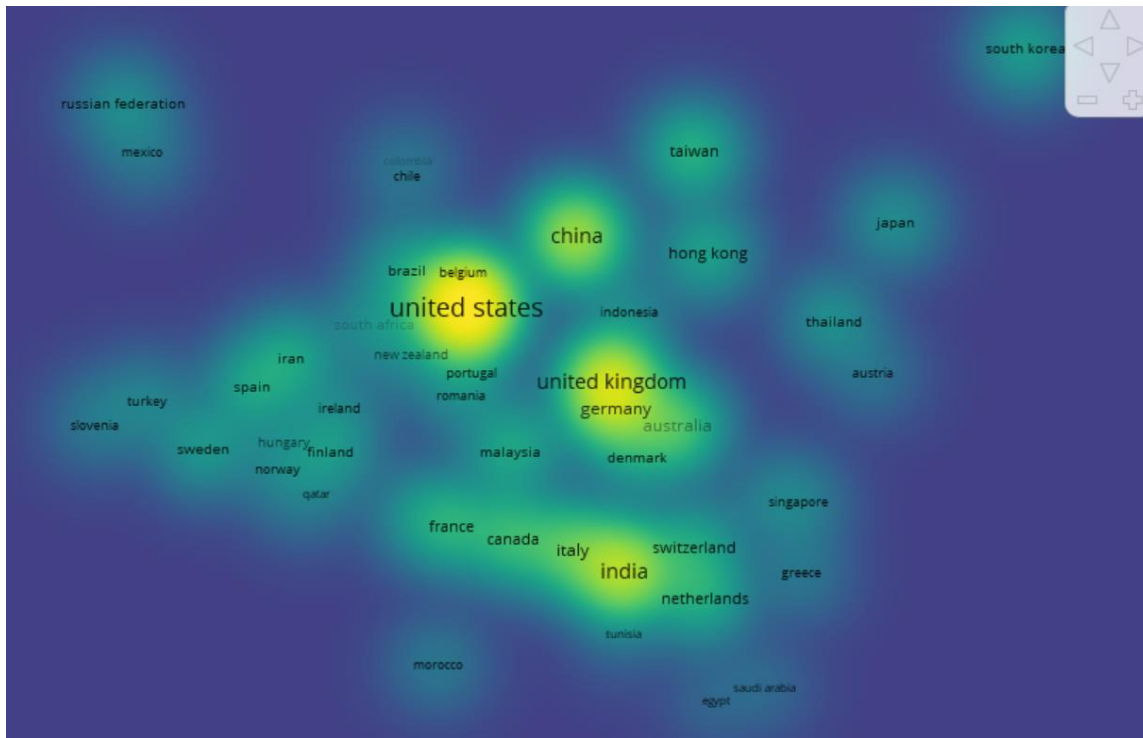
Countries such as Russia, Morocco, Bangladesh, Singapore, and Qatar are the ones that most recently started publishing research on GSCM as displayed in the figure I. Still, most of the countries shown in this figure have been researching GSCM within the last 6 to 5 years.

Figure I. Overlay Visualization – Country timeline
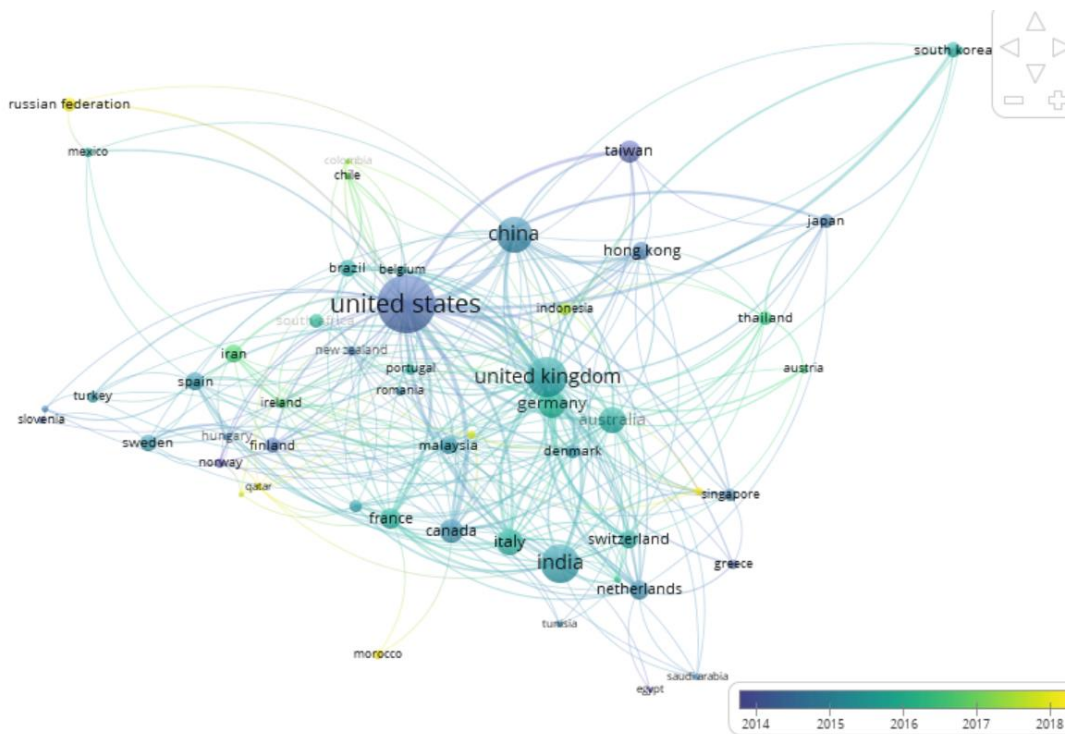
In regards to research on sustainable supply chain, most of it has been from the UK, China, Canada, and the general region of Europe (Zemigala, 2019). Research on sustainability has been from the US, Netherlands, and the UK (Muñoz-Villamizar et al., 2019).

Conclusion

In this paper three main questions were answered; what the main topics in global supply chain management are, what the trend within those topics is, and which countries are doing research on GSCM. This was done with the purpose of giving undergraduates a better understanding of the possibilities to continue with GSCM studies, narrowing down some of the topics within this general field, and understanding the field more clearly.

VOSviewer maps display the results to those questions with visual representations. It was determined that there are seven main topics in the field of supply chain management. These are sustainability, decision-making costs & logistics, international trade, competition & risk management, sustainable development, commerce, and public policy & taxation, with sustainability and sustainable development being the most current. All seven topics then have subtopics, and many topics are linked with one another. This topic connectivity is because new topics could have been adapted from older topics, and the new topics can have influence over the old ones making them all interrelated.

Most of the research has been done in the United States, the United Kingdom, China, India, and Germany. Articles affiliated with reseach centers from the US, the UK, and China make up more than 10% of the total articles on GSCM. Russia, Morocco, Bangladesh, Singapore, and Qatar are the countries that most reacantly started doing reseach on GSCM.

With these results in mind, I can be sure that the topic I decide to focus on during my master's studies will be relevant to the field. I can now also make an informed decision regarding which country and, therefore, which university to study in, depending on the countries performing the most research on the field of global supply chain management.

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