Academic contributions in supply chain management: A university analysis

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Abstract

The studies related to supply chain management have experienced a huge growth during the last 27 years. So, it seems necessary to investigate the diverse dimensions of this growth to understand better the existing trends also the possible patterns. The purpose of this study is to analyze the leading and productive worldwide universities. To do so the universities are studied globally, periodically and in some select significant journals in supply chain management area. The data of Web of Science is analyzed between 1990 to 2017. The results show that although in general American universities have the highest share among others, but Asian universities and especially Chinese ones start a rapid growth and it is predictable that in future they become leaders. Besides, European universities also have the next position according to the number of publications.

Keywords: Supply chain management, bibliometrics, Web of Science, VOS viewer, universities

1. Introduction

Since Oliver & Webber (1982) introduced the concept of supply chain management (SCM), many scholars work on this discipline and its different dimensions. These studies are dedicated to diverse aspects throughout a spectrum from studying the importance of each element of SCM (Frohlich & Westbrook, 2001) to present an appropriate framework for SCM and its performance measurement (Lambert & Cooper, 2000; Gunasekaran et al. 2004) to evaluate its impact on the organizational performance (Li et al, 2006).

Due to this level of investigation and based on an increasing number of the publications in this area, it seems essential to analyze the details about the papers and the existing trends in this area and to understand about the leading universities (Cancino et al. 2017a). Although there are some reviews on SCM by using diverse methods, none of them explain about the issue of leading universities.

In this study we analyze the top leading universities all around the world based on their influence and productivity from different point of views: their global positions, a comparative study about the universities in terms of various indicators, periodic study of the universities and the performance of the universities in several journals specialized in SCM. So, to achieve to these results we use bibliometric analysis (Broadus, 1987; Pritchard, 1969) in SCM research between 1990 and 2017. Web of Science (WoS) as a comprehensive database was selected to begin the process of search. All the obtained data are the articles that published in academic journals. The search process starts at the same time with the keywords that are: "supply chain" or "supply chain management" or "SCM" and some specialized journals of the area such as: Supply Chain Management: an International Journal, Journal of Supply Chain Management, International Journal of Information Systems and Supply Chain Management, Journal of Humanitarian Logistics and Supply Chain Management, Journal of Transport and Supply Chain Management and Operations and Supply Chain Management: an International Journal. The next step is excluding the papers of 2018, then filtering by 16 categories of WoS related to the area and finally filter those results that are: article, letter, note and review based on the classification of WoS.

The results of the study show that according to the number of the leading universities, American universities have the highest share, almost half of the top 50 universities. After them Chinese universities

are obtaining the second position with around 20% of the leading universities.

The rest of the article is as follows. Literature review section analyze the related literature to SCM research area and bibliometric methods. Bibliometric methods section reviews the bibliometric methods. Then in results section, the universities analyze comprehensively globally, periodically and in some individual journals. Finally, the conclusions section is dedicated to report the findings and contribution of this study.

2. Literature review

Bibliometric analysis based on its capability to prepare diverse data, as an efficient method is used in literature in many disciplines. To understand this concept and its several aspects thoroughly, many scholars try to define it based on their opinion. Pritchard (1969), defined it as "to shed light on the processes of written communication and of the nature and course of development of a discipline, by means of counting and analyzing the various facets of written communication … the application of mathematics and statistical methods to books and other media of communication" but according to Broadus (1987), bibliometrics is "the quantitative study of physical published units, or of bibliographic units, or of surrogates of either".

There are some samples that apply bibliometric method to study the ranking of the universities all over the world not only in diverse disciplines of economic and management, but through some works that analyze the trend of different journals during the time. Cancino et al. (2017a) investigate about the universities that are most productive and influential in innovation research. Additionally, Cancino et al. (2017b) analyze the performance of Computers and Industrial Engineering during 40 years from many aspects including trend of universities. In another example, Martínez-López et al. (2018) with the motivation of the fiftieth year of European Journal of Marketing, do a bibliometric analysis that one of part of that work belongs to the universities. Likewise, two very same works also via a bibliometric study analyze the situation of the universities respectively in Technovation and Information Sciences (Merino et al. 2006; Merigó et al. 2018).

Based on this reality that although there are some related bibliometric works on SCM, there is no specialized study on the trend of the leading universities in this research area. Via this work we try to analyze the universities not only in the scope of the USA or Europe, but we have a worldwide opinion to investigate them.

