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Operations research in supply chain management of fashion and textiles: Systematic literature review

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ABSTRACT

This paper will cover the adverse effects of the constantly growing fast-fashion industry within the textile industry on the environment and the challenges faced while trying to make the industry more sustainable in terms of supply chain management. This literature review critically analyses the content of over two hundred papers published in many alternative reputed journals and books spread over fifty years i.e., 1972 to 2022. This systematic literature review is designed by using the subsequent categories: year, sustainable supply chain management (SSCM), textile industry, recycling, textile industry sustainability, water waste management, and barriers. The findings from this literature that the sustainability problems have been solved in theory using multiple different methods such as linear programming problem(LPP), Decision Making Trial and Evaluation Laboratory (DEMATEL) method, life cycle assessment (LCA), etc., but implementation is difficult. The results indicate that with increasing consumer awareness, more and more opportunities are becoming available to put the problems solved in theory into practice with the help of advanced operations research techniques and better and more efficient algorithms in SCM systems.

Keywords: *Sustainable Supply Chain Management (SSCM), Textile Industry, Fast-Fashion Industry, Sustainability, Barriers, Recycling.*

1. INTRODUCTION

"Sustainable supply chain management (SSCM) is defined as the management of material, information and capital flow as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements" (Seuring & Müller, 2008). When dealing with environmental issues, companies and academics refer to green supply chain management or environmental management programs that aim to reduce harmful effects on the environment (Jia et al., 2018)Business organizations are under serious threat to sustaining their existing supply chain due to globalization, challenging markets, demand uncertainty, and recent economic competitiveness. Organizations won't be able to attain a dominant position in the market only by focusing on and increasing internal efficiencies. Recently, sustainability has gained importance and if an organization wants to be in a prominent position in the market, it is necessary to integrate sustainability into their supply chain. Integrating sustainability concepts in core business functions of the supply chain enables an organization to achieve a "competitive position" in the market, in this contemporary era of a globally challenging environment (Ansari & Kant, 2017a) Unlike traditional supply chain management, sustainable supply chain management aims to meet economic, social, and environmental triple bottom line across the entire supply chain for multiple stakeholders (Xu et al., 2019). Dimensions like modern slavery, child labour, unfair wages, gender discrimination, etc. are included in social impact. Factors like water pollution, global warming, emission of CO2, etc. are included in environmental

impact. Economic impact includes the return on investment, impact on profit, and productivity (Warasthe et al., 2022). Over the period a lot of research is done to develop various theoretical frameworks and have scrutinized empirical cases to judge and enhance the performance of supply chains with respect to the dimensions of triple bottom line. For example, studies have summarized key categories, initiatives, and practices of sustainable supply chain management, proposed metrics to measure supply chain sustainability developed frameworks for sustainable supply chain management investigated the interactions between suppliers and buyers within a sustainable supply chain, and revealed critical factors influencing sustainability practices in supply chains. (Xu et al., 2019). This literature review focuses specifically on SSCM in the textile industry as in "2018, the fashion sector was responsible for approximately 2.1 billion metric tons of GHG emissions, half of which were created by fast fashion. Fast fashion brands produce high volumes of synthetic, petroleum-based garments in developing countries, creating high levels of emissions and textile waste" (Wren, 2022a). According to (Wren, 2022a)"fast fashion industry will contribute to irreversible damage to the environment by 2030." It is more and more recognized that indirect consumers of water, like shoppers, manufacturing and trading corporations, are pertinent factors on the trail towards a greener economy. Plenty of corporations are endeavouring initiatives to achieve a comprehensive understanding of the water-related risks in their supply chain. Many times, the old method of company water accounting is not able to manage water use within the supply chain. Several tools have recently been developed to overcome these limitations: some are accounting tools for water use and operational risk, whereas other approaches aim to introduce the impacts of consumption (UNEP/SETAC) or to promote a deeper engagement in resource management (Chico et al., 2013)(Jena et al., 2015)of Stockholm University has conducted an important survey to see if consumers have a willingness to pay extra for an environmentally friendly garment or the garments that are produced by an environmentally friendly process. "It is reported that 89% of the respondents expressed their disposition to pay extra given that the garment they acquire is eco-friendly. The median amount they are willing to pay is around 65 SEK (Swiss currency) additional. There is an increasing trend within the demand for organically created cotton garments that are increasing within the international cotton marketplace for a distinct segment product. During the current times, although the textile industry is the foremost employment generator, the textile business is taken under consideration as ecologically one of the foremost polluting industries. The issues that build the life cycles of textiles and articles of clothing unsustainable are the utilization of harmful chemicals, high consumption of water and energy, generation of huge quantities of solid and gaseous wastes, Brobdingnagian fuel consumption for transportation to far off where textile units are placed, and use of non-biodegradable packaging materials. It is a matter of concern that these processes use water, energy, and chemical-intensive and cause serious environmental hazards. Thus, world awareness of environmental demands for natural fibre-based textiles, natural dye, and finishes are gaining momentum in academic, research, and industrial analysis." (Daniel Chico & Garrido, 2013) Despite having a reasonable number of articles contributing to the implementation of different methods to integrate sustainability with supply chain management, the literature lacks a combined, multi-faceted view of the effect of SSCM in textile industry. This paper specifically aims to systemically review the literature on SSCM in the textile industry and its effect on the triple bottom line.

2. LITERATURE REVIEW

A supply chain is a collection and connection of activities related to acquiring raw materials, processing those materials into intermediate goods, and then finally into finished goods delivering these completed goods to the consumers, it is the flow of goods and services in the market (Hau L. Lee, 1993).

