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Utilizing Green Innovation Performance in Various Organizations Through Sustainable Supply Chain Incorporation

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ABSRACT

The emission of carbon dioxide, carbon monoxide, and nitrogen is resulting in rapid climate change which is one of the biggest threats to the environment. In most developing countries, the emissions of these gases are due to industrial development resulting in carbon depletion, global warming, acid rain, and greenhouse effects which are hard to reduce. These environmental pressures and global resources can be relieved through green manufacturing. Green manufacturing supports the long-term growth, evolution of human society and economy. The investigations done to know the effects of environmental study and green integration in the manufacturing industries are very scarce. So many efforts and integration of green supply chain systems have been made to obtain the objectives and implementations of various green projects. The outcomes reveal that the total concentration of the organizations was to enhance the internal environmental regulation with midstream sustainable supply chain management (SSCM) activities. The establishment of sustainable practices is limited at the external level and many organizations are doing partnerships with the supply chain partners so that they can enhance their SSCM presentation. The performances of organizations, the pressure of consumers, top-level managemental support, and risk management are important motivators of an organization for which they are bound to accept the SSCM establishments. The research for low carbon supply chain systems, green and environmental systems are still in their initial stage and need to be researched and developed. So this paper aims to review the literature to address the most desired question of the current times, "How and why are industries exploring sustainable strategies in developing countries to improve processes to manage supply chain practices during manufacturing processes? The current study contributes to the futuristic sustainability dissemination by focusing on easily transferable techniques that may help shift whole industry sectors towards sustainability and presents ideas for the future growth of green manufacturing.

Keywords : ***Sustainable practices, Sustainable supply chain management, Green performance, Green manufacturing***

1. INTRODUCTION

Supply chains generally comprise the collaboration of different companies to satisfy the demand of the market, e.g., dealers, sellers, distributors, retailers, logistics, customers, transportation facilities, and government regulations. The organizations have been emphasizing the increase in the efficiency of the supply chain since the past few decades by enhancing the development of supply chains in the organization to give out the products and services to the customers with the superfast delivery and low cost. Long-term dealerships, outsourcing and arrangements, and collaboration with some vendors need new strategies to be used by the businesses to decrease the cost of the supply chain gradually (Park and Kim, 2014). The suppliers of the supply chain are available worldwide and have become interdependent, interlaced, and dynamic because of globalization. The supply chains also have some outward uncertainties like variation in the rate of the currency exchange, adapting the rate of the import tax, limited exports, cultural issues, terrorism, natural calamities, and many more. So, a business must achieve a tactic edge to grasp the worldwide supply chain with overcome undeniability and risks. Even though the companies still have to manage the vulnerabilities and risks coming in the supply chain, sustainability is another problem that has been added to the uncertainties of the supply chain. The manufacturing industry is the backbone of a country's economy (Bui et al., 2021). It can reflect a country's overall national strength. Mechanical manufacturing is straining the global energy machinery. Manufacturing generates wastewater, unwanted gas, and residue. It hurts the ecosystem and does not promote a healthy ecological environment. Manufacturing business no longer only serves economic objectives. New goals include improving environmental preservation, scientific research, and resource utilization. To attain this goal and promote the growth of green manufacturing, the manufacturing industry must be developed sustainably (Ravindran and Warsing Jr, 2016).

It is essential to distinguish the sustainability and problems in the supply chain east and west. But the lack of additional exposure to environmental issues in its global supply chain, some selected farms have experienced great suffering in the past. Also, the worldwide policymakers have been facing difficulties in handling and recognizing the challenges indulged with the worldwide supply chain and transportation system regularly (Ravindran and Warsing Jr, 2016). Focusing on the increase of the supply chain execution alone is not enough for new worldwide business for the organization to stay in the competition and achieve success. This is due to corporate models that are increasing rapidly and the intelligence of clients towards sustainability. The rules and regulations of the environment are becoming more complicated and international supply chains should react to such changes (Alkhuzaim et al.,

2021).It is also vitally important that the industries and organizations must make their supply process, sustainability properly, and productivity. A sustainable management of supply chain is nothing but managing of cash flows, awareness, and content by collaborating with different companies with their supply chain by considering sustainable growth priorities that are social, economic, and environmental growth as per the requirements of stakeholders and consumers (Seuring and Müller, 2008).

The process of supply chain management has five major interrelated issues i.e., relations with the suppliers, distributing the orders of the suppliers, selecting target suppliers, supply chain system, and supply contracts. With the above-stated factors, the problems of studies in the rising countries have been restricted. Till now the research has been limited in the SSCM area where large countries like Germany (Wittstruck and Teuteberg, 2012), China (Zhu and Sarkis, 2004), the USA (Green et al., 2012), and the UK have participated in this research. With the shifting of multinational companies learning related to SSCM within the local companies has been improved which is a great advantage from adapting into the supply chain (Zhu et al., 2008).

To ensuring sustainability in supply chain management has evolved into serious problem for businesses today and the research in this regard is insufficient. The current study has tried to focus the concept and advocate that ongoing development and research need to feel the gaps that are present in the literature and produce more studies on sustainable supply chain management discussing how and what steps the organizations need to take up to promote sustainable supply chain management.

2. Methodology

This paper seeks to provide a comprehensive, critical analysis of the state-of-the-art research iin the area of sustainable supply chain management. For this a systematic literature review approach was selected, being an important and integral part of research for any field of study (Easterby-Smith et al., 2002. In the current review the literature published in English language and having focus on sustainable supply chain management during the time period from 2010-2021 were included. In this research paper, articles, journals, books, and conference write-ups have been presented to make sure of including the academic fields under investigation by keeping the most important publications for extraordinary managerial effect. The keywords used for the literature search were Sustainable practices AND Sustainable supply chain management AND Green performance AND Green manufacturing either present in the title or in the abstract of the manuscript. Data bases such as Web of science, science direct, google scholar were used for data search and selection. In the first stage the abstract of the paper was considered for initial selection of the publication in the study. Generally, the papers using mathematical modelling for the study development were not included in the review while technical studies such as inventory, life-cycle assessment, pollution prevention, reverse logistics, and disassembly were included in the review. In the second step the supplication of the papers was removed and the articles were selected for further analysis, followed by review of the abstract, methodology and conclusion of the paper. This led to the further screening of the literature and final selection lead to the literature that was used in the writ up development and for full length study as well. Based on the literature and after critical analysis the content of the current study was developed and different themes appeared as discussed below.

3. LITERATURE REVIEW

3.1 DEVELOPMENT AND APPLICATION OF GREEN MANUFACTURING

Green manufacturing is also called environmental awareness manufacturing. It is a modern manufacturing method that considers both resource usage and environmental impact. "Green Production" promotes the circular economy paradigm in modern manufacturing and promotes sustainable growth of society. Product design, development, manufacture, packaging, use, and disposal are all part of the product lifecycle. Green production reduces negative environmental impacts, improves resource use, and increases overall benefits over a product's lifecycle. Green manufacturing will be a significant challenge and competitive area in the future industry. Green manufacturing will continue to incorporate breakthrough technology from other areas to establish a resource-saving and eco-friendly society (Bhattacharya et al., 2011). Following are the ideas for boosting green manufacturing.