3. Bibliometric methods

There are several definitions that can explain bibliometrics concept. According to Broadus (1987), bibliometrics is "the quantitative study of physical published units, or of bibliographic units, or of surrogates of either". To this end, the papers could be analyzed based on different criterion such as (publications, citations and h-index) (Cancino et al. 2017a). During the process of literature review, there are many examples that have focused on one of these criteria. Chao et al. (2007), Li et al. (2009) and Fahimnia et al. (2015), have established their works based on number of publications. Whilst, there are some studies that focus on citation analysis (Xie et al. 2008; Podsakoff et al. 2008). Besides, since Hirsch (2005) introduced h-index as an indicator to combine the number of articles and citations, it becomes a popular indicator to classify the papers (Alonso et al. 2009). This indicator expresses that "if a set of articles have an h-index of 10; it means that ten studies of the set have received ten or more citations" (Merigó et al. 2016). This study is based on the number of publications.

The data gathering process was done on April 2018. The selected keywords with the purpose of covering as much publications possible in the area are "supply chain" or "supply chain management" or "SCM" from one side and the other constraint toward a high quality search is including the results of some related journals from the other side such as: Supply Chain Management: an International Journal, Journal of Supply Chain Management, International Journal of Information Systems and Supply Chain Management, Journal of Humanitarian Logistics and Supply Chain Management, Journal of Transport and Supply Chain Management and Operations and Supply Chain Management: an International Journal between 1990 to 2017.

It is important to say that according to the obtained results, some modifications seem necessary.

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For example, the authors instead of four countries "England", "Wales", "Scotland" and "North Ireland" just considered one country as UK. The same story exists for "China" and "Hong Kong" that the country that appears in a table as China is a combination of both.

VOS viewer is a powerful software that is used to report visually the countries of the study through bibliographic coupling, citations and co-authorship analysis (Van Eck & Waltman 2010). Bibliographic strength between two papers is defined as the number of common references cited by both papers (Morris 2005). Besides, "co-authorship analysis represents the volume of publications of a set of variables and how they are connected between them" (Merigó et al. 2016).

With the aim of presenting the obtained results in a graphical form, VOS viewer generates visual reports. Figure 1 to 20 represent the graphics that belong to the most influential journals in SCM research area, global trend of the universities, their periodic trend and their situation in the selected individual journals. Note that in the literature, there is other software that could be used for mapping the bibliographical material (Cobo et al. 2011; 2012).

3. Results

3.1. Leading universities in SCM research

During the period of the analysis there were a plenty of universities that publish papers in SCM area. It is possible to rank the universities based on different indicators. Table 1 gives a comprehensive report around the top 50 universities in SCM research with a global overview. It is noticeable that the ranking is based on h-index. To enrich this table, some other data are also available in this table. Besides the total publications, total citation and h-index of the leading countries, these indicators are calculated also in top 10 journals of the area to understand the portion of each university in them. Moreover, the ranking of each university based on QS ranking and Shanghai ranking is also reported. The benefit of ranking analysis is giving a comparative idea of the position of the universities in SCM area against general position.

As can be seen in Table 1, most of the universities are American so that as an example 6 of 10 top universities are American. However, it is noteworthy to say that the first leading university is Hong Kong Polytechnic University that is a Chinese university. From top 50 universities in this area, 46% of them are American and 18% are Chinese. Although Cardiff University is the third university in this list, but it is important to say that among all, only 8% of the universities are British.

Although the ranking is based on h-index and in this item the difference between the first and second university is not that high, but in terms of publication it is important to say that, Hong Kong Polytechnic University has published almost 2 times more than Michigan State University as the second top university. Besides, there are the other examples that are high in number of publications and not in h-index. One of these universities is Indian Institute of Technology IIT that according to h-index is the 19th university in the ranking bat based on the number of publications is the 4th one.

The other interesting item to analyze is the situation of each universities in the top 10 journals of this discipline. The purpose of this analysis is to know on what level the top universities publish in top journals in SCM research. With a quick glance the trend of American universities is not completely the same as the global overview. Based on the Table 1, there are some of them which don't have any publication among these top journals. From the other side, as an example Arizona State University has published almost all his publications (99%) in these top 10 journals. On the other hand, although Hong Kong Polytechnic University has published less than 50% of his articles in the top 10 journals, but the portion of his h-index from these journals is quite acceptable (around 71%).

As a supportive information and with the help of VOS viewer software, Figure 1 represents the bibliographic coupling of the universities with a threshold of 134.

3.2. Periodical analysis of leading universities

The purpose of this section is to analyze the trend of each university during the time to study better and more profound their position from the first year till the last year of the analysis. To this end, based on this fact that publishing the papers began in 1990, we consider three periods: 1990 to 1999, 2000 to 2009 and 2010 to 2017.

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During 1990-1999, American universities have the highest share of the top universities. It is interesting to know that in this period, Hong Kong Polytechnic University that is globally on the top of the list of leading universities even is not among the top 40 universities.

The analysis of the leading universities between 2000 and 2009 also shows that, although again most of the universities are American, but some Asian universities were entered among the leading universities such that among top ten, four of them are Asian.

The significant point of the period between 2010 and 2017 is the presence of three Asian universities as top three universities of this classification. This occurrence and the trend of last periods can express that during the next years the domination of Asian universities will be more and more. Additionally, the number of American universities is still high but in comparison with the last periods decreased and are substituted by some universities from Asia and Europe. In this period almost half of the universities are Asian (45%) however this percentage for the last period was 27%.

3.3. Individual journal analysis of the leading universities

One of the interesting analysis that could shed light to understand the position and the behavior of the universities in SCM research area is analyzing them in the important journals of the field.

To this end, we analyze the leading universities in two professional journals of the field: Supply Chain Management: An International Journal and Journal of Supply Chain Management. In Supply Chain Management: An International Journal most of the universities are European and among them there are a lot of British universities, around half of them. The other interesting item about this list is the presence of some Australian universities that have a good share. In return for the Journal of Supply Chain Management 24 universities from 30 are American and it is 80% and the other 6 universities are European.

The next two journals that are analyzed are International Journal of Production Economics and International Journal of Production Research. The reason of choosing these journals is that because they are on the top of the list of most publishing journals

in SCM area. For the first journal it is noteworthy to say that the distribution of Chinese and European is almost the same and the small number of American universities.

Table 1 - Most influential universities in SCM				
R	University	COU	H	TC	TP
1	Hong Kong Polytechnic U.	CHN	59	14214	504
2	Michigan State U.	USA	54	11697	286
3	Cardiff U.	GBR	50	8155	236
4	U. North Carolina	USA	47	9678	275
5	Arizona State U.	USA	46	8975	224
6	Pennsylvania State U.	USA	40	6646	205
7	Chinese Academy of Sciences	CHN	40	4580	150
8	Stanford U.	USA	40	9149	98
9	Georgia Institute of Technology	USA	38	6647	145
10	U. Hong Kong	CHN	37	5246	198
11	Carnegie Mellon U.	USA	37	4983	118
12	U. Minnesota Twin Cities	USA	37	4205	115
13	U. Tennessee Knoxville	USA	36	4833	167
14	Cranfield U.	GBR	36	4896	165
15	Indian Institute of Technology IIT	IND	35	5035	274
16	U. California Berkeley	USA	35	4807	124
17	U. Maryland College Park	USA	35	4459	109
18	U. Southern Denmark	DNK	34	4031	151
19	Ohio State U.	USA	34	5170	139
20	MIT	USA	34	3924	127
21	Chinese U. Hong Kong	CHN	34	4066	104
22	Erasmus U. Rotterdam	NLD	33	4100	103
23	U. Texas Austin	USA	33	3417	89
24	Insead Business School	FRA	33	4794	87
25	National U. Singapore	SGP	32	4197	149
26	Texas A&M U. College Station	USA	32	3753	147
27	U. Manchester	GBR	32	3483	123
28	Auburn U.	USA	32	3413	113
29	U. Cambridge	GBR	32	2991	111
30	U. Texas Dallas	USA	32	3051	109
31	City U. Hong Kong	CHN	31	3304	183
32	U. Science and Technology of China	CHN	31	3252	140
33	Hong Kong U. Science and Technology	CHN	31	3295	125
34	Shanghai Jiao Tong U.	CHN	30	2998	142
35	U. Michigan	USA	30	4093	140
36	U. Montreal	CAN	30	3154	130
37	U. Florida	USA	29	2912	128
38	Iowa State U.	USA	28	2816	104
39	ETH Zurich	CHE	28	2334	100
40	Tsinghua U.	CHN	27	2389	144
41	Polytechnic U. Milan	ITA	27	2471	120
42	U. Arkansas Fayetteville	USA	27	2430	117
43	Eindhoven U. Technology	NLD	27	2938	103
44	Linkoping U.	SWE	27	2499	87
45	Nanyang Technological U.	SGP	26	2888	128
46	Aalto U.	FIN	26	2233	112
47	U. Padua	ITA	26	2204	88
48	North Carolina State U.	USA	26	3435	84
49	Amirkabir U. Technology	IRN	25	2210	133
50	Purdue U.	USA	25	3310	123

Abbreviations: R = Rank; COU = Country; HI = h-index (in SCM); TP and TC = total number of publications and citations (in SCM).

In this journal, Hong Kong Polytechnic University is a leader and the difference of his publications with the second and third universities is meaningful so that

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for example this university publish more than three times in comparison with the third university that is Polytechnic University of Milan. In International Journal of Production Research, the dispersion of the universities is almost the same with this difference that the Chinese universities are not the only Asian universities and some Indian and Iranian universities also exist among them. Besides that, the top three universities in this list are Asian. Although in this journal, Hong Kong Polytechnic University is the first based on the number of publication, but University of Hong Kong has a better performance in terms of total citation and *h*-index.

In Journal of Cleaner Production, there is only one American university among the top 30 universities and the rest of them are European and Asian universities. Also, there are two Brazilian universities that are consecutively 8th and 11th. In the list of Computers and Industrial Engineering 26 of 30 universities are Asian following by two Canadian universities, one American and one French. Among Asian universities, although Indian Institute of Technology IIT is the first university and publishes more than two times than the second university but in terms of number of universities, Chinese and Iranian Universities have a better position.
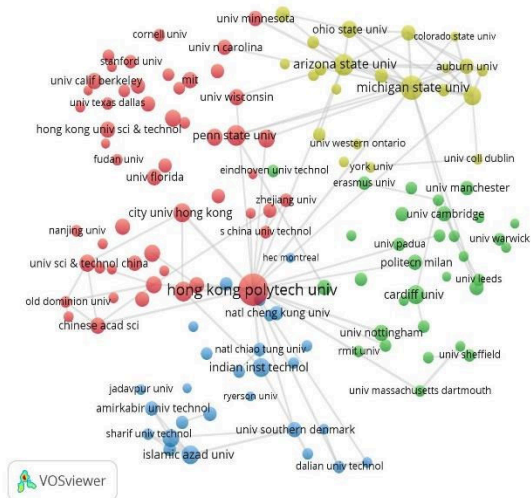

Fig 1. Bibliographic coupling of the universities in SCM research- threshold: 134, connections: 100

4. Conclusions

This study provides a comprehensive bibliometric analysis of the leading universities of all the world in supply chain management research area between 1990 and 2017. With a purpose of obtaining a comprehensive understanding about the field, total number of publications, total citations and *h*-index are analyzed.

Other results of this analysis belong to the universities' share in top 10 journals of the area. Although American universities have the highest share in comparison with the others, but the obtained results of top 10 journals are not in compliance with the global results. As an example, there are some universities that have even zero publications in top journals but vice versa as an example, Arizona State University publishes 99% of his papers in these 10 top journals. in addition, Hong Kong Polytechnic University as a leader of the leading universities publishes less than half of his papers among top 10 journals.

First, analysis focuses on a global perspective to understand the trend of the publications during the years of the study. Among the leading universities in this classification Hong Kong Polytechnic University is the first university of the list but based on the results, American universities have the most share among the others and after them Chinese universities have the next position in terms of total publications. However, the British universities have a low share in comparison with the others.

Then, our study focuses on periodical analysis of the universities' positions where during three periods, the universities are analyzed. A general analysis around these periods expresses that in the very first period of study, American universities are indisputably leaders of the universities which publish papers in SCM research but year by year this trend changes so that during the years of last period most of the universities are Asian and especially Chinese. From this trend it is possible to conclude that the future of the leading universities in this area, belongs to Asian universities.

Finally, the obtained results of the universities in some individual journals are studied. The analysis demonstrates that in some journals or group of journals American universities have the highest share, but in some of theme Chinese universities seize the top position in terms of number of the universities. There are two groups of journals

(Manufacturing Journals and other SCM Journals) that consecutively the top universities in them belong to Iran and South Africa.