Sustainability in supply chains comprises of three responsibilities: **social, environmental, and financial**. Efficient management of sustainable supply chains is important as it helps to increase productivity while saving money at the same time. By adopting sustainable techniques and resources, one can improve the efficiency of buildings, vehicles, machinery, etc. at significant cost reductions. Reusing clothing is the main benefit of garment recycling. Reusing clothing and textiles helps reduce waste and cuts down on the need to produce energy-intensive modern garments. In contrast, unsuitable clothing can be recycled, reprocessed into fabrics or other materials, or used to make rags or other goods. The purpose of choosing this research topic was to get knowledge of how the supply chain works when sustainable practices are used. The textile and fashion industry supply chain was chosen because quick fashion is a way to comprehend the consumer who continually purchases products. There is a lot of unnecessary wastage of resources in this industry, and although recycling is being done, a large amount of the material still ends up in landfills. This examination of the fast fashion, luxury fashion industries, and textile industries' supply chains aims to reduce wasteful practices and conserve resources whenever possible. The original motive behind considering this technique of researching the previous reviews is to supply a top-level view concerning the past literature and proving the requirement of why this study is needed.

The textile industry has been active since the inception of trade and has gone through a deep modernization phase. One paper commented, "The performance of companies is highly dependent on the performance of their suppliers and supply chain, this is especially true for the textile and apparel industry." (Seuring & Goldbach, 2017). The textile industry also got impacted by environmental regulations, institutional laws and standards, as well as cooperate management and behavior. (Shen & Li, 2019)

The rapidly expanding fashion and apparel sector, together with the associated economic and social sustainability concerns it has sparked, has increased consumer demand for sustainable fashion while also igniting fierce rivalry. Fashion and textile items, however, are distinguished by their complex business models, wide range of available products, and quick product lifecycles. Also, high supply chain clearance is also required make sure that that the source of sustainable substances can be checked and verified. With the accreditation, the retail business may attach hangtags to the clothing, letting customers know where the sustainable raw materials came from. Blockchain technology can be used as a result to make the fashion supply chain system more transparent and traceable.(Fung et al., 2021)

Now we will see how the denim manufacturing industry which covers a major part of the fast-fashion industry has a negative effect on the environment. To produce a pair of denim a large amount of pure water resources are used and only a small portion of it is

reused. To address this problem a research paper was written on **A water footprint assessment of a pair of jeans: the influence of agricultural policies on the sustainability of consumer products** was conducted by (Chico et al., 2013) . This study reports the results of a water footprint (WF) assessment of 5 kinds of textiles normally used for the assembly of jeans, as well as 2 different fibres (cotton and Lyocell fibre) and 5 corresponding production strategies for spinning, colouring, and weaving (Chico et al., 2013). Different software system like CROPWAT was accustomed verify the green and blue water consumption of the cotton production stage (Chico et al., 2013). The blue water footprint impact assessment was performed within the cotton production phase by following the methodology of the Water Footprint Assessment Manual (Chico et al., 2013). At the end of the paper, the author suggests that Water Footprint (WF) accounting is a useful tool for the identification of relevant water consumption and pollution within the supply chain (Chico et al., 2013). WF accounting is additionally helpful to investigate water use at a disaggregate level, permitting its reference to production and consumption, each spatially and temporally, and therefore the study of the drivers and trends of water use (Chico et al., 2013).

Denim processing and health hazards: This chapter written by (Periyasamy & Militky, 2017) aims to check the health and environmental problems regarding the denim manufacturing industry. The authors attempt to examine environmental and health issues concerning harmful denim manufacturing process such as sandblasting, PP spray etc. The outcomes which we can derive from the chapter are:

(i) Use artificial intelligence for the production of dark denim.

(ii) Polluted water needs to attain higher capital to go green, this might increase the cost of production otherwise the untreated water will go into the rivers

(iii) Advantages of dark denim: minimises the hazardous process and saves the health of the workers who are involved.

Fashion firms have implemented sustainable practises as a result of outside demand. The term "organic cotton" is frequently used when discussing sustainable purchasing. For instance, 43% of H&M's total cotton usage came from sustainable sources, and by 2030, all of the company's brands hope to use recycled and sustainable materials. In order to minimise water usage and water pollution during the dyeing of jeans, Levi's introduced a "Waterless Dyeing Process" in 2016. In order to make ripped and washed jeans more environmentally friendly in 2018, Levi's Eureka Lab has developed a new laser technology. Gucci, a high-end fashion label, declared that it would discontinue using original leather in 2017. In order to create handbags and shoes, the sustainable fashion designer-label Stella McCartney takes his stand on utilising synthetic leather. This kind of synthetic leather has a high level of practicality and may even compete with real leather. The used goods are gathered by Uniqlo for charitable donations. Nike reuses old sneakers to make new ones. Major, well-known, and global fashion businesses exhibit a wide range of other behaviours.(Cai & Choi, 2020)

A study was also conducted on the Life-cycle assessment of denim (Periyasamy et al., 2017). Militky. The author has used the Life-cycle assessment method to quantify the impact of the denim manufacturing industry on the triple bottom, i.e., environment, social and economic factors. The outcomes which we can derive from the chapter are:

(i) Production of denim and consumer care stages play a huge role in climate change.

(ii) There is a lack of technology to reuse the water used for the production of denim which increases the wastage of water.

(iii) Deforestation is done for fibre cultivation to produce more denim.

During the period of 1980's – 1990's changes in textile industry were adapted at a rapid pace. Systematic thinking as described by (Moore & Ausley, 2004), helped in sustainable industrial development.
Rise in global supply chain clusters were also seen. Industrial literature publishing were created to analyse how varies geographically formed clusters saw rise in export rates. (Bair & Gereffi, 2001)

Governments have imposed various environmental fees on the fashion sector to reduce pollution with the aim of improving environmental sustainability. Fashion companies typically use market demand data to enhance demand forecasting to account for market uncertainties. Market data is frequently used in measures like style forecasting and colour forecasting. Due to blockchain's security, dependability, and ability to display a very real and clear image about market data, there have recently been recommendations suggesting that blockchain may help to mitigate the data quality issue in the growing economy.(Choi & Luo, 2019)

Textile recycling also gained momentum, with a sustainable mindset. The main issue was finding a feasible market for developing the end products. And to find a high-quality end product, gathering of material was to be done in an efficient way. Therefore, there was a dire need of operation analysis to be developed in this field (De Groot & Luiken, 1999). Also, issues regarding time management and complex solution formation played an important role in providing greener solution for textile SC (Seuring et al., 2004).

Research is also conducted on the topic of integrating sustainability in supply chain management.

Designing a roadmap towards a sustainable supply chain: a focus on the fashion industry is a research paper written by (Moretto et al., 2018). The primary goal of this study is to create a sustainable roadmap for the apparel industry (Moretto et al., 2018). Social and environmental sustainability practices were categorized into a five-step roadmap using case studies of three tiers of three fashion SCs as an empirical base (Moretto et al., 2018). The paper's primary output may be a five-step plan including practices and an overarching objective (Moretto et al., 2018). The paper's primary product is a five-step roadmap which involves practices and an overarching objective. The roadmap is then discussed in terms of potential directions for growth, including within Steps and between completely unrelated Steps (Moretto et al., 2018).

Initially, laws made by the government of a country impacted the textile finishing industry, and manufacturers took decisions based on these specifications. "The European Union, is said to restrict the marketing and use of certain dangerous substances and in textile and leather products, has taken the worldwide lead in restricting some dyes as a result of their carcinogenic nature."(Brookstein, 2009). But during the latter 1990's and initial 2000's, the industry saw a change in the form of better environmental programs and strategies. This is further explained as "The aim is to specify the resultant selective milieu that favours specific paths of technological development and environmental actions" (Søndergård et al., 2004).

During this time period concept of agile manufacturing also gained momentum. Here, Agile manufacturing means "capability of surviving and prospering in the competitive environment of continuous and unpredictable change by reacting quickly and effectively to changing markets."(Gunasekaran, 1999). To do so technological advancement came into place during this time. Wherein usage of logistics in the aspect of automated warehousing, and better manufacturing methods. These concepts were highlighted in the publishing's (Teich & Ivanov, 2009), (Cho et al., 1996).

Quick Response needs companies to adapt to the strategic requirements of the supply chain. Quick Response strategic planning requires a considerable amount of input from the supply chain as a whole, which in turn requires a highly co-dependent, cohesive group comprising companies with complementary, customer-focussed goals. (Perry et al., 1999) Concepts of textile recycling also flourished, as firms got to know that recycling textile impacts the profit margins of the company.(Hawley, 2006)

This time period also so rise in the FDI's made in developing countries as raw material in such countries were abundant. Most of the supply came from Carrabin and Asian countries, cause of the low-cost production (Salike, 2010). It was also explored that average daily earning in developing countries were lesser than developed ones. "The phase out of MFA by 2005 will fully integrate textile and clothing trade under World Trade Organization (WTO), thereby giving textile-producing countries unfettered access to global markets and further fuelling the global trade of textile and clothing products."(Arora et al., 2004).

Evolution of sustainability in supply chain management: A literature review written by (Rajeev et al., 2017) talks about the development of sustainability issues by examining trends in various economies, and industries, through different methodologies (Rajeev et al., 2017). A comprehensive thematic analysis was performed on 1068 filtered articles from 2000 to 2015, highlighting the event and importance of the body of information (Rajeev et al., 2017). The study proposes a conceptual framework to classify numerous factors along the triple bottom line pillars of property problems within the context of supply chains. The author suggests that studies addressing social problems are scarce, and additional focus is needed on the measure of social impacts on the supply chain (Rajeev et al., 2017). Finally, he proposes future avenues to increase analysis on the SSCM domain while keeping in mind the requirement to handle industry-specific and economy-specific issues from the triple bottom line perspective (Rajeev et al., 2017).
During the years (2005-14) there was a rise in the development of the sustainable supply chain management in the textile and fashion industry. Listed below are a few models / concepts that are used in these industries so as to optimize the operations management and sustainability of such industries:

I.<u>See Now Buy Now (SNBN) Vs. See Now Buy Later (SNBL)</u>
The supply chain models in the fashion industry of the textile sector have evolved with time. We can see that a lot of influence in this industry comes from social media exposure. The conventional model of SNBL i.e. See Now Buy Later has been present in fashion and textiles for a long time. It means that sellers sell and consumers buy the product several months after it has been introduced in the market may it be in the form of a fashion show etc. The new supply chain model of SNBN i.e. See Now Buy Now is looking to replace the conventional model as, due to the unfathomable rise of social media and its reach, consumers are offered the products soon after it has been released. This introduction system is bringing about a revolutionary change in this industry(Shen et al., 2020)

But it is a fact that SNBN as a system should only be used by SMEs or to sell the low-cost holding products (shirts) of high-end brands like Burberry as it can only profit from such brands. Brands like Gucci and other high-cost holding product selling brands should continue with SNBL to maintain their customer valuation and quality.

II.<u>Logistics and Supply Chain Management (LCSM)</u>
There are several methods and models of allocation and supply that have been used in markets all over the years. The primary objective of these companies is to optimize their cost and allocate their transportation, products, and costs in such a way that gives the most efficient, feasible, and profitable outcomes. A few of the methods/models have been discussed below:

- Optimal Advertisement Budget Allocation is a polarized strategy used to coordinate the channel between high-end and low-end products. It is of peak importance for such high-end brands to be brave enough to take risks to combat the gap between the offered products.
- Examination of the grey market and counterfeiting through analytical and empirical research. It enables us to see how this research of the grey market is used to determine the pricing by a single manufacturer (Shen et al., 2020)

III.<u>Supply Chain Integration (SCI)</u>
Supply Chain Integration is where the OEMs (Original Equipment Manufacturer), customers, and suppliers work cooperatively and come together and are also aware of the chain at all levels. The four core elements- integration, operations, purchasing, and distribution all work in sync to make their way towards cost-effectiveness and competitiveness. It is a strategic collaboration between the manufacturer and the supply chain partners to handle inter and intra-organizational processes to achieve maximum efficiency. We need to study the three main dimensions of SCI (customer, supplier, and internal integration) to fully comprehend how it works.

(Flynn et al., 2010)

IV.Interpretive Structural Modelling (ISM)

Interpretive structural modelling (ISM) is **a well-established methodology for identifying relationships among specific items, which define a problem or an issue**.

There are several issues in the textile sector concerning sustainable supply chain management. The main areas of focus may include child labour, working conditions like contracts, payment, safety, etc., and workers' health and safety. The textile industry also being one of the largest global industries after the oil industry, also faces a major issue and is the source of a great amount of pollution including the release of toxic waste and chemicals causing harm to health. Due to this enormous environmental pressure, most textile industries are looking to adapt the model of sustainable supply chain management. (Diabat et al., 2014b)

Textile firms must also minimise the environmental impact of their supply chains in order to foster a better environmentally conscious sector. Effective sustainable supply chain management (SSCM), which includes sustainable practises throughout supply chain activities, will be important for this. By concentrating on two major areas which are reducing the indirect impact caused by upstream and downstream activities, and re-evaluating clothing design to increase the efficacy of current sustainability measures such as brands can adopt a complete approach to SSCM. In order to lessen the long-term environmental effect of their supply chains, fast fashion firms can adopt a number of essential activities, which are highlighted in this report along with gaps in current programmes and how fast fashion brands are currently implementing SSCM.(Wren, 2022b)

Now we will be talking about the recent trends in the SSCM in developing and developed countries.

Sustainable supply chain management in developing countries: An analysis of the literature written by (Jia et al., 2018) present an analysis of the educational literature addressing sustainable supply Chain Management (SSCM) practices in developing countries. The research methodology of this paper was by considering Peer-reviewed journals in the electronic database (Scopus and EBSCO). The keywords used for the selection of the articles were: developing countries, sustainability, and supply chain. From this paper, we can identify the gaps in the literature that require further research on this subject, particularly in the context of developing countries (Jia et al., 2018). This paper provides a comprehensive conceptual framework integrating drivers, barriers, mechanisms, and outcomes for each buying firm from developed countries sourcing from developing economies and supplying firms in developing countries (Jia et al., 2018).

We can also take the example of Hong Kong textile manufacturing market to further showcase a shift towards outsourcing, discussed in (Loo, 2002). Hong Kong during the initial 2000's had a strong threshold as its local enterprises and industries curated a well-formed garment cluster. "Many financial institutions and management consultants located in Hong Kong, from local and international, provided professional service on financial and management to the Hong Kong garments cluster." (LI et al., 2003)

Fashion firms have implemented sustainable practises as a result of outside demand. The term "organic cotton" is frequently used when discussing sustainable purchasing. For instance, 43% of H&M's total cotton usage came from sustainable sources, and by 2030, all of the company's brands hope to use recycled and sustainable materials. In order to minimise water usage and water pollution during the dyeing of jeans, Levi's introduced a "Waterless Dyeing Process" in 2016. In order to make ripped and washed jeans more environmentally friendly in 2018, Levi's Eureka Lab has developed a new laser technology. Gucci, a high-end fashion label, declared that it would discontinue using original leather in 2017. H&M starts the used clothing collection plan in order to complete the cycle. The used goods are gathered by Uniqlo for charitable donations. Nike reuses old sneakers to make new ones. Major, well-known, and global fashion businesses exhibit a wide range of other behaviours.(Cai & Choi, 2020)

Analysing barriers of sustainable supply chain in apparel & textile sector: A hybrid ISM-MICMAC and DEMATEL approach by (Vishwakarma et al., 2022)**.** The main objective of this study is to identify the critical barriers to a sustainable supply chain in the apparel and textile industry. Various methods like DEMATEL, ISM, and FMICMAC are used to identify critical barriers to Sustainable Supply chains and classify them. It was noted that the Communication gap among stakeholders, Barriers that affect the performance of this sector, Lack of training and education regarding sustainability, capacity constraints, and Lack of reverse logistics practices are the critical barriers to sustainable supply chain management (Vishwakarma et al., 2022).

A research paper was also reviewed by (Gardas et al., 2018) which identified and modelled the critical challenges to sustainable development in the textile and apparel sector. Fourteen vital challenges to the sustainable development of the case sector were identified through literature and professional opinion survey, and their cause-effect relationship was established using the Decision-Making Trial and Evaluation Laboratory (DEMATEL) method (Gardas et al., 2018). The study's findings showed that the two biggest obstacles to achieving sustainability in the case sector—a lack of efficient government policies and inadequate infrastructure—were worth the decision-makers' full attention. The study's conclusions are meant to aid decision- and policy-makers in comprehending the impact of obstacles to the example sector's sustainable growth and in creating new strategies or altering current ones.

To overcome these barriers to adopting sustainability in supply chain management research was conducted by (Tseng & Hung, 2014) which proposes a strategic decision-making model considering both the operational costs and social costs caused by the greenhouse gas emissions from operating such a supply chain network for the sustainable supply chain management.

MIPS (Material Input per Service Unit) methodology, fuzzy AHP approach, and many other methods were used for evaluating supply chain management sustainability in the publishing industry (Tseng & Hung, 2014). The results showed that the higher the social cost rate of carbon dioxide emissions, the lower the quantity of the emission of Carbon dioxide (Tseng & Hung, 2014). The

results also suggested that legislation that forces enterprises to bear the social costs of CO2 emissions resulting from their economic activities is an effective approach to reducing greenhouse emissions (Tseng & Hung, 2014). A strategic decision-making model considering the social costs of carbon dioxide emissions for sustainable supply chain management

Sustainable supply chain management: framework and further research by (Dubey et al., 2017) directions talk about the current framework which is used to adopt sustainability in supply chain management and provides directions to further enhance the research in the field. This paper systematically reviews the literature on SSCM drivers; secondly, it argues for the utilization of different strategies analysis to deal with queries associated with SSCM drivers; and third, it proposes and illustrates the utilization of TISM and Cross Impact Matrix-multiplication applied to classification (MICMAC) analysis to check a framework that extrapolates SSCM drivers and their relationships (Dubey et al., 2017). The outcome that we can derive from the study is that the sustainable supply chain theoretical framework developed by using TISM helps to explain the dynamic interactions of product style, enabling technologies, and environmental conservation strategy to realize better brand equity cost savings and competitiveness through a total systems approach (Dubey et al., 2017). The result shows that institutional pressures, ethics, and values of society influence the competitiveness of any firm (Dubey et al., 2017).

Now to finally evaluate the producers as resource consumers and to find alternative consumption patterns, a study was conducted by (Blatt et al., 2020). The main focus of this paper is on identifying bottlenecks at each textile production step to implement actions, but also on the customer sensitivity to designing and improving the effectiveness of recycling policies and programs for post-consumer materials (Blatt et al., 2020). This study uses energy environmental accounting to evaluate the production supply chain. Different ratios like the Energy Yield ratio (EYR), Energy Investment Ratio (EIR), Environmental Load Ratio (ELR), etc are also used to establish the relationship between respective fields (Blatt et al., 2020). Combined producer/consumer-driven actions improve the environmental performance of the chain, facilitate to increase in the potency of resource use, deal with technology restrictions and acknowledge consumption patterns (Blatt et al., 2020).

“The focus of company’s environmental concerns has widened from the companies' own activities e.g., distribution, packaging waste, energy efficiency to that of the environmental impact of the product supply chain and the potential for chemical contamination in the final consumer article.”(Easton, 2005). In developing countries such as India, textile industries faced a lot of pressure to adopt sustainable supply chain management concept.(Diabat et al., 2014a)

Papers were also published regarding cleaner manufacturing process adapted to reduce the harmful waste generation. Stating “modern management mode which could comprehensively consider the environmental influence and resource utilization efficiency in the whole supply chain and how to implement the green supply chain management in special industrial operation.”(Zhou, 2009). One such paper analysed the framework developed to minimize environmental impact of textile chemicals. It showcases the application of system thinking and use of green chemistry helped flourish the textile industry. “The case for the beneficial use of these tools is presented as an example of how to increase productivity through greener (environmentally conservative) production induced by cooperative stakeholder actions.”(Moore & Ausley, 2004)

2.1 Research motives

The current paper aims to conduct a unique literature review on SSCM and provide the current status of the analysis field by classifying and analysing the relevant papers extracted from the structured search on totally different views.(Ansari & Kant, 2017b) The authors try to achieve this goal by looking for answers to the subsequent analysis questions(Ansari & Kant, 2017b):

- What is the existing research standing in SSCM?
- Data regarding various research methodologies and styles which are being applied?
- Which totally different data analysis techniques and OR/Mathematical tools are prevalent?
- What sorts of industries are focused and which countries are dominating in the SSCM research area?(Ansari & Kant, 2017b)
- Which decision-making ways are used in SSCM research?
- What are the key enablers and barriers for SSCM?

And finally, what are the future analysis opportunities that require to be addressed

3. RESEARCH METHODOLOGY

A systematic literature review-based study is conducted to answer the above questions. Fink (1998) defines literature review as “a systematic, explicit, and reproducible design for identifying, evaluating, and interpreting the existing body of recorded documents”. (Tranfield et al., n.d.) suggest that to manage the diverse knowledge about a specific research topic, literature review is a decisive tool that supports researcher in the following ways:

- mapping, consolidating and evaluating the existing academic structure of identified field; and developing the scope of further opportunities through identifying key research gaps in the existing body of research(Ansari & Kant, 2017b)

Collection of data related to the field and evaluating it along various perspectives is the most acceptable approach in literature review (Seuring & Müller, 2008). This literature review conducts a (qualitative) content analysis (Warasthe et al., 2022) and adopts the four-step procedural process model proposed by (Brun et al., 2008) explained below:

Step 1. Material collection: Collecting the material to be analysed, delimiting and defining the unit of analysis.(Ansari & Kant, 2017b)

Step 2. Descriptive analysis: Accessing the formal aspect of the collected material and providing background for theoretical analysis.(Ansari & Kant, 2017b)

Step 3. Category selection: Selection of major topics of analysis and detailed classification of each structural dimension along which the collected material will be analysed.(Ansari & Kant, 2017b)
Step 4. Material evaluation: Analyzing the material according to the structural dimensions, identifying the issues and interpreting the results.(Ansari & Kant, 2017b)

3.1 Material collection:

It is very important to select relevant articles to conduct a Systematic literature review. Keyword based searches in electronic databases and library services is the foremost the most ways of attaining the articles for literature study. Additionally, some relevant articles that did not appear by the keyword sieve can also be obtained by scanning the table of contents of major leading journals (Webster & Watson, 2002). In view of this to perform the bibliographic analysis, we considered the following step-by-step ordered process: selection of information, criteria for inclusion, criteria for exclusion, and search of relevant articles.(Ansari & Kant, 2017b)

3.1.1 Database selection: Science Direct database was considered for the study as it is a large, multidisciplinary database that provides access to scholarly research in the following subject areas: Physical Sciences and Engineering, including Chemical Engineering; Chemistry; Computer Science; Engineering and Materials Science. It is a full-text database offering journal articles and book chapters from more than 2,500 peer-reviewed journals and 11,000 books.

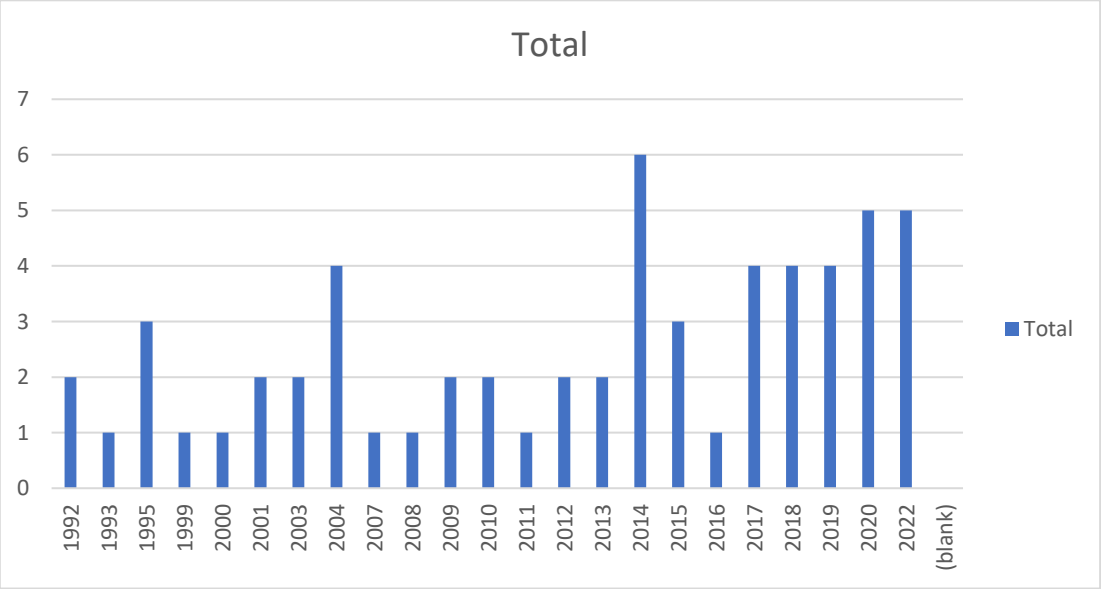
3.1.2 Criteria for inclusion: 1. Articles published between January 1978 to 2022 were considered for the synthesis of peer-reviewed literature.
2. "All Fields" category as well as all of the "Subject Areas" available in Science Direct was chosen for the search.(Ansari & Kant, 2017b)
3. The articles published in only English language and focus on management issues were aimed for analysis.(Ansari & Kant, 2017b)

3.1.3 Criteria for exclusion: 1. Conference proceedings, working papers, technical reports are not considered in the review to maintain the quality of content(Ansari & Kant, 2017b). (Preliminary refinement of papers from the total database).
2. Those articles which did not address the sustainability issue in the supply chain were also eliminated via(Ansari & Kant, 2017b)(Final refinement of papers).

3.1.4 Search of relevant articles: The structured keyword "sustainable supply chain" was used to look for related articles within the field. More than 1,000 articles resulted in the database from an initial search that contains any one term of the phrase "sustainable supply chain"(Ansari & Kant, 2017b). Hence, to limit the articles, the keyword "sustainable supply chain" as an exact phrase was searched in the Title, Abstract, and Keywords of the online Science Direct database a total of 689 articles were generated during the first step(Ansari & Kant, 2017b). Preliminary refinement of the overall articles left us with 349 usable articles. Finally, a total of 250 peer-reviewed papers, research papers and book chapters were obtained after final refinement for analysis purposes, all from well-acknowledged publishers(Ansari & Kant, 2017b). Full paper analysis of 250 papers was done with the aid of excel sheet to gather the needed information.(Ansari & Kant, 2017b)

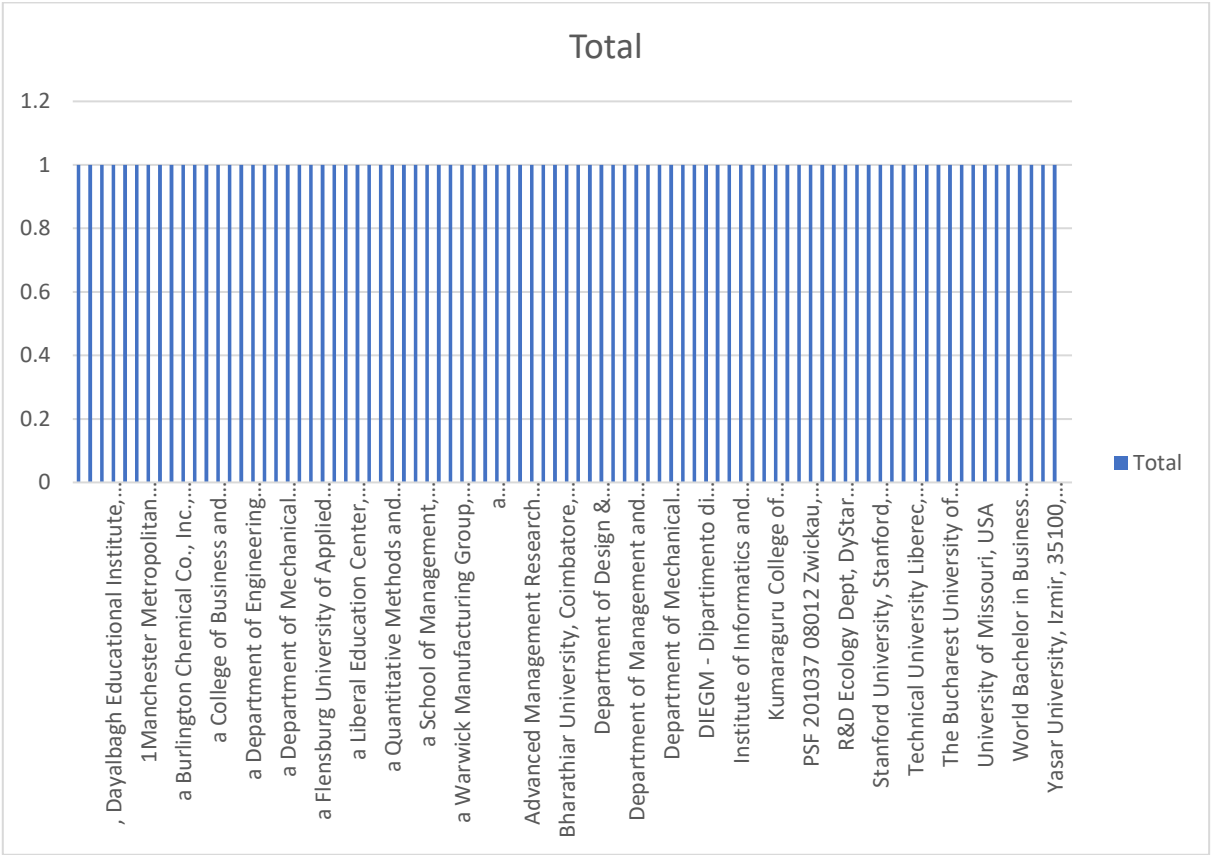
3.2 Selecting criteria for content analysis

As decided earlier and to meet the research objectives, the criteria for content analysis need to be derived that are in correspondence to the research questions. Either a deductive approach or an inductive approach can be used for setting up the criteria to carry out the classification of the literature under study (Seuring & Müller, 2008). The study derives analytic categories before the material is analysed thus using deductive approach (Seuring & Müller, 2008). Assessment of the chosen set of papers for descriptive analysis was carried out on the subsequent dimensions: distribution of publications across periods and main stream journals, research methodology and research style applied, OR/Mathematical tools and techniques used, use of data analysis techniques, type of industry-focused in analysis, main authors contribution to research topic, universities, and countries actively involved, enablers and barriers for SSCM.(Ansari & Kant, 2017b)



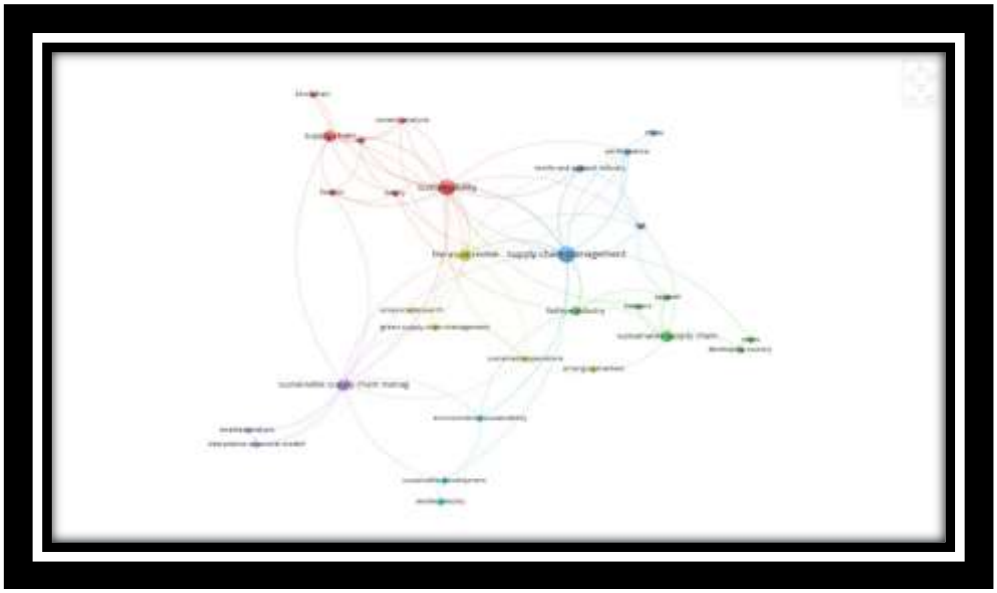
The number of contributing articles/ papers published from 1992 to 2022 is shown in the figure. From 1992, the number of articles published kept increasing with the increase in technology and sustainable supply chain management development. Alongside this, the fashion industry and the textile industry also expanded manifold with new techniques and methods arising to make the process of production and management more efficient, growth in areas like fast fashion, etc.

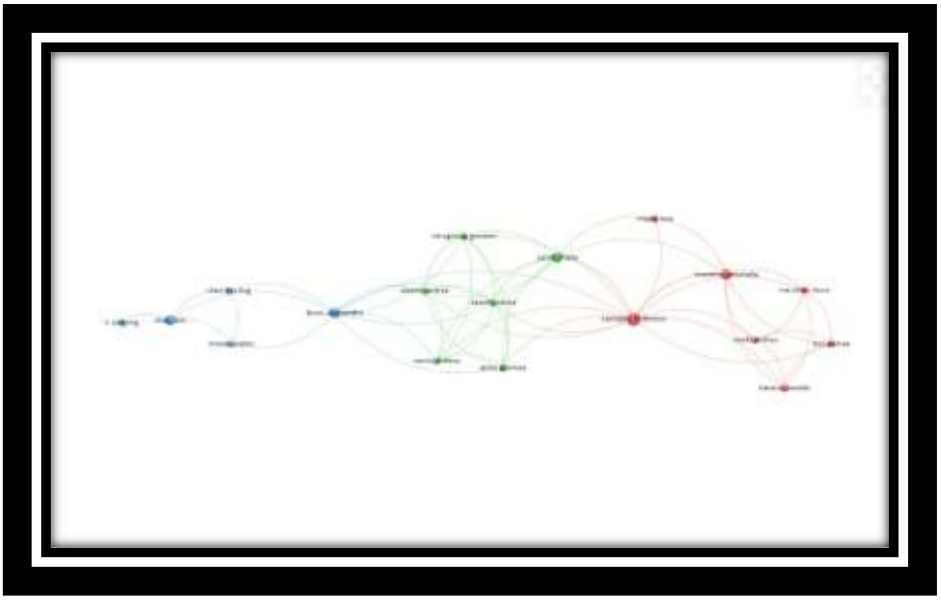
The greatest number of articles on the sustainability of supply chain management have been published in the years 2014, 2020, and 2022. The general trend visible in the graph is that the quantity of papers is increasing.



information about the affiliation of the author's institution is given here in the figure, it shows that all the authors are affiliated with different institutes, none of them have the same affiliation and we can also infer from the figure that these affiliations have published one article per year, for example, Burlington Chemical Co., Inc., POB 111, 615 Huffman Mill Road, Burlington, NC 27216, USA b Microbiology and Inorganic Chemistry Branch, NC Division of Water Quality, 4405 Reedy Creek Road, 1623 Mail Service Center Raleigh, NC 27699-1623, USA published one article in 2004, similarly DIEGM - Department di Ingegneria Elettrica, Gestionale e Meccanica, University of Udine, Via delle Scienze, 208, Udine, Italy published one article in 2000, and in the same way, all the institutions have published their one articles or one paper in one year

Vos viewer Graph:





From the finalized literature review, we can clearly point out the main domain for the research paper are 1) Supply chain management, 2) Sustainability, 3) Fashion Industry, 4) Conceptual framework building. Through the analysis done on VOS viewer, we can see the interconnection between core topics. And these bibliometric networks construct a framework on which SSCM analysis is done. Also, to be noted form the analysis of literature review, most of the articles published under supply chain management of textile related industries were cited during the recent years. This is in part to the slow adaptability of supply chain techniques during the 20th century. Analysis can also be made on newly emerging ideology for the textile industry, as we can see rise in specialised keywords such as; sustainable operations, environmental sustainability, blockchain and content analysis. We also compiled data on the authors referred in the research paper, where we can see that (Caniato, Federico) and (brun, Alessandro) are the two-leading author for the literature review publishing on textile industry.

4. CONCLUSION

Evolving markets are defined as those markets that have reached a stage of development but are not yet completely established. We have done a theoretical study by creating and exploring the appropriate analytical models, which was motivated by the low data quality problem that is frequently acknowledged to exist in emerging markets and the significance of having sustainable fashion operations in these countries. The public pays close attention to sustainable fashion. Over the past years, a lot of related studies have also been released. In the meantime, one of the crucial topics that all fashion apparel supply chains should be aware of is sustainable fashion product creation. In this essay, we have first identified the fashion industry's supply chain structures. Then, by studying the literature on the product development process, we were able to identify the crucial milestones in fast fashion industries. In this research paper we have briefly explained what SSCM basically is and the need of SSCM. We were also successful in finding the adverse effects of Fast – Fashion Industry and the same has been mentioned in the research paper as well. Through research and analysis we have mentioned the current trends in SSCM, barriers to SSCM and by working on the methodology and after analysing past years research papers we have also mentioned the methods to overcome its barriers.

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