Industries can improve green manufacturing by absorbing the strength of many disciplines like nanotechnology, neural networks, new energy technology, information technology, and strengthening basic science research related to green manufacturing. Increase research on green manufacturing, green design, green production, green recycling, and remanufacturing. Breakthrough a succession of important technologies with other disciplines, patent a set of typical green methods and critical equipment and develop a green manufacturing industry structure that reduces pollution and energy consumption. Sustainable manufacturing industry growth and the legislative framework in related sectors should be enhanced, industry standards in green manufacturing should be developed, and professional technical people training should be reinforced (Huang, 2018). The concept and knowledge of sustainable manufacturing should be widely communicated and promoted to support creating a sustainable manufacturing system. A green design process considers environmental considerations, product quality, function, and recyclability. Green design demands designers to analyze the entire life cycle of mechanical items. It ensures product quality, function and minimal pollution, which facilitates recycling and resource exploitation (Li and Li, 2018). To support the "green" development of the manufacturing industry and build a green production system, it is required to abandon inappropriate processes and methods in traditional mechanical manufacturing means and control the time of green product production properly (Fang, 2009). Green materials cause little or no pollution to the environment during production and usage and do not harm the human body. Green resources may be recycled, lowering production costs and material consumption while also lowering pollution, boosting the growth of green manufacturing.

Green products are more expensive, but businesses should not be stingy. Their best interests require them to forego color materials in favor of dirty, non-recyclable materials. To avoid quality loss and resource wastage, society may decide to ban the bad practice

(Han, 2018). Green technology reduces pollutants and increases energy efficiency in product manufacturing. For example, waste materials are processed and recycled into finished products to boost resource utilization rates. Green technology should change old technology's inappropriate and flawed elements, including pollution and resource waste. The traditional mechanical manufacturing process generates substantial waste and contaminants, which pollute the environment if not properly treated. If garbage and contaminants can't be recycled, then suitable green treatment approaches should be used. In short, green manufacturing reduces pollution and waste, increases material usage, and promotes sustainable development (Guan, 2018).

3.2 IMPROVE GREEN PERFORMANCE THROUGH SUPPLY CHAIN INTEGRATION

In 1982, studies were carried out to investigate the theory of supply chain management and find the difference between supply chain management and logistics (Christopher and Ryals, 2014). The actual inception of the definition of the management process of supply chain is yet unknown. But according to the researchers, the definition in the demand trend is regulated by the transmission of demand from the supply chain to the users (Scott et al., 2015). The emergence of supply chain management is assigned to total cost planning and delivery methods. The complete comprehension of this structure involves complete evaluation of the delivery system and logistics so which can explain the changes of the dynamic system precisely that has been added with the early theory of the supply chain.

The approaches and ideas presented in the conventional systems depict that the total system should be divided into sections to find the maximum efficiency of the system, centralizing a certain object will not create good results, but the deficiencies present in the total system will be decreased. Apparently, logistic and supply chain management process are inter-related but many researchers have distinguished the two processes. In a study, (Mills and Hoeber, 2013) stated that according to the principle of logistics, it is a relation between customers' service providers and manufacturers to get proper solutions in terms of transactions, knowledge, transport, and product. Whereas supply chain management is assumed that the manufacturer's service providers and consumers have interpersonal and political features of confidence control dependence and conflicts. We can also say that the supply chain management is more than logistics. The unionist thoughts also empower the thoughts of stocks that supply chain management is accountable for governing eight of the business processes such as sourcing, managing customer relations, controlling demand delivery of orders, creating inventions consumer, relation management, and marketing. The ideas of logistics as given by supply chain management processes, "logistic is the supply chain process that consists of reliable, flow, storage, and property distribution from its origin to the final destination, is prepared, implemented and controlled.

In a study published in 2010, (Jüttner et al., 2010) suggested that supply chain management include different partners to create value-making enterprises, and defined this particular supply and management process as an up and down relationship established with the consumers and the suppliers to create more value at a lower cost in the supply chain. (Vaaland and Heide, 2007), illustrated three vital points i.e.

- The operational idea is governed by handling resources from beginning to the end to concentrate on the logistic operations.
- Relational concepts mirror the corporation adjustment and administration of supply chain relations.
- Process-related concepts depend on the connections of technologies to manage the operations of supply.

The colossal supply and management chain system sometimes needs to be shifted from the traditional hierarchical structure towards a more process-oriented structure by the application of assistant systems. This transition and transformation breaks down the initial chain system, first into a tracking and controlled process, and subsequently into a successful processor-oriented structure that is associative, emphasizes upon close partnerships and helps establish a relationship between customers and stakeholders (Govindan et al., 2015).

3.3 SUPPLY CHAIN PRACTICES IN PAST, PRESENT AND FUTURE

Historically, supply chain management goes through three phases for the process to undergo completion: the first phase is the physical distribution management, which focuses on final product delivery; logistics management, which optimizes internal operations; and supply chain management, which focuses on cross-organizational integration. For today's supply chains to be successful, we must remember the essence of previous supply chains (Aline and Sami, 2013). Supply chains used to have long periods of relative stability. With lower degrees of customer control and shorter supply chains. Supply chain performance programs focused on generating revenues across all supply chain linkages. Leveraging to decrease the uncertainty, decreasing inventory, as well as competing on quality became increasingly important as supply chain executives became more focused on increasing efficiency (Christopher and Holweg, 2011). This system worked well and businesses benefited significantly from it. Global supply chains have rapidly expanded, aided by low-cost labor and raw resources, profitable investment opportunities, developing export markets, and host government incentives to attract global markets (Liu et al., 2018a, Liu et al., 2018b). Developing very lean supply chains relies on tactics like outsourcing, reduction in inventions, timely principles, and rising company cooperation. One of the most cost-effective operating methods have become practicable in a more prosperous climate, increasing investment returns. In a study (Griffith et al., 2006) stated that while ecologically safe supply chains targeted at increasing product sales and lowering expenses (stocks' reduction, JIT inventory), and optimizing assets, the ultimate focus was on increasing financial efficiency. As supply chains became more efficient, the business climate changed. Consumer shocks, political instability, currency fluctuations, and global market movements are just some of the few market changes that have taken place. Increasingly, international firms have promised to only engage with suppliers who meet strict social as well as environmental requirements. These multinational companies (MNCs) typically require their new group of suppliers to comply with those criteria, and they expect their suppliers to do the same. So, the

goal is to develop a sustainable supply network that cascades throughout the supply chain (Aline and Sami, 2013). Many MNCs who have signed up have encountered scandals caused by suppliers who, although knowing about sustainability requirements, continue to breach them (Rajeev et al., 2017). Consider the recent embarrassment for Apple, Dell, and HP for purchasing electronic material from companies all over the world that obliged employees to work in hazardous conditions and the ramifications for Nike and Adidas for sourcing from suppliers that polluted Chinese rivers. Moreover, all of the scams implicated top suppliers. Lower-tier suppliers nearly always have weaker practices, exposing organizations to substantial financial, social, as well as environmental hazards. In the current manuscript, we discuss how MNCs might mitigate these risks (Villena and Gioia, 2020).

3.3.1 Problems in Supply Chain Practices

MNCs face unique issues in operating with lower-tier suppliers. There is rarely a direct contractual relationship, and the MNC's business is generally irrelevant to the lower-tier supplier. Automakers in the US and Japan might require a seat manufacturer to meet their sustainability standards. But persuading suppliers to follow suit may be difficult. Assume it works with a foam maker that also serves the electronics, machineries and health care industries, with its sustainability guidelines. As a result, the foam manufacturer has no motivation to meet the automakers' sustainability standards (Villena and Gioia, 2020). Smaller suppliers are also less prepared to tackle sustainability demands. Of course, they may not be aware of acceptable social and environmental norms or standards. They are often seen working in countries where such restrictions are absent, lenient, or non-existent and even if they do know about MNC sustainability rules, they have nothing to comply. This phenomenon explains why the majority of low-tier suppliers had no toxic waste disposal plans and no environmental management programs at all. Ignorance afflicts MNCs as well. They don't know who the suppliers are, where are they from, or their skills. The literature review shows the lower-tier suppliers are tiny or medium-sized private enterprises that give minimal public information, making them virtually unknown. Several MNC directors find this as a major issue. All of these factors make low-tier suppliers the difficult-most members of a supply network. If they have poor questionable sustainability performance, MNCs doing business with them risk losing clients, having to find out new suppliers, or having their supply chains disrupted. Companies must include both first- and second-tier suppliers in their sustainability plans to mitigate risks (Villena and Gioia, 2020).

Following aspects were acknowledged during the research to encourage social and environmental responsibility among suppliers-

- Setting long-term sustainability targets.
- First-tier suppliers must set long-term sustainability goals.
- They integrate lower-tier suppliers in their sustainability plan.

These are all good practices that other businesses should embrace. Firms can also use our MNCs' specialized initiatives to propagate excellent practices across their supply networks. The MNCs usually setup and monitored social and environmental targets for first-tier suppliers. For example, the automotive industry values supplier diversification. It compels first-tier suppliers to invest 7% in minority suppliers. Many first-tier suppliers have now met that goal; others have made significant improvements. For instance, by creating and adopting new performance criteria for their purchasing managers. First-tier suppliers said the MNC periodically checks on progress and helps them network with minority lower-tier suppliers (Villena and Gioia, 2020).

- **Lower-tier supplier sustainable management**: Multinational firms should utilize a mix of direct, indirect, collective methods for quality check. Other MNCs annually must audit its first-tier suppliers to learn about their health, safety, labor, and environmental practices, as well as their lower-tier suppliers' sustainability performance.
- **Indirect Method**: Our research found that MNCs entrust sustainability management to first-tier suppliers. For example, they teach suppliers and reward them for adopting sustainability practices. For most first-tier suppliers, such training led to significant improvements in manufacturing methods and requests that suppliers adopt similar sustainability requirements. Their preferred-supplier programs encourage peer learning about sustainability. To improve connections with the MNC and share best sustainability practices, one firm invites their own most socially as well as environmentally responsible suppliers to an exclusive group.
- **Collective Method**: MNCs work with competitors and major suppliers to establish industry-wide sustainability standards. They acknowledge that a single MNC cannot combat global suppliers' poor labor or environmental policies alone. It would be unreasonably expensive and unfair because significant firms utilize many of the same suppliers.

Collaboration has several advantages. Suppliers can utilize a uniform self-assessment or audit to satisfy numerous clients and prevent duplication, also, suppliers with many customers with similar sustainability needs are more ready to join in these projects. Moreover, industry-wide training is financed by members, making sustainability projects more realistic. Also, when MNCs help their first-tier suppliers join an industry association, they must follow industry norms, which entails assessing their sustainability. The RBA, for example, mandates full members to approve annual audits of at least 25% of their own and 25% of their suppliers' high-risk facilities. (Risk is evaluated in terms of labor, health, safety, and ethics (Villena and Gioia, 2020). With so many big companies in their sectors, industry organizations have a unique power over first- and second-tier suppliers. In a study (Villena and Gioia, 2020) analyzed the work of MNCs closely with international organizations and non-governmental organizations (NGOs). To enhance corporate social responsibility, all three companies have signed the UN Global Compact. The three MNCs also engage in the CDP's Supply Chain Program, where suppliers declare carbon emissions. According to the (CDP, 2019) supply chain report, suppliers with a minimum of 35% of program members were engaged in climate change in 2018. The researchers noted that suppliers are also strengthening their attempts to cascade good change downward through their supply chains. MNCs utilized that information to negotiate supplier contracts. One company devise an award to reward suppliers who have improved their performance in the CDP Supply Chain Program. Other MNCs tracks the program's ratings annually in its supplier scorecard. First, MNC engineering and procurement departments frequently preapproved lower-tier vendors without regard for social or environmental factors. In other words, procurement as well as engineering focus on the three Ps of sustainability: profit, people and planet. As a result, lower-tier

suppliers who had already taken approvals may violate the sustainability standards of the MNCs they work with. So, the first-tier suppliers may face trouble. They must cooperate with preapproved suppliers but are held responsible if they abuse people or pollute the environment.

Divergent goals within an MNC's functional units such as engineering, procurement, sustainability can cause systemic loss to the total sustainability of a company and its credibility is destroyed. This can be avoided by aligning incentives across all functions that engage with first- and second-tier suppliers. Procurement officers also lack sustainability training and incentives. MNCs should invite procurement officials of suppliers to sustainability training sessions with safety, environmental and health personnel to address this issue. Alternatively, MNCs might engage the top executives of their first-tier suppliers and motivate them to spread sustainability criteria to lower-tier suppliers (Villena and Gioia, 2020).

3.4 CONSEQUENCES OF SUPPLY CHAIN MANAGEMENT ON GREEN INNOVATION PERFORMANCE

Supply Chain Management or SCM started back in the 1980s; several types of research were conducted in SCM for the decade after that, and finally, the growth of supply chain management started. In recent days SCM has been making drastic changes from an improving research source to a consolidated one. In the fourth phase falls the green supply chain management system that is a part of SCM. The aim is to incorporate stability from strategic, innovative product design being delivered to the customer (Aline and Sami, 2013). This whole process keeps on working in supply chain management, and because of it, the future of SCM still needs to be established (Rajeev et al., 2017). When talking about the green supply chain, it can significantly differ from green transactions to integrated green supply chain operations in the literary sector. Therefore the green supply chain is also known as application of environmental thought to supply chain management which further includes purchases, material sourcing, product designing, distribution of final products to the customer, manufacturing products as per the customer's choice, and end to end management of life (Jermsittiparsert et al., 2019). Green supply chain management can work like magic if used properly. Therefore, academicians and practitioners introduced GSC as an effective way to enhance environmental sustainability (Tseng et al., 2019). Though this idea emerged in 1990s, the actual growth of this idea was by the start of 20th century. (Handfield et al., 1997) introduced the whole concepts of environmental management to the overall collections of operations of the customer's entire order. Below is a figure that would clear the various challenges in SCM and how it has been divided into multiple further groups according to the background.

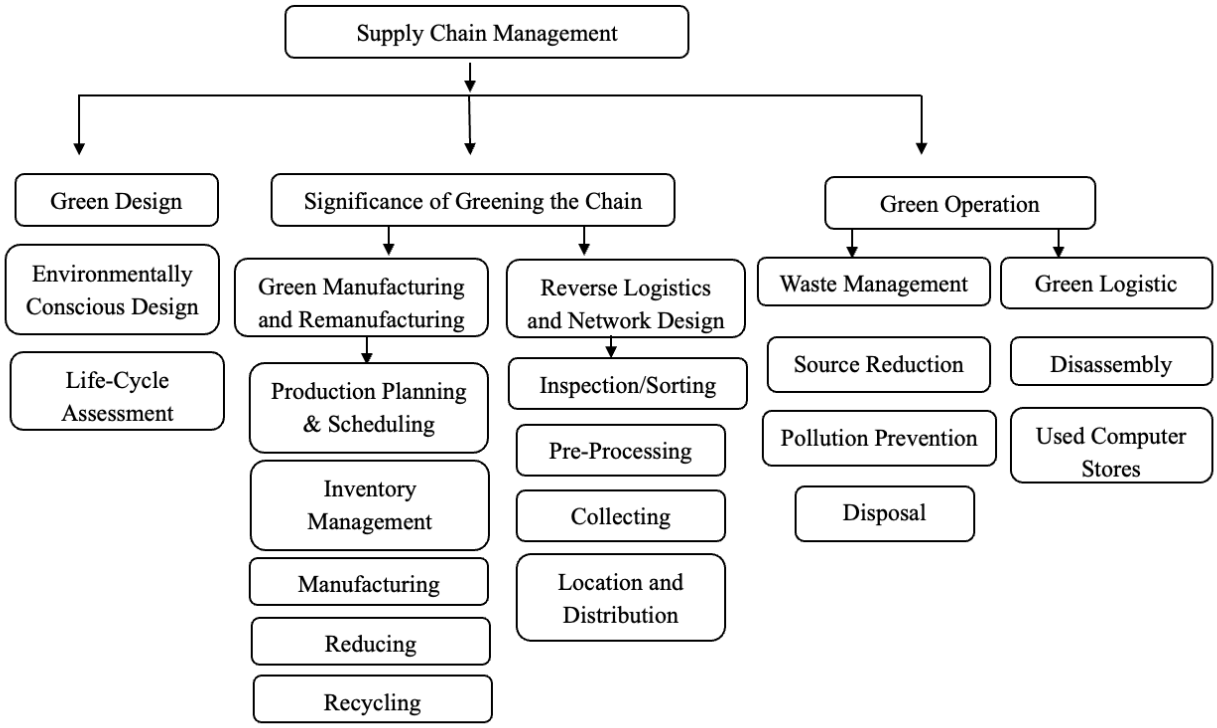

Figure 1: Events in green supply chain of a manufacturing industry

Reducing the environmental damage of any product, green product development comes into action and plays a very vital role (Srivastava, 2007). Usually, it is seen that environmental factors expand the potential to mitigate the impacts on customer's product design. Therefore, the design phase is said to be 70% of how much cost it will be to design the product. Hence the clinicians have progressively developed several specialized instruments like Gabi, Simapro, etc., to create a compelling atmosphere (Bag et al., 2020). Focusing specifically on product performance leads to a better Design for the Environment (DfE). However, on the other hand, the supply chain network works as an architect and does increase the influence and does not decrease the product design output (Sauer and Seuring, 2017).

3.4.1 Manufacturing and Re-Manufacturing of GSC

There are several phases of GSC, and the major categories of research are three.

1. Pinch Analysis.
2. Industrial Energy.
3. Energy Life Cycle Analysis.

According to (Ninlawan et al., 2010) the green revolution reduces the prices of raw material and high-quality output, increases occupational health prices, enhances corporate identity, and lowers environmental consumption. As per the recent findings relating to the manufacturing practices done in the manufacturing sector are as below:

1. Wash and thoroughly rinse the product so that it becomes reasonable to use and chemical-free.
2. Replace lead with other materials such as gold, copper, silver, bismuth, zinc, etc.
3. Provision of quality check at the input points and testing it again before getting access.

It is called as Energy-efficient technology as it is increasing the working of types of machinery, enhancing the working capacity of the kinds of machinery and the input of power usage is good such as unloading and charging technology. This can be minimized by decreasing the use of harmful artificial glue such as epoxy glue, promote recycling and reusing the products as much as possible and increase the awareness of maintaining and sticking to 3R's.

3.4.2 Network designing and reverse logistics

Reverse logistics is when some return, re-use, or reproducing material and parts benefit the manufacturer. Reverse logistics completely differ from the traditional logistics processes (Trochu et al., 2020). In the field of reverse logistics, the researchers try to use a more quantitative modeling approach. Therefore, a mix of several internal programming is used to solve problems with the reverse logistic process (Jack et al., 2010). While highlighting managing waste, it seems to be a distinguished issue concerning the green supply management chain (Méndez-Fajardo et al., 2020). However, disposal of waste entails a decrease in emissions (Adeleke and Olukanni, 2020). In a recent study (Yang and Lin, 2020) found that waste management can be done using several other methods such as locating treatment plants, distributing the waste disposal network, recycling it as much as possible, etc. In a study conducted in recent year (Yadav and Samadder, 2017) the authors have shown concern about not doing waste management control. The main agenda focused is how to prevent the pollution that has already been caused. If done in the right way, then the carbon emission of greenhouses can be reduced. The United Nations Environmental Program (UNEP) has laid concern on why to focus on cleaner production as a regular implementation. Hence it is further classified by the researchers on (Zeng et al., 2010) how to get involved in the more sterile production business and how to evaluate, work in more environment friendly way and explore economic ways to enhance the efficiency. Cleaner production is used in various sectors such as alimentary, ceramic, mines, and so forth. Hence, cleaner products rely on how one gets access to resources and how exactly the energy flows through the enterprise (Huang et al., 2013, Jia et al., 2014, Sladkova and Loginova, 2016).

Green procurement or ecological procurements, depends on the requirements of purchases. Hence, purchasing is classified as one of the critical parts of supply chain management, which occurs because of the effectively changing Green Supply Chain Management. In several kinds of research and studies, it has been seen that some amount of impact falls on the business and finance because of green procurement. Therefore it is essential to properly evaluate how industrial companies get several types of equipments to enhance their performance environment-wise and eliminate pollution, lowering water and energy usage (Blome et al., 2014). Green Procurement is the purchase of services and products that are environmentally friendly and selected by the contractors while taking care of the environment (Wong et al., 2016).

3.4.3 Features of green procurement

Green procurement aims to avoid pollution and indulge in activities that are more environmentally friendly and contribute less harm. This includes purchasing, technological use, quality of products or raw material, and services, contracts, and effect on the environment. This policy applies to every organization regardless of size. This whole green procurement purchase is as easy as purchasing recycled products or renewable energy (Blome et al., 2014). In an already published study (Appolloni et al., 2014) say that green services and products utilize fewer resources designed to last for a longer duration of time. Thus the impact of green services and products on the environment is significantly less and makes the environment a better place to live. Therefore before the green procurement policy is implemented, it is necessary to evaluate the current purchasing policies and practices (Tate et al., 2017). After proper evaluation of all purchases and consumption of energy, then only an appropriate scheme of green procurement can be implied on many. It is also necessary to make others understand that switching to green procurement helps reduce waste and reduces expenditure, making it possible to increase the production rate, competitive price offering (BSDGlobal, 2002b). Hence organizational policies, environmental management systems, legislation, and multilateral contracts often require organizations to help start the green procurement program. A few places that adopted the green procurement program are as follows**:**

- **Ikea**: It is a household and furniture products retailer and has achieved a goal of 2000 suppliers. Their working style focuses more on improving environmental impact and also enhances working conditions. Internal sources have verified that Ikea is very strict with the code of conduct that the supplier needs to meet. If continuously, the code is broken, then Ikea removes the supplier from the list. The code of conduct includes that waste must be appropriately handled, the harmful emission of gasses must be reduced, and the disposal of hazardous chemicals must be done correctly (BSDGlobal, 2002a).
- **Fujitsu**: It is situated in Japan and follows the green procurement policy very strictly. They select materials, products, types of equipment, etc., based on the quality and environmental friendliness. They avoid toxic substances, focuses on energy and resource conservation, recycling products as must as possible.
- **Travel Bureau Japan:** It is a travel agency situated in japan and follows the environmental management system since 1999. The EMS asks to focus on developments related to green procurement policy.

As per their name, green design is not only environmentally friendly but also tries to include the importance and thought of saving our environment. Hence, the product design in discussion with organizations and supply chains not only makes the product's performance better but also reduces the environmental effects of the design (Liu et al., 2018a, Liu et al., 2018b). (Gábriel, 2016) has also explained how the environment can be directly affected by just a mare design. Hence, products must be engineered so that they be technically sustainable, lasting, and eco-friendly. Therefore before the designing stage, more preference must be given to raw materials high on the recycling level (Hong et al., 2019). In the supply chain management sector, a lot of focus has been given to decreasing carbon emission and controlling it for improving the environmental damage caused. On the other hand, because of the increase in global warming and population problem, carbon emissions are gaining much attention. Researchers have tried to find out different facts to reduce the carbon supply. (Sundarakani et al., 2020) also laid a blueprint on how the heat flow cycle is better as compared to carbon emission. Studies have been carried out regarding energy carbon emission distribution (Sundarakani et al., 2020) and according to them, a web-based tool can measure the carbon intensity; the program will be set according to the inputs such as energy type, storage types, transportation types, etc. So, lowering carbon emission can be evaluated in different levels of the supply chain. Therefore, (Holweg, 2014) tried to assess the global sector risk due to this harmful emission. Similarly, (Jira and Toffel, 2013) addressed the interaction with the relevant reason given by the providers on usage. Hence a "MEW" flow model indicating the energy, waste, and material used was made to understand the manufacturing facilities and help pick changes.

Researchers have also tried to understand the carbon footprints but calculating different methods in the supply chain management of other sectors and goods (Pelletier et al., 2014), including bananas manufacturing (Svanes and Aronsson, 2013), and ethanol (Pattara et al., 2016) etc. Hence, in approaching the above framework of efficiently managing the supply chain, lowering carbon emission is also considered necessary. However, it is also not denied that the reality is far more different than the assumed goal. In the sector of carbon emission in SCM, it is seen that more theoretical work is done than the actual work (Piecyk and McKinnon, 2010).

Therefore, carbon emission still stands a problem for many. According to the above content, the several activities and actions divided in providing sustainable energy are:

1. **Product**: While talking about the product, it is seen that the design of the product, design of the packaging, managing the waste, re-using or recycling the products makes it more efficient for effective SCM.

2. **Green Procurement**: The management of supplier, transportation, sales, purchase, and waste disposal can make the SCM more successful.

3. **Output**: Formulated and established output processes and waste management can help in SCM management.

4. **Logistic**: Providing and managing packaging design, reversal logistics, and consumer shipping can help in effective SCM.

Therefore, if all the above-suggested methods and suggestions are followed, it can help balance the environment and make the SCM effective. The domain can get affected by anything we do to it or any actions we are taking (Rigot-Muller et al., 2013). Hence managing the work and environment, both are necessary. However, many organizations tend to forget this and break the affect supply chain management, causing environmental degradation. SCM is a great and effective way to work in order and effectively learn how to manage things without bearing a threat to the environment.

3.5 UTILIZING MODERN SUPPLY CHAIN EVOLUTION

Supply chain managers are getting-used-to with utilizing and handling contemporary sustainable supply chain resulting in introducing digitization, omnichannel marketing, and big data supply chain with many innovative things happening out there. A few from those developments are mentioned below (RIVERLOGIC, 2020). Digitalization of the supply chain is necessary that is involved with a new initiative that can change the business process to a single form and encourage the development of modern technology (RIVERLOGIC, 2020). According to PWC, the motto of digitization is an effective and innovative supply chain environment that removes overall difficulties and creates clarity and responsiveness. It forecasts a new age by replacing manual operation by serving the organization with a view that involves the efforts to create a paperless process through correct ways by matching supply chain model process with what-if scenes. Organizations are creating huge trades to deliver an omnichannel shopping experience as per the consumer request. Omnichannel supply chains are giving much pressure on the supply chains and logistics which overlays supplying consumer orders and refilling stocks at the manufacturing locations which will enable the consumers to buy products that are released online or direct from the shop. An overall supply chain logistics comprises a transition from single-channel supply to multi-channel to omnichannel supply (RIVERLOGIC, 2020).

The transition from the ordinary single supply chain to the circular supply chain was released and the leftover products were used and remade by the industries and manufacturers with newly developing and recycling raw materials. The legal criteria regarding this are very strong which is used for reusing and easily processing the waste goals in which customers are the first ones to use recycled materials and many manufacturing industries get benefited from this circular supply chain (RIVERLOGIC, 2020). While many companies depend on old technologies in the supply chain process but the future of some supplies chains is cloud computing. Supply chain cloud computing is found in different ways like PaaS, SaaS, and IaaS that gives simple stable and overall spoke to reduce the need of managing costly and message on famous computing infrastructure. In 2020 cloud-specific computing has raised 7 times faster than other IT sectors and operating alongside by providing an enhanced user interface, quick access to updated features, and great functionality (RIVERLOGIC, 2020). Many organizations are now accessing artificial intelligence and machine learning methods to achieve large information so that they can simplify the procedures and automate the processes. The estimate shows that the growth of many organizations has been increased to 27% by utilizing machine learning and artificial intelligence method for the last four years. Optimization algorithms and deep learning analysis have held organizations to recognize new management procedures for children's methods and simplifying difficult warehousing. This method had also replaced employees who used to perform daily supply activities and problematic supply chains (RIVERLOGIC, 2020). The IoT is an ageless matter which reveals that if the prices of the products get declined the IoT products will rise more and by 2022, it is predicted to touch 13 % of the annual expansion. IoT helps the organizations track the deliveries manage the inventions and automatically reorder the stocks (RIVERLOGIC, 2020).

The change from offshore manufacturing to local supply is a prominent pattern of supply chain management. Manufacturers can adopt this process to get more demand with less cost (RIVERLOGIC, 2020). Supply chain digitization, transparent consumer information, and origination of IoT had increased the axis of bigger information, tremendous knowledge, and market insight from the past performances to the future ones of the supply chain. This had made it possible to know the dynamics and expectations of businesses and clients by using large information and redoing the supply chain (RIVERLOGIC, 2020). Nowadays, businesses and organizations have switched to robotics to make use of labor-intensive tasks as there was a lot of demand for omnichannel supply chains. Robots are utilized for performing daily activities like counting, fetching warehouse data, sorting and delivering items (RIVERLOGIC, 2020).

3.6 CONVERTING CHEMICAL SUPPLY CHAIN TOWARDS SUSTAINABILITY

Sustainability is now widely recognized as a factor in management, making thoughts and company's idea formulation. However, many companies still confront significant operational as well as organizational hurdles when becoming more sustainable, especially when targeting their suppliers. Increasing awareness of the threat to human existence drives their way towards sustainable production and consuming habits. Still, these efforts are restricted by human behavior and the necessities and limits of the economic system. The current study has addressed this gap by examining which intra- and inter-organizational activities are critical to establishing an SC. The qualitative empirical analysis is done using the practice-based approach and its application to supply chain practice. The German chemical processing industry, Germany's third-biggest sector and fourth-largest chemical industry globally, were selected as the empirical area for this case study investigation.

3.7 Theoretical foundation

The resource-based view (RBV) and the relational view (RV) are two prominent resource-based studies made for strategic management. Then we define the practice-based view (PBV) and the supply chain practice view (SCPV), which provide the theoretical framework for our analysis. According to Dyer and Singh (1998), inter-organizational is a level that broadens the perspective from a single organization to several organizations (Dyer and Singh, 1998). Between the two is the intra-organizational level, which comprises business duties, work teams, or sole workers. They define inter-organizational SCM as "a collection of activities that transcend multiple formal organizations that can imitate". SCM research has usually used Barney's RBV to analyze a firm's resources and influence on competitive advantage. To acquire a long-term competitive advantage, businesses must-have resources that "allow them to develop and implement plans that increase their efficiency and effectiveness." Resources must be valuable, scarce, imperfectly copied and challenging to substitute to deter rivals. The RV, proposed by (Dyer and Singh, 1998), covers inter-organizational competitive advantage, expanding the RBV's intra-organizational approach. The RV implies that vital resources may cross-firm borders and be incorporated in interfirm processes and routines. Complementary resources or talents and good governance can all contribute to inter-organizational competitive advantage. In addition, the SCPV may assist explain why some managers embrace sustainable measures while others don't. Here, it is essential to note that the effectiveness of a practice depends on the activities previously implemented: an approach may benefit some businesses or supply chains while leaving others untouched.

3.8 Conceptualizing SSCM through practices

Best methods, competitive advantages, and high-class financial performance are highly and mostly represented in (S)SCM research. Other research focuses on SC practices and their effects. Bloom et al. (2013) (Bloom et al., 2013)showed how management consulting for maintenance, repair and operation (MRO) and inventory management improved efficiency for Indian textile producers. An analysis of survey data indicated that best-practice variables impact management support as well as adoption decisions of manufacturing the top-class methods and that effective implementation enhances operational performance. In a previously published study, Corrocher and Fontana (2008) emphasized the role of social variables in management practice implementation (Corrocher and Fontana, 2008). The research on management techniques and their effects has shifted the focus from a single business to an SC. In a study by Swart et al. (2012) state that managing human performance requires coordinated effort throughout the SC. Processing, communication, as well as development techniques are critical for effective SC partner collaboration (Swart et al.,

2012). In another study it is stated that SSCM frameworks are at times built on management practices and are connected with them to get SC outcomes. Most importantly, demonstrate how SC integration and innovative organizational behavior improve environmental, social and economic performance. The SSCM frameworks suggested by Pagell and Wu (2009) and Beske and Seuring can be improved (Pagell and Wu, 2009). In each models ignore the complementary and conflicting interaction of the results of environmental, social and economic performance. Their SSCM approaches have weak or non-existent isolation mechanisms that might help propagate sustainable practices and alter whole businesses.

3.9 Sustainability of the chemical process industry

Sustainability is a hot subject for chemical producers and their supply networks which will likely continue to shape the industry's future. Although the chemical industry has a long history of environmental sustainability, it has a bad reputation and image regarding commodities, production methods, and energy usage. The chemical industry consumes around one-third of all industrial energy and has a 15% worldwide energy reduction potential. However, SSCM research on the chemical process industry has been sparse compared to the food or textile industries (Oelze et al., 2020). The consumer goods and transportation industries focus on empirical SSCM research, whereas chemical producers are less frequently studied. In the chemical process sector, sustainability concerns typically arise in process engineering or product development.

3.10 AN OVERVIEW OF METAL–ORGANIC FRAMEWORKS FOR GREEN CHEMICAL ENGINEERING

Metal-Organic Frameworks (MOFs) are defined as hybrid materials which are made of metal ions and organic linkers and are one of the porous substances in nature. These materials have the characteristics of crystallization and high surface areas (Ajoyan et al., 2018). Anyone can see the structures of accessible cages, tunnels, and the pores which are presented by these MOF structures. These structures also have the features of mechanical and thermal stability (Boodhoo and Harvey, 2013). Today with the growth of modern technologies the trend of industrialization and making of numerous infrastructures has become very common. So due to all this, the environment is losing from us at a great pace. To meet this challenge of degrading the environment with the rising technologies these MOF structures are going to increase in use in each and every study possible. This is the reason why these structures have come into use in green clinical studies (Furukawa et al., 2013). By the end of the 20th century, the major concern of each and everyone went to increase the use of resources that are eco-friendly in nature. So to make this concern or supreme level the field of green chemical engineering has gain momentum in which the use of hazardous substances is eliminated as well as promote the use of materials that can be used for more than one process (Howarth et al., 2017). MOF structures have gained immense popularity because of their functional diversity, oneness, and tolerability, mostly for use in green chemical engineering They also permit control on the composition of the materials, morphology, and function by the wisely choosing the building units and the use of smart functionalities. These are the various factors behind the use of MOF structures as eco-friendly products in place of hazardous materials (Furukawa et al., 2013). There are various stages on which MOF structures go to use in green chemical engineering. These stages are crossed step-wise by these structures for their best use. Firstly, the MOF structures that are the best to serve the purposes of green chemical engineering are designed and then with the help of these designs they are manufactured or synthesized. The methods of synthesizing the MOF structures include a general method, green synthesis, scale-up preparation, and many more. The properties of organic solvents such as corrosivity, toxicity, cost, recyclability, and much more cause problems that can't be mitigated (Cui et al., 2016). The presence of nitrates may cause an explosive hazard, and the chlorides can lead to harmful byproducts. Oxides and hydroxides are thus preferred. Special and customized ligands are needed for the production of MOF structure. So, their availability can also be an issue. The applications requiring thin films require the structures whose sizes are nano whereas for storage applications large-sized particles are required for maintaining their stability. The solvents which are non-reactive or non-volatile in nature should not be used while using the MOF structures for various applications. The shaping and conversion into different forms are also the two major necessities while carrying out any reaction using MOF structures (Foo et al., 2014). These are the various challenges that come in the way while doing the scale-up production method for the production of MOF structures for serving various purposes and applications wherever needed or desired in any shape or form. Cheaper design and method of manufacturing, safer units that are used in production, minimum energy input, using non-harmful substances, easy activation, manufacturing at a continuous rate are the factors on which the design of MOF structures has been decided for optimum use (Stock and Biswas, 2012).

1. *Structural characteristics and stability:* The basic structural characteristics of MOF structures include crystallinity, purity and porosity of the substance and the stability categories are thermal stability, chemical stability, mechanical stability, and many more. Now after deciding about the characteristics first the structure is tested whether it is feasible and stable after converting into the desired product. If its testing goes good then further the step of processing is done but if the testing does not take place as per the desired level then the strategies for maintaining the performance and stability are implemented.
2. *Processing:* The MOF structures should be manufactured in a way that they retain their basic properties as well as add some other advantages which are helpful in green chemical engineering. They can be reshaped and can be converted into different forms to make the best use out of them. There are various methods of converting the structures into different forms. These are discussed below:

- In-situ method: This method is also called the direct method. In this method as the name suggests the crystalline powder is initially arranged in different forms at the time of formation of the MOF structures in the shapes of membranes or hollow superstructures.
- Post synthesis method: The other name of this method is the indirect method. In this method, the reshaping of the structures is done at a later stage after the initial formation of the structures in pre-defined shapes.

The common shapes of these MOF structures include the shapes granules, pellets, membranes, foams, gels, paper sheets as well as some hollow structures. However, the shapes are decided on the basis of their applications with the barriers of stability and feasibility (Stock and Biswas, 2012). The various applications of the MOF structures are listed below:

- Adsorption Applications: In this time of fossil fuel depletion and with the increasing trends towards modernization and industrialization environmental problems combined with the other problems create a major throwback to our lives. So, to stop all these various alternatives of these fossils are discovered. For these applications, MOF structures also play a greater role. By the use of these structures, the sources that are made for using them as fuels are not only eco-friendly in nature but also serve a variety of other advantages such as less energy input, mass storage capacity, operation easiness, and regeneration methods. They can also be used in advanced applications such as efficient fuel storage, pollutants removal, water harvesting, and many more.
- Separation applications: The process of separation depends on the adsorption and desorption nature of the constituents present in a mixture. Separation is a process used in the applications such as petrochemistry, mining, fine chemical engineering, environmental management, pharmaceuticals, and many more (Yan et al., 2017). Then to meet the other challenges related to the separation process such as energy consumption, difficult equipment, and safety hazards under extreme conditions (Yan et al., 2017).
- Energy-related applications: With the rise in populations at higher levels each day the demand for fuel consumption is increasing due to which leads to fuel storage as well as environmental pollution. So, there is a high rise in demand for energy resources that are clean, safe, and sustainable in nature (Matsuda et al., 2005).
- Electrical conversion: MOF structures can also be used for electrical conversion purposes such as electrolysis, fuel cells, supercapacitors, rechargeable batteries, and many more electrical conversions (Matsuda et al., 2005).
- Fine chemical catalysis: These structures are also used in this field for the purpose of increasing efficiency, reducing cost and waste, and using eco-friendly products that are the main focus of green chemical engineering. This field includes the processes of oxidation, cycloaddition, hydrogenation, organic catalysis, polymerization, and many more (Bobbitt et al., 2017).
- Commercialization: The need for MOF structures has also risen to fill the gap that is between academic research and commercial or real-life applications. The cost of these MOFs by using the various synthetic methods. So even if the MOF structures are not used for commercialization purposes the urgent need for them can be risen in near future to benefit all living beings to live a healthy and peaceful life (Woellner et al., 2018).

3.10.1 MEMBRANE-BASED METHOD FOR PROPYLENE SEPARATION

Propylene (C_3H_6) is essential in industrial applications since it is frequently utilized to manufacture everyday chemicals. For example, most propylene is used to make polypropylene and other products (Sholl and Lively, 2016). Globally, C_3H_6 production was over 100 million tonnes in 2016 and is predicted to rise at a 3.6% annual rate until 2025. To get high purity C_3H_6, it is separated from components like propane (C_3H_8), which is currently done via cryogenic distillation (Eldridge, 1993). However, due to the comparable physical characteristics of C_3H_6 and C_3H_8 molecules, cryogenic distillation requires a lot of energy. This requires two enormous splitter columns of 180 trays each, resulting in substantial capital and operational expenses (Ren et al., 2006). This procedure consumes almost the same amount of energy. In general, petrochemical energy use is around 40% or 1014 Btu/year. It also cost approximately $50 million to build. Thus, even small improvements to the purification process might result in considerable energy savings when processing C_3H_6 and C_3H_8 combinations. As a result, new low-energy separation methods are urgently needed (Faiz and Li, 2012).

3.10.2 Membrane materials for C_3H_6/C_3H_8

Polymeric membranes' cheap cost and simple processing have expanded their uses. Metal-enhanced transport membranes were developed to overcome the limitations of conventional polymeric membranes, such as poor permeability and selectivity. Unlike polymeric membranes, assisted transport membranes may easily separate C_3H_6 and C_3H_8. The carrier's fragility, however, limited the uses of these membranes (Tanaka et al., 1996).

Polyimide membranes made from dianhydride and diamine precursors have excellent chemical and mechanical stability. They are used in C_3H_6/C_3H_8 separation and have garnered much interest. Solution diffusion dominates C_3H_6/C_3H_8 separation across polyimide membranes (Staudt-Bickel and Koros, 2000). However, due to C_3H_6 and C_3H_8 molecules, this method is insufficient to differentiate them. The inorganic molecular sieve membranes (CMSs, zeolites, zeolite imidazolate frameworks) are superior to polymeric membranes (ZIFs). High separation performance and strong chemical and thermal stability make them suitable for C_3H_6/C_3H_8 separation (Das and Koros, 2010). Polymeric membranes and MMMs are at the trade-off's left-bottom, suggesting reduced C3H6 permeance and C_3H_6/C_3H_8 selectivity. Inorganic membranes like CMS, ZIF-8, and organosilica are situated opposite. Its permeance and selectivity were significantly greater (Swaidan et al., 2014). The price of membrane materials should not be overlooked. Membrane separation of C_3H_6 and C_3H_8 molecules is dominated by solution-diffusion, facilitated transport, and molecular sieving. The separating abilities of organic, inorganic, and hybrid membranes were emphasized, despite certain inherent limitations (Kang et al., 2001). The advancements of organosilica membranes for C_3H_6/C_3H_8 separation has also been highlighted where sol-gel and CVD methods are commonly employed to create organosilica membranes. On silica or organosilica membranes, pore sub-nano-environment engineering is used to improve C_3H_6/C_3H_8 separation characteristics. The C_3H_6/C_3H_8 separation is difficult due to the comparable physico-chemical characteristics of C_3H_6 and C_3H_8 molecules (Liao et al., 2016).

4. DISCUSSION

While literature review depicts that minimal attention had been paid to green, and low-carbon supply networks, the supply chain research has grown a lot for last two decades. Due to climatic change, the study reveals that carbon is an important place to recognize in the supply chain network. The assessment also highlights a significant research gap in understanding organizational behavior concerning external factors such as environmental strain. A new outlook on the network and its constituents, including organizations and other network players, is needed. In times of network stress, this new knowledge emerges (Foo et al., 2018). The practical analysis shows that quantifying carbon footprint of a network is complex, time-consuming, and costly. Today's theories and practices do not adequately address the requirement for a model for assessing carbon emissions (Rahman et al., 2014). Many literatures are found on supply network configuration and design, but not much on improving, green, and low-carbon supply chain networks, especially in manufacturing. This study also shows that sustainable supply chain management is a significant issue for businesses. The current market situation is progressively driving enterprises to embrace sustainability. Professionals are more conscious that business survival and competition guide solutions to social and environmental concerns. However, the study found that not all companies are using sustainable supply chain management. Some companies are suffering from environmental supply chain issues. Others, on the other hand, believe that social problems are vital to supply chain efficiency (Liu et al., 2018a, Liu et al., 2018b). The outcomes incorporated that firms are keenly engaged in enhancing intra-organizational environmental efficiency. Corporate sustainability programs are designed to reduce waste and increase environmental efficiency (UKEssays, 2020). However, firms' commitment to resolving inter-organizational environmental efficiency looks insufficient. Few organizations actively collaborate with supply chain network partners to improve green supply chain management efficiency. Contextual elements such as consumer demand, market wants, type of product, perceived stakeholder pressure, and financial availability influence green supply chain management operations (Sahoo and Vijayvargy, 2020). Many green supply chain management methods and programs have been implemented to improve intra-organizational efficiency, including cost reduction, environmental impact reduction, waste reduction, and operational productivity. However, many organizations lack an environmental inclination at the inter-organizational, upstream, and downstream SCM levels (Gábriel, 2016). To enhance green supply chain management performance amongst businesses, few organizations have well-established internal processes and systems.

The outcomes provided in this research are positive outcomes of successful sustainable supply chain management. An organization's size determines its market-oriented priorities and financial ambitions. According to (Zhu et al., 2005) proximity and inter-company connections can help improve environmental performance. Meetings between the producers continue to adopt and develop new sustainable ideas. In addition, consumer-manufacturer staff cooperation, collective bargaining, and joint R&D will increase the environmental performance (Afroz et al., 2019). Financial indicators are used to analyze companies and track an organization's progress. Due to rising global demand, supply chain efficiency has become a substantial, sustainable source of benefit. The supply chain's actual results are an essential metric of a company's effectiveness. According to (Prajogo and Olhager, 2012), sustainable supply chain management improves individual and total organizational efficiency. Design, source, development, output, and return are all part of the SCOR model.

(Gu et al., 2016) suggested the benefits of sustainable supply chain methods which are as follows-

1. Transport and warehousing are safer, and better working conditions benefit lower health and welfare costs.
2. Lower pricing, shorter lead times, and more consistent products are all benefits of applying ISO 14000 requirements.
3. Sustainability initiatives would appeal to both manufacturers and consumers.
4. Lower labor costs.
5. Price reduction due to the reduction of recycling capacity and product waste.

So, organizations must determine their top talents and keep a detailed record of their strengths. Contextualized measures indicate the extent of ecological supply chain stability with respect to supply system management. To respond more adaptively at suitable levels, sustainable supply chain managers can adopt polycentric processes. As the context changes, they must integrate self-organization mechanisms that allow the supply chain to retain and re-create its identification and adaptation processes (Zailani et al., 2012).

4.1 Economic application

Macroeconomic sustainability is discussed with effectively managing finite resources to foster macroeconomic growth and prosperity. (Kopnina, 2017) links economic flexibility to financial metrics like GDP. It is a spectrum of social challenges anchored in human and natural resources. GDP is defined as total economic output by (Gonçalves et al., 2017). Moreover, critical macroeconomic stabilization components are low unemployment, a good trade, and other favorable monetary and financial conditions (Khan et al., 2021). Generally, national politicians have prioritized economic growth over social and ecological institutions (Saint Akadiri et al., 2019a, Saint Akadiri et al., 2019b). To be economically viable, a company must retain both tangible and intangible assets. Equipment, land, buildings, inventory, and funds constitute tangible assets. Intangible assets include a brand's reputation, inventiveness, ethos, and workers' hidden abilities and talent (Wheelen and Hunger, 2011).

4.2 Environmental Application

Ecological sustainability focuses on limiting the negative environmental impacts of business activity. Unrestrained economic growth is a prime severe threat to the natural world and environmental processes, according to (Kopnina, 2017). It defines environmental sustainability as "protecting and renewing the present and future generations' ecosystem. "Climate change, global warming, pollution, erosion, and biodiversity loss are worldwide challenges. Consumers are quickly forcing corporations to adopt eco-friendly strategies. Companies can help address environmental challenges by adopting environmentally sustainable practices into their

operations. But for some administrators, the expenses of sustainable operating outweigh the benefits. According to (Morelli, 2011), some practitioners consider environmental policies anti-business, reducing corporate efficiency and rising short-term production costs. But now, various proactive businesses are working to improve their environmental efficiency. Environmental conservation is seen as a prerequisite for satisfying various stakeholder groups and establishing a sustainable competitive advantage. (Porter and Van der Linde, 1995) recommended enhancing ecological sustainability while increasing profitability. As well-planned environmental regulations could lead to inventions that reduce or increase a commodity's total cost. These advancements allow enterprises to utilize raw materials, electricity, and labor, reducing costs and breaking the impasse. In the end, better capital efficiency makes enterprises more competitive.

4.3 Social Application

Incorporated social responsibility (CSR) reflects the social components of sustainability, and the terms are sometimes used interchangeably. The company's constant presentation towards ethical acts and grant stated economic growth (Trendafilova et al., 2013). The goal of reducing poverty and improving health in wealthy countries is equity.' Social sustainability addresses a person's cultural, economic, social, and emotional demands. For many researchers, good social capital management is a must. Social capital is a long-term asset of an organization that is not depreciated but refined. Management must provide a pleasant working environment where workers can enhance social and other skills (Kopnina, 2016). For example, (Saint Akadiri et al., 2019a, Saint Akadiri et al., 2019b) investing in human resources, improving workforce skills, encouraging teamwork, networking, and access to information can all help. Social capital also aids a larger organization in enhancing education, eradicating poverty, and addressing hunger and other major societal issues. In addition to maintaining strong community ties, researchers say that businesses that cultivate social responsibility have easier access to credit and a better image. This gives you a competitive edge.

5. CONCLUSION/RECOMMENDATIONS

This research was conducted to clarify how and why the organizations use the methods of sustainable supply chain management. After studying the literature review it was clear that many researchers have tried to find out the connection between several green supply chain management ideas and aspects of the presentation of the component. The significance of sustainable supply chain management is increasing in every organization due to the increased professionalism in the supply chains, globalization, speedy delivery, and the expansion of supply chains. Green manufacturing helps improve resource usage, reduce production costs, and reduce pollution (Simão et al., 2016). The notation "green" should be used in product design, manufacturing, and treatment processes to reduce pollution. The economic implications and recycling the products have been used to study the ecological supply chain but it was found that there was a drawback in understanding and using the best methods in the green supply chain from both practical and theoretical research. No studies were used to consider the consequences on the organizational regulation socially, economically, operationally, and environmentally while launching the 7 SSCM practices i.e., green design green procurement, green manufacturing, lower carbon emission, waste management, network design, and clean production. Also, none of the past studies has been used to examine the developmental practices and the performance of the company as an organization in the manufacturing industries. Moreover, the enterprises are not handling the social and environmental problems, and the constants that depend on the context decide the use of sustainable supply chain management. As per the results, the managements are concentrating more on enhancing the efficiency of organizational supply change management among other organizations. Furthermore, the study witnesses to promote greener supply chain partnerships with the collaborators of the supply chain are desired to optimize the sustainability to a higher extent (Green et al., 2012). Recently, many mathematical optimization models have been created by the researchers to make decisions regarding SSCM as the ongoing business in the recent years that might face new problems due to the subdivisions among the organizations. The main focus of using the mathematical models is to know the upcoming problems. The achievements of the supply chain can reach high over time and solve new problems in different environments. To gain success and more productivity at SSCM, the manufacturing organizations must collaborate with important stakeholders. So, an overall understanding regarding the organizational problems that are affecting the sustainable implementation must be analyzed in different regions. It is expected that the current study would encourage and create awareness regarding the use of sustainable supply chain management with its rules and regulations. Many avenues can be started in the future depending on the overall system stated in the study. The problems that are faced by the sellers can play a major role in the sustainability and manufacturing across the globe which will encourage the researchers to explore the application of sustainability in the supply chain management in developing and developed countries. Therefore, the researchers can focus on developing new methods or models that can be applied in industrial, constructional, chemical and organizational sectors. It is the responsibility of the senior manager or supply managers to install the governance systems to regulate sustainable supply change and convert respectable supply chains so that they can be included in the existing ones. Organizations must define their capabilities and services with a report about how they are better than their competitors. Companies should also bring up their sensitivities regarding internal and external supply chains. Supply chain adaptors must create a supply chain partnership to manage the whole process and maintain the flexibility needed to succeed the business today and regulate the knowledge regarding the supply chain and coordinating it.

Some recommendations to enhance the application and development of sustainable supply chain management focusing greener innovations in the field are stated below:

1. To spread the awareness regarding SSCM and encourage customers to use sustainable products to take over hazardous waste only
2. To increase the lifetime of the products and services by developing different structures to dismantle or assemble them, rather than purchasing new or leasing products.
3. Dangerous materials can complicate the regulations required to control RoHS
4. To dispose of the manufacturing waste according to the procedure and find recycling methods, if available.

5. Encouraging sustainable public system services and public functions conducted with the theories of sustainable growth. Public system services can reduce the development and use of environmental impacts.
6. Promote recycling and renovating by arousing awareness among people to reuse the products by doing campaigns
7. Increase of motivation to use extended products responsibility. Extended product responsibility is a system for environmental safety that concentrates on the polluter pays theory to encourage the creator to take the responsibility of taking the whole drug production process and packaging
8. Create a database office to collect the data regarding production waste management and import-export and keep a record of them.
9. Integrate the skilled laboratories and create reverse logistics team
10. To achieve environmental needs, one must corporate and help consumers, suppliers, and logistic providers to know more about the environment and mitigated emission forms
11. Sustainable supply chains must carry out a poly-centered framework so that the organizations could react more regarding the contacts with their experience and skills at proper levels. A self-organization process should be implemented in the supply chain for its existence and building its identification and conversion mechanism.
12. The efficient management of a sustainable supply chain in different levels should be checked and focus must be kept on planning and operational areas.

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