Evaluating Sustainability in Supply Chain Management Employing the GRI Framework: Insights from Global Manufacturing Companies

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Abstract— *The operational environment of a firm directly influences the success experienced by its customers, suppliers, partners, and employees. A supply chain functions as the primary link in this context. Multinational corporations are disclosing their sustainability initiatives in accordance with the comprehensive directives established by the Global Reporting Initiative (GRI). Organizations use various communication channels, particularly those aimed at investors, to convey sustainability achievements while enhancing the openness of their expectations. This report evaluates the programs of the largest European multinational enterprises based on the Circular Economy. Employing a template analysis approach, the content of sustainability reports is scrutinized to construct a database of Circular Economy initiatives. Significant findings include the extent of implementation of these practices, the level of involvement of supply chain partners, and the reasons that have driven their acceptance. The study's results will provide metrics for executives and decision-makers in manufacturing businesses to assess sustainability or sustainable practices along the whole value chain. To enhance their brand image, profitability, and sustained engagement with diverse stakeholders, firms must assess sustainability. This will result in an increase in sustainability-oriented activities and disclosures. This study aims to delineate a model for a sustainable supply chain that incorporates economic, environmental, and social dimensions to enhance comprehension of the interactions among these three factors and the sustainability of supply chains.*

Keywords— Supply Chain Performance, MNCs, Manufacturing Sector, ESG (Environmental, Social, Governance), SSCM (Sustainable Supply Chain Management), GRI (Global Reporting Initiative).

I. INTRODUCTION

Supply Chain Management (SCM) is the strategic coordination of traditional business activities both inside and across businesses that are part of the supply chain. This is done with the goal of improving the long-term performance of individual companies as well as the supply chain as a whole. The phrase "supply chain management" (SCM) refers to the intricate process of coordinating all of the stages that are involved in the production and delivery of a product or service, beginning with the conception of the idea and ending with the sale of the unit. It includes everything from raw materials to final products, as well as the cash, data, and information that are a part of the supply chain. It also includes the details of the supply chain. Supply chain management (SCM) is a process that tries to produce value and satisfy consumers. It includes activities such as sourcing raw materials, creating completed items, keeping track of stocks, and arranging delivery. Supervising the flow of resources (such as money, commodities, and services) and data (information) from producers to consumers is a necessary part of this process. Supply chain management, often known as SCM, functions as more than simply a logistical function; rather, it is a strategic approach to optimizing the whole value chain with the purpose of maximizing efficiency, minimizing costs, and maximizing customer satisfaction.

1.1 Mastering Market Needs Through Advanced Demand Forecasting

The design of supply chains is strongly dependent on demand forecasting since it provides valuable information about forthcoming market changes, customer preferences, and product demand. It is a cornerstone that plays a direct role in

directing decision-making across the supply chain, from sourcing and production to stock management and delivery. One of the most important tasks that it serves for companies is to assist them in planning for the future by anticipating and assessing the demand for their products or services. By accurately anticipating demand, it is possible to fulfill the goals of optimizing inventory levels, avoiding stockouts or excess inventory, and enhancing the overall efficiency of the supply chain for the whole organization. Through the use of demand forecasting, organizations have the ability to better predict market risks and opportunities, which in turn serves to assist with the process of making strategic decisions. Because of this, businesses are better able to plan for seasonal shifts, changes in industry trends, and changing customer preferences, which in turn reduces the likelihood of inventory shortages or overstocking. The process of demand forecasting is beneficial to capacity planning since it provides insight into production requirements and the distribution of resources. This ensures that companies are able to satisfy the requirements of their customers without squandering money or exhausting their available resources.

1.2 Optimizing Operations - The Art of Capacity Planning

An organization's production capacity, resources, and competences are evaluated and optimized via the process of capacity planning in order to determine whether or not the organization is able to meet the demand that has been placed on it. Precise demand projections, precise evaluations of actual capacity levels, identification of prospective bottlenecks or restrictions, and careful planning of resource allocation are all essential components for effective and efficient operations. Manufacturing, services, healthcare, and logistics are just a few of the many industries in which capacity planning is crucial for improving production efficiency, pleasing customers, managing costs, and achieving complete business success. Capacity planning is also critical for attaining entire company success. Planning for capacity is essential because it allows for the matching of supply and demand, which helps to reduce instances of under- or over-utilization of resources.

1.3 Linking Supply Chain Strategy with Organizational Strategy

Alignment with the goals of the corporation is an essential component in order to guarantee that the supply chain, along with all other organizational activities and initiatives, are moving in the same direction as the overall picture. Keeping everyone focused on the bigger vision is made easier by alignment, which is why it is so important. If the objectives of the company and those of its supply chain are aligned, it will be much simpler to invest resources, including money, time, and effort, in endeavors that will ultimately provide positive results. When this is taken into consideration, the firm can be guaranteed that its supply chain will act as an asset that assists it in gaining a competitive advantage in the market and distinguishing itself from other businesses in the industry. The process of alignment contributes to an increase in both efficiency and effectiveness. Establishing alignment between the activities of the supply chain (including production, distribution, and procurement) and the aims of the corporation may result in the streamlining of operations, the reduction of costs, the minimization of waste, and the improvement of overall performance. Improvements have been made in each of the following areas: operational efficiency, resource use, reaction to changes in the market, and customer expectations.

II. REVIEW OF LITERATURE

Richard Brophy (2024) conducted research examining the evaluation of supply chain management (SCM) methods by insurance intermediaries in Portugal and Ireland, with particular emphasis on possible geographical discrepancies in their judgments. A comparative study approach was used, gathering data via questionnaires sent to insurance agents in Portugal and Ireland. These nations were selected owing to their sophisticated intermediary-driven insurance markets. The findings indicate that some aspects of supply chain management vary markedly between Portugal and Ireland. Nonetheless, the insurance brokers from both nations have similar perspectives on critical elements of supply chain management.

Abdul-Azeez (2024) offered an exhaustive analysis of strategic methodologies for sustainability in multinational companies (MNCs), exploring the frameworks, practices, and obstacles encountered by these global organizations in their quest for sustainable development. Due to mounting challenges from stakeholders, regulatory authorities, and customers, multinational corporations are progressively incorporating sustainability into their fundamental strategy. This analysis examines essential sustainability strategies, including environmental management systems, corporate social responsibility (CSR) efforts, and sustainable supply chain management. The article examines the significance of innovation and technology in promoting sustainable practices, the need of connecting sustainability with corporate governance, and the difficulties of establishing uniform sustainability standards across various geographic locations.

Brian (2025) conducted research with the primary aim of investigating cross-cultural strategic management techