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# GREEN SUPPLY CHAIN MANAGEMENT PRACTICES: A LITERATURE REVIEW

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### Abstract:

Evidence that green supply chain management is one of the best practices contributing to economic and environmental performance has been acknowledged in the literature. The purpose of this study is to review 100 articles on green supply chain management practices from the year 2000 until the year 2019. A content analysis methodology was employed to classify the articles. Approximately 100 articles on green supply chain management practices were analysed using SPSS 22 to determine the frequency and percentage in the year of study, dimensions of green supply chain management practices, geographical area, and types of methodology. The results show that numerous articles were published in the year 2015, green purchasing is the most common dimension discussed by researchers, the highest publication is in Asia, and the most common research method is empirical (survey/cross-sectional) approach. Supply Chain Management is the top journal publishing articles on green supply chain management practices. The originality of this paper is to systematically review 100 articles on green supply chain management practices using content analysis methodology, which has been overlooked by previous researches. Future studies may analyse types of theory, objectives, and the findings of different articles to get a better picture of green supply chain management practices trend.

### Keywords:

Supply Chain Management, Green Supply Chain Management Practices, Systematic Literature Review, Content Analysis.

## Introduction

The environmental issues are increasingly outstanding and deserve attention by the manufacturing sector because the world will be facing an extreme climate change in the year

2050 if the industries are still ignorant about the global environment (Future of Life Institute, 2019). Due to global climate change and global warming, the Paris agreement has been formed at the end of December 2015, which is under the United Nations Framework Convention in order to reduce the releases of greenhouse gasses and carbon emissions (Robbin, 2016). Since the Industrial Revolution, the world is facing global warming in which carbon dioxide has risen approximately more than 35% (Sharma and Ghandi, 2016). In the present scenario, supply chain activities involve multifaceted process, which includes all activities and movement of raw materials to finished products contributing to environmental degradation (Tachizawa et al., 2015) and 87% of customers claim that manufacturers should be blamed due to environmental negligence of their suppliers (Wong et al., 2012). The growing concern on the environment in this century leads to more than 300,000 companies obtaining ISO 14001, applying the environmental management system, and employing environmental practices (International Organization for Standardization, 2018). In the supply chain context, green supply chain management practices become one of the best practices to protect the environment. The best scenario among firms implementing green supply chain management practices is that all members in the supply chain can improve their financial performance in terms of profit and become more environmentally friendly (Zhu et al., 2019).

In the production and operations management area, the number of literatures regarding green supply chain management practices is increasing in recent years and becoming popular among scholars (Singh & Trivedi, 2016). Since 1995, Sarkis highlighted that green supply chain management practices can be a strategy to improve the environmental performance of a company and it was continuously investigated by scholars such as Carters and Rogers (2008), Chen et al. (2010), Xu (2011), Lin & Sheu (2012), Hajikhani et al. (2012), Savita et al. (2012), Rozar (2013), Meera & Chitramani (2014), Su et al. (2014), Fahimnia et al. (2015), Singh and Trivedi (2016), and Famiyeh et al. (2018).

Previous scholars have surveyed various types of literature review articles on green supply chain; for instance, Balon (2019), Sharma and Ghandi (2016), Singh and Trivedi (2016), Fahimnia et al. (2015), Gurtu et al. (2015), Malviya and Kant (2015), Kumar and Chandrakar (2012), Wu et al. (2012), Sarkis et al. (2011), and Srivastava (2007). These articles have reviewed various concepts of green supply chain management through bibliometric analysis, meta-analytic review, and systematic literature review. Therefore, the originality of this paper is to review green supply chain management practices using content analysis methodology by following the stages from Ibrahim et al. (2015).

Due to the scholarly interest in the area of green supply chain management practices, as highlighted above, the objective of this study is to review over 100 research articles on green supply chain management practices from the year 2000 until 2019. This paper critically reviewed articles based on year of study, dimensions of green supply chain management practices, geographical area (continent), types of methodology, and types of journals.

### **Literature Review of Green Supply Chain Management Practices**

In the 1990s, people started to look at the concept of environmental quality. In response to save the environment, Beamon (1999) transformed the traditional supply chain into a green supply chain in order to reduce waste and pollution and minimise the use of resources. The design of the green supply chain was developed by extending some activities such as recycling, remanufacturing, and reusing into the traditional supply chain design. In the 2000s, the researchers are giving interest to the green supply chain concept and uncover how to introduce the green supply chain in a practical way. Therefore, academicians start exploring how to manage the green supply chain and introduce the concept of green supply chain management

to the global practice (Zhu et al., 2008; Baojuan, 2008; Srivastava, 2007; Zhu & Sarkis, 2004; Kogg, 2003; Zsidisin & Siferd, 2001). According to Hajikhani et al. (2012) and Boujujan (2008), green supply chain management covers activities such as green designing, green production, green package, green marketing, and green recycling. Nowadays, consumers are demanding products designed to overcome the issue of waste disposal (Dowie, 1994).

The growth of green supply chain management literature has moved into green supply chain management practices. According to Diabat and Govindan (2011), green supply chain management is now considered as a green practice, which consistent in sustaining environmental performance at all management levels and the entire supply chain. Groznic and Erjavec (2012) highlighted that the ‘green practice’ is related to the green economy, whereby it aims to improve three main things, namely improving social equity, reducing environmental risk, and improving the ecological problem. As mentioned by Field and Sroufe (2007), green supply chain management practices are being identified by the business management team to support the high demand of the environmentally friendly product in order to improve environmental performance and reduce cost. The practices also play an important role to reduce environmental risk, increase the efficiency of ecology, and improve the economic performance of the organisation (Kumar & Chandrakar, 2012; Zhu & Sarkis, 2004). There are various definitions of green supply chain management practices as shown in Table 1.

**Table 1: Definitions Of Green Supply Chain Management (GSCM) Practices**

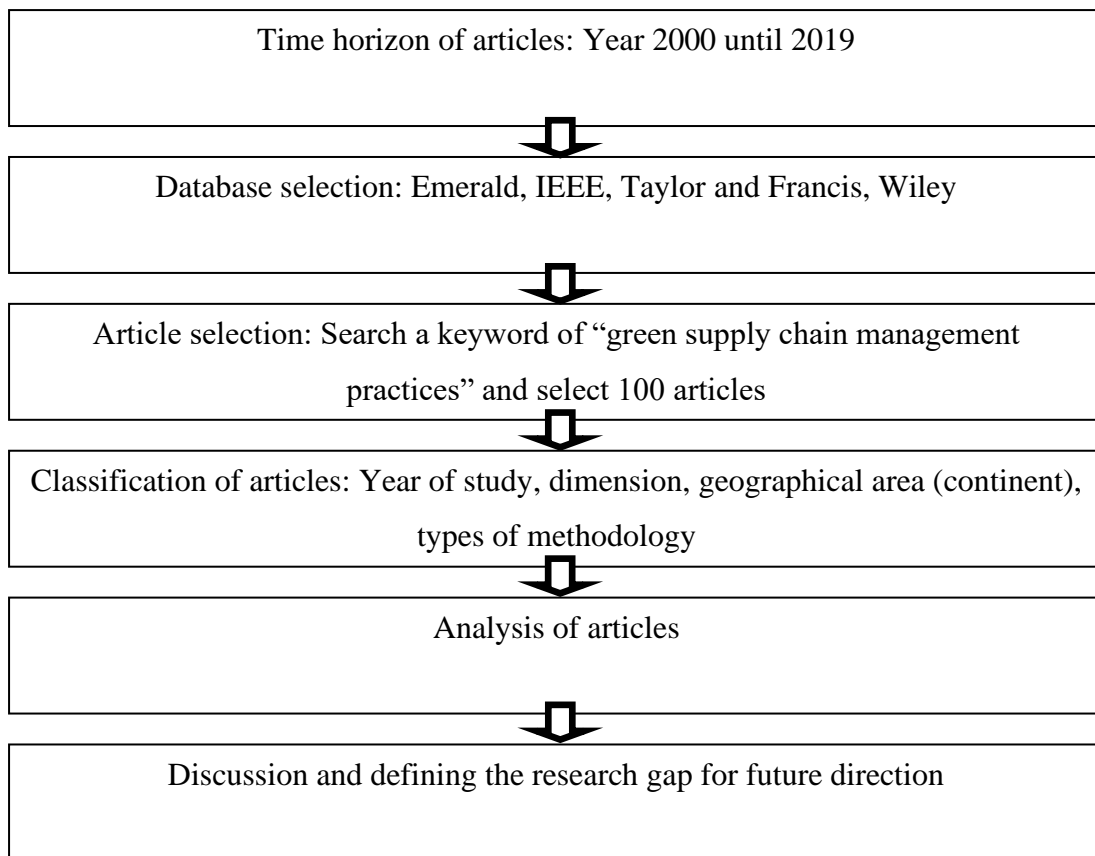
Author(s) Year	Definition	Journal
Balon (2019)	Green supply chain management (GSCM) practices can be defined as the practices that concern on environmental aspects among industry, organisation, and economy, compared to the conventional supply chain that ignores the environmental aspects.	<i>Business Strategy and Development</i>
Laari et al. (2018)	GSCM practices have risen as common-sense implies by which to seek an environmentally focused strategy and to merge natural management with supply chain management.	<i>Business Strategy and the Environment</i>
Gurtu et al. (2015)	GSCM practices are defined as a practice to minimise the negative impact of supply chain on the environment.	<i>Management Research Review</i>
Chien (2014)	GSCM practices are practices that competent to increase sustainable performance.	<i>International Journal of Environmental Monitoring and Protection</i>
Green Jr. et al. (2012)	GSCM practices are defined as a contribution to the organisation by reducing air emission, reducing solid waste, and improving environmental performance.	<i>Supply Chain Management: An International Journal</i>
Kumar and Chandrakar (2012)	GSCM practices are a cooperative proactive environment, green strategic procurement, and supply chain management approach to develop suitable and correct capabilities for managing a green supply chain.	<i>International Journal of Engineering and Advanced Technology (IJEAT)</i>

<b>Author(s) Year</b>	<b>Definition</b>	<b>Journal</b>
Wang and Lin (2010)	GSCM practices are defined as the environmental management of suppliers, which includes principles and govern suppliers in order to evaluate the suppliers' performance and improve the green product.	<i>International Engineering and Engineering Management</i>
Yu et al. (2008)	GSCM practices are described based on how the company uses energy resources in the supply chain activity by improving environmental health and optimal energy use.	<i>In Service Operations and Logistics, and Informatics</i>
Field and Sroufe (2007)	GSCM practices are identified by the business management team to support the high demand for environmentally friendly products in order to improve environmental performance and reduce costs.	<i>International Journal of Production Research</i>
Chien and Shih (2007)	GSCM practices can be defined as a practice in the supply chain with the aim of meeting environmental protection and achieving international expectations.	<i>International Journal of Environmental Science, and Technology</i>
Rao (2002)	GSCM practices are a practice of greening the supply chain in order to achieve zero waste, continuous improvement, customer focus, and employees' empowerment.	<i>International Journal of Operations &amp; Production Management</i>

From the practitioners' viewpoint, Baresel-Bofinger et al. (2012) considered green supply chain management practices as environmentally conscious in all supply chain's stages including purchasing activity, production, managing material, logistics (inbound and outbound), and reverse logistics. From supply chain side and operations point of view, Singh (2010) described green supply chain management practices as environmentally conscious for suppliers, manufacturers, retailers, and customers (supply chain members) to save cost, reduce the delivery time, and increase the efficiency of production and become a strategy to sustain a competitive advantage for a company. The academicians believe that the practices are a strategic direction for internal environmental management, and integration of principles in supply chain activity on environmental management, specifically in the manufacturing process, supply activity, logistic activity, packaging, distribution, and delivering the final goods (Savita et al., 2012).

### **Review of Methodology**

A literature review was described by Meredith (1993) as a summary of the present literature by ascertaining the objective of research, trends, the scope of research, and issues from past literature. This study employed a content analysis methodology to review 80 articles on green supply chain management practices. Content analysis is a systematic research method of reviewing and analysing articles in a selected area. The stages of content analysis were adapted from Ibrahim et al. (2015) in which six stages of content analysis were employed to review articles on green supply chain management practices. Based on the methodology adapted from Ibrahim et al. (2015), Figure 1 presents the stages of content analysis for this study.



**Figure 1: Stages of Content Analysis for Literature Review**

(Source: Ibrahim et al., 2015)

To avoid outdated articles on green supply chain management practices, in the first stage, the study sets a time horizon of 19 years, beginning in the year 2000 until the year 2019. The second stage of content analysis is database selection. There are four main databases involved in selecting the articles from the year 2000 until the year 2019, namely Emerald, IEEE, Taylor and Francis, and Wiley. Consistent with the stages employed by Ibrahim et al. (2015), the third stage of content analysis is article selection. The article selection stage begins by searching a keyword of “green supply chain management practices” and continues by selecting 100 articles. The fourth stage was also employed by Ibrahim et al. (2015), in which the study classifies the selected articles into the year of study, dimensions of green supply chain management practices, country, types of methodology, and types of journal. To classify the articles, this study uses SPSS 22 to analyse 100 articles in order to determine the frequency and percentage of each classification. Analysis of articles is the fifth stage of content analysis in this study. The last stage of content analysis for this study involves discussion and defining the research gap for future direction.

### **Analysis of Literature Review**

The objective of this study is to review 100 articles on green supply chain management practices in order to provide information to the readers and identify gaps for future research. The analysis of the literature review is divided into five sections that are: 1) year of study, 2) area of study, 3) types of methodology, 4) dimensions of green supply chain management practices, and 5) types of journal.

### Section 1: Year of Study

In this section, 100 articles were analysed based on the year of publication. The trend regarding the number of articles per year was identified as shown in Figure 2. 100 articles were analysed using SPSS 22 to identify the frequency of articles from the year 2000 until the year 2019.

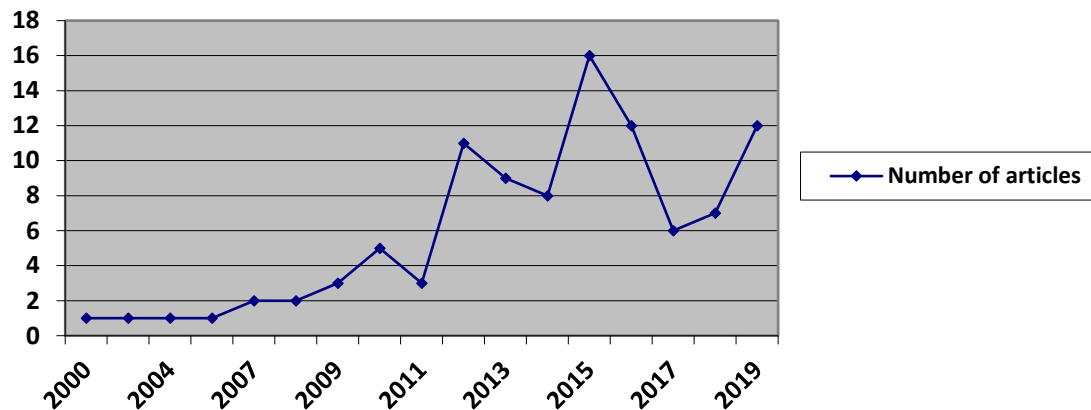


Figure 2: Number of Articles Per Year

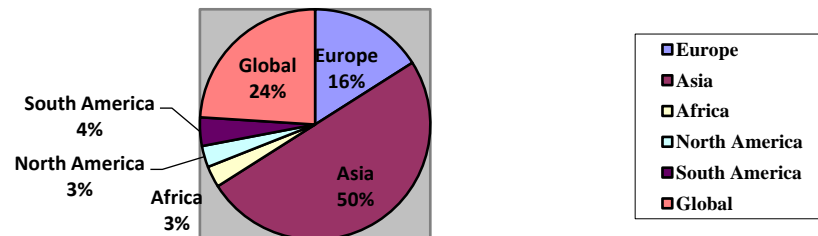
According to Figure 2, the number of articles on green supply chain management practices is increasing but it fluctuates. In total, 11 articles on green supply chain management practices were published from the year 2000 to the year 2009. It shows that the number of published articles is still at a low point and remains stable. A possible reason for the small number of articles published in the said years is due to the fact that the green supply chain management practices are still a new idea in several industries, especially the manufacturing industry (Zhu et al., 2012). At this point in time, industries are reluctant about the implementation of green supply chain management practices due to the conservative perception that the practice involves high cost and expenditure (Shohan et al., 2019). In addition, in the early 2000s, they were just starting to give attention to environmental issues and began to explore the concept of environmental quality (Beamon, 1999; Boujuan, 2008; Eltayeb and Zailani, 2009).

Another 89 articles were published from the year 2010 until the year 2019. It means that the number of articles was extremely rising compared to the period from the year 2000 until the year 2009. The articles on green supply chain management practices peaked in the year 2015 with a total of 16 articles. At this stage, practitioners changed their perception and started to design their supply chain to be more environmentally friendly. Scholars also witnessed a substantial move to explore green supply chain management practices due to the rising environmental problem all over the world, the rising of environmental expenditures for the manufacturing industry, and climate change. The implementation of green supply chain management practices has also been proven to increase the company profit by reducing the waste and utilising the surplus asset (Khan et al., 2019). The number of articles was declined by the year 2017, however, it continued to rise until the year 2019.

### Section 2: Geographical Area (Continent)

Studies on green supply chain management practices have been conducted in almost all parts of the world. In Section 2, the geographical area for 100 articles on green supply chain management practices was observed in order to identify the research gap. The geographical

area was divided into six areas, namely Europe, Asia, Africa, North America, South America, and Global. The frequency and percentage of articles based on the geographical area are presented in Figure 3.



**Figure 3: Geographical Area of Articles**

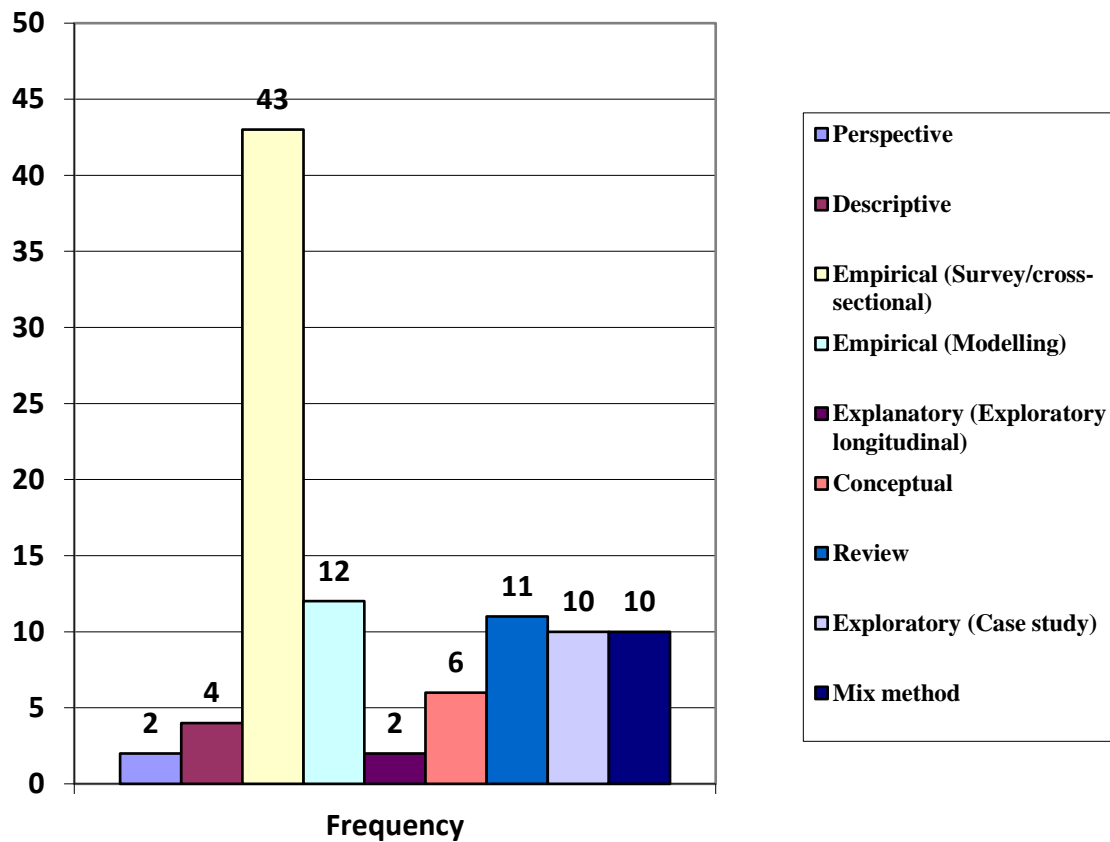
Based on Figure 3, it is clear that most articles have been studied in Asia with a total of 50 articles. 24 articles studied in the global area, in which the researchers have not specified the geographical area, or the researches were generalised. It is followed by 16 articles in Europe, four articles in South America, and three articles in Africa and North America, respectively. However, there is no article studied in Australia based on the 100 listed articles. The most frequently researched country in Asia on green supply chain management practices is China. A possible reason why researchers conducted researches in China is that China is involved in massive manufacturing activities, whereby half of the products in the world are manufactured in China. Due to that, the environmental problem is extremely rising and cannot be easily controlled by the supply chain members (Garza-Reyes et al., 2018). Compared to other continents, the manufacturing industry in Asian countries has the highest expenditure cost, in which it is expected to expand 123 billion dollars by 2025 for waste management (United Nations, 2018). A serious environmental issue has motivated the researchers to study the green supply chain management practices in the Asian region.

Besides that, based on the analysis of five continents, this study summarises that most researches were conducted in developing countries such as India, Thailand, Malaysia, Spain, and Sweden and there were least researches conducted in under developing countries such as Brazil in South America. According to Hynes and Wang (2012), the objective of industries in developed countries is to achieve sustainability in economic, environmental, and social performance. Meanwhile, most underdeveloped countries are only focusing on improving economic growth. Therefore, most manufacturing industry in developing countries is implementing green supply chain management practices. In addition, from the study conducted in South Africa, Oja et al. (2013) stated that most developing countries concern about environmental protection due to the rising of manufacturing activities. However, developing countries are giving attention only to improve their economic performance.

### **Section 3: Types of Methodology**

Malhotra and Grover (1998) classified types of research methods into nine categories, which are *perspective*, *descriptive*, *empirical (survey/ cross-sectional)*, *empirical (modelling)*, *explanatory (exploratory longitudinal)*, *conceptual*, *review*, *exploratory (case study)*, and *mix method*. Therefore, 100 articles on green supply chain management practices were reviewed

based on nine types of methodology established by Malhotra and Grover (1998). The analysis of the methodology is presented in Figure 4.



**Figure 4: Types of Methodology**

This study reveals that numerous articles on green supply chain management practices used an empirical (survey/cross-sectional) approach (43 articles). Empirical (survey/cross-sectional) study is a methodology in which the data is collected from a survey and the data is obtained at a single point in time (Zikmund, 2003). Based on the analysis, 10 articles on green supply chain management practices were used to review an empirical (modelling) approach. Review research is a methodology in which the data is collected from a literature review, while empirical (modelling) is a methodology based upon experimental approach in which relates through the application of mathematics (Chaudary and Alka, 2017). The analysis also shows that 10 articles used mix method approach, followed by six articles used conceptual methodology, four articles used descriptive approach, and two articles used perspective and explanatory (exploratory longitudinal) approach, respectively. According to Ibrahim et al. (2015), the conceptual study explains the basic concept of research topic, while descriptive is an approach to explain, formulate and construct the model based on the focus of research. Perspective provides a conclusion of the research topic based on the perceptions and assumptions of the authors. Additionally, exploratory longitudinal is an approach to “collect data at two or more points over time from similar respondents to monitor its response before and after an experiment”.



**Section 4: Dimensions of Green Supply Chain Management Practices**

There are multiple green practices involved in supply chain activity in order to improve company performance. Out of 100 articles, 56 articles discussed the dimensions of green supply chain management practices. Table 2 presents the top 20 green supply chain practices based on the analysis of 100 articles.

**Table 2: Dimensions of Green Supply Chain Management Practices**

No.	Dimensions	Number of articles
1	Green purchasing	36
2	Eco-design	26
3.	Cooperation with customers	22
4.	Internal environmental management	20
5.	Reverse logistics	13
6.	Green manufacturing	12
7.	Investment recovery	9
8.	Green design	9
9.	Green logistics	6
10.	Green distribution	5
11.	Green marketing	5
12.	Green product	5
13.	Green innovation	4
14.	Green packaging	3
15.	Recycling	3
16.	Environmental monitoring	3
17.	Waste management	3
18.	Warehouse and green building	3
19.	Environmental collaboration	2
20.	Supplier assessment and evaluation	2

According to the analysis of dimensions, this study observes that the most common dimension of green supply chain management practices is green purchasing, in which 36 articles discussed the green purchasing. It is followed by eco-design (26 articles), cooperation with customers (22 articles), internal environmental management (20 articles), reverse logistics (13 articles), green manufacturing (12 articles), investment recovery (nine articles), and green design (nine articles). Three dimensions were identified and discussed by five leading articles on green supply chain management practices, namely green distribution, green marketing, and green

product. Five most accepted dimensions of green supply chain management practices (green purchasing, eco-design, cooperation with customers, internal environmental management, and reverse logistics) are discussed next.

Green purchasing can be defined as a set of activities by the managers that consider environmental awareness in purchasing activity in choosing the environmental-friendly materials or products (Eltayeb & Zailani, 2009). Based on the outcome of this study, green purchasing is acknowledged as one of the most accepted dimensions used in green supply chain management practices. Green purchasing is also one of the important combinations in green supply chain management practices that influence the firm about environmental awareness (Laosirihongthong et al., 2012; Bin et al., 2008). Green purchasing has been highlighted as the practice, which can reduce environmental impact by having a good relationship in terms of monitoring and collaboration with suppliers (Zhu et al., 2019).

Eco-design is also found to be one of the most accepted dimensions of green supply chain management practices. According to Laosirihongthong et al. (2013) and Büyüközkan and Çifçi (2012), 80% of the environmental burden is affected by product design. The environmental issue can be reduced by the implementation of eco-design because it is the combination of cost, quality, performance, and environmental-friendly characteristics of the product design and it also involves ecological activities and product development (Hajikhani et al., 2012).

Nowadays, customers become more interest in environmental products since the issues of global warming, waste, and pollution have actively affected natural health. Customers' intention of green interest has also triggered organisations to have direct coordination with the customers. 75% of the customers in the USA are opting to purchase products from firms that have environmental practices and produce environmental products (Hajikhani et al., 2012). Therefore, cooperation with customers becomes one of the most acceptable dimensions of green supply chain management practices. Cooperation with customers is defined as environmental cooperation within the firm and customer to meet the environmental objective and fulfil customer environmental needs (Yu et al., 2014). Cooperation with customers in GSCM practices is prioritised for sharing information in order to achieve a competitive advantage (Rozar et al., 2015).

Internal environmental management is defined as a transformation on the set of activity into inter-organisation practice based on the company's objective set by top management (De Giovanni, 2012). Internal environmental management is found to be one of the important practices in green supply chain management since this practice involves inter-organisational culture and activity that has been set by the management, then follows by the organisation itself (Green et al., 2012). Top-level managers are seen as a key influencer in forming organisational practice and culture. For instance, if the top-level managers have set their focus on green objective, inter-organisation such as employees and managers at different levels in the company tend to involve in green practice (Jazairy & Haartman, 2019).

Reverse logistics is found to be one of the top-five common dimensions used by green supply chain management practices' literature. The logistic activity becomes a pillar in a supply chain operation and a high potential for environmental burden. As a green supply chain management practices, reverse logistics aims to reuse, remanufacture, and recycle the product or material used by the firm, which focuses on "closing the loop" (Hsu et al., 2012). In addition, the sale of scrap and sale of used materials are also known as reverse logistics activities (Baresel-Bofinger et al., 2012). For instance, Sony and Toyota Corporation implement reverse logistics

as their green supply chain management practices in order to recover their carbon footprint (Younis and Sundrakani, 2019).

### Section 5: Types of journal

The following analysis discusses the journals that publish articles on green supply chain management practices. Based on 100 articles from the year 2000 until the year 2019, this study found 51 journals that published articles on green supply chain management practices. Specifically, this study highlighted the top 10 academic journals that published researches on green supply chain management practices as shown in Table 3. From the observation, nine articles from the year 2012 until the year 2019 have been published in *Supply Chain Management*. Six articles on green supply chain management practices during the year 2009 until the year 2019 have been published in the *Journal of Manufacturing Technology Management*. *International Journal of Operations & Production Management* and *Benchmarking* have published five articles on green supply chain management practices from the year 2005 until the year 2019, respectively. It is followed by four articles from *Business Strategy and the Environment*, *Industrial Engineering and Engineering Management*, and *Management Research Review*, respectively, which have been published from the year 2008 until the year 2019. Other articles on green supply chain management practices were published in other top 10 journals such as *Competitiveness Review*, *Industrial Management and Data Systems*, and *Journal of Cleaner Production* from the year 2002 until the year 2018. All top 10 academic journals were listed at Scimago Journal & Country Rank (SJR) with H Index range from 14 to 150, retrieved November 2019.

**Table 3: Journals Publishing Articles on Green Supply Chain Management Practices**

No.	Journals	Number of articles	H Index	Quartile ranking
1	<i>Supply Chain Management</i>	9	98	Q1
2	<i>Journal of Manufacturing Technology Management</i>	6	60	Q1
3	<i>International Journal of Operations &amp; Production Management</i>	5	120	Q1
4	<i>Benchmarking</i>	5	54	Q2
5	<i>Business Strategy and the Environment</i>	4	84	Q1
6	<i>IEEM 2007: 2007 IEEE International Conference on Industrial Engineering and Engineering Management</i>	4	14	Not yet assigned quartile
7	<i>Management Research Review</i>	4	42	Q2
8	<i>Competitiveness Review</i>	3	19	Q1
9	<i>Industrial Management and Data Systems</i>	3	88	Q1
10	<i>Journal of Cleaner Production</i>	2	150	Q1

## Conclusion

This study performed a review on green supply chain management practices using content analysis methodology. Based on the year of study, the year 2015 published the most articles on green supply chain management practices. In terms of the geographical area, this study found that most studies on green supply chain management practices were conducted in Asia, specifically in China. In addition, this study also identified that developing countries are giving attention to green supply chain management practices. A total of 43 articles employed an empirical (survey/cross-sectional) approach. Green purchasing is found to be the most common dimension of green supply chain management practices, in which 36 articles discussed this dimension. In terms of the publishing journal, *Supply Chain Management* is the top journal that published articles on green supply chain management practices, in which nine out of 100 articles were published in this journal. This journal is also listed in Scimago Journal & Country Rank with 98 H Index. Based on the analysis, research gaps were identified. There is still a lack of green supply chain management practices studies applying perspective research approach and explanatory (exploratory longitudinal) approach. In addition, there is still less research conducted in Australia. Almost 10 issues of supply chain activity were discussed in the Australian Logistics Council (2014) and the rising of the environmental problem requires the academicians to study green supply chain management practices in Australia. Furthermore, the number of articles reviewed in this study is not sufficient to get a clear picture of the trend, especially in terms of the year of study and types of methodology. Since this paper only focuses on the year of published articles, geographical area, types of methodology, dimensions of green supply chain management practices, and types of journal, future studies may analyse types of theory, objectives, and the findings of different articles to get a clear picture concerning the trend of green supply chain management practices. Besides, by adapting the content analysis methodology by Ibrahim et al. (2015), it is recommended that future studies employ more than 100 articles on green supply chain management practices for a better outcome..

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