References

Alonso, S., Cabrerizo, F. J., Herrera-Viedma, E., & Herrera, F. (2009). H-index: A review focused on its variants, computation, and standarization for different scientific fields. *Journal of Informetrics*, 3, 273–289.

Broadus, R. (1987). Toward a definition of "bibliometrics". *Scientometrics*, 12(5-6), 373-379.

Cancino, C. A., Merigó, J. M., & Coronado, F. C. (2017a). A bibliometric analysis of leading universities in innovation research. *Journal of Innovation & Knowledge*, 2(3), 106-124.

Cancino, C. A., Merigó, J. M., Coronado, F. C., Dessouky, Y., & Dessouky, M. (2017b). Forty years of Computers & Industrial Engineering: A bibliometric analysis. *Computers & Industrial Engineering*, 113, 614-629.

Chao, C. C., Yang, J. M., & Jen, W. Y. (2007). Determining technology trends and forecasts of RFID by a historical review and bibliometric analysis from 1991 to 2005. *Technovation*, 27(5), 268-279.

Cobo, M. J., Lopez-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). Science mapping software tools: Review, analysis and cooperative study among tools. *Journal of the American Society for Information Science and Technology*, 62, 1382–1402.

Cobo, M. J., Lopez-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2012). SciMAT: A new science mapping analysis software tool. *Journal of the American Society for Information Science and Technology*, 63, 1609–1630.

Fahimnia, B., Sarkis, J., & Davarzani, H. (2015). Green supply chain management: A review and bibliometric analysis. *International Journal of Production Economics*, 162, 101-114.

Frohlich, M. T., & Westbrook, R. (2001). Arcs of integration: an international study of supply chain strategies. *Journal of Operations Management*, 19(2), 185-200.

Gunasekaran, A., Patel, C., & Mc Gaughey, R. E. (2004). A framework for supply chain performance measurement. *International Journal of Production Economics*, 87(3), 333-347.

Lambert, D. M., & Cooper, M. C. (2000). Issues in supply chain management. *Industrial Marketing Management*, 29(1), 65-83.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T. S., & Rao, S. S. (2006). The impact of supply chain management practices on competitive advantage and organizational performance. *Omega*, 34(2), 107-124.

Li, L. L., Ding, G., Feng, N., Wang, M. H., & Ho, Y. S. (2009). Global stem cell research trend: Bibliometric analysis as a tool for mapping of trends from 1991 to 2006. *Scientometrics*, 80(1), 39-58.

Martínez-López, F. J., Merigó, J. M., Valenzuela-Fernández, L., & Nicolás, C. (2018). Fifty years of the European Journal of Marketing: a bibliometric analysis. *European Journal of Marketing*, 52(1/2), 439-468.

Merigó, J. M., Cancino, C. A., Coronado, F., & Urbano, D. (2016). Academic research in innovation: a country analysis. *Scientometrics*, 108(2), 559-593.

Merigó, J. M., Pedrycz, W., Weber, R., & de la Sotta, C. (2018). Fifty years of Information Sciences: A bibliometric overview. *Information Sciences*, 432, 245-268.

Merino, M. T. G., Do Carmo, M. L. P., & Álvarez, M. V. S. (2006). 25 Years of Technovation: Characterisation and evolution of the journal. *Technovation*, 26(12), 1303-1316.

Morris, S. A. (2005). Manifestation of emerging specialties in journal literature: A growth model of papers, references, exemplars, bibliographic coupling, co citation, and clustering coefficient distribution. *Journal of the Association for Information Science and Technology*, 56(12), 1250-1273.

Oliver, R. K., & Webber, M. D. (1982). Supply-chain management: logistics catches up with strategy. *Outlook*, 5(1), 42-47.

Podsakoff, P. M., MacKenzie, S. B., Podsakoff, N. P., & Bachrach, D. G. (2008). Scholarly influence in the field of management: A bibliometric analysis of the determinants of university and author impact in the management literature in the past quarter century. *Journal of Management*, 34(4), 641-720.

Pritchard, A. (1969). Statistical bibliography or bibliometrics. *Journal of Documentation*, 25(4), 348-349.

Van Eck, N. J., & Waltman, L. (2010). Software survey: VOS viewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523-538.

Xie, S., Zhang, J., & Ho, Y. S. (2008). Assessment of world aerosol research trends by bibliometric analysis. *Scientometrics*, 77(1), 113-130.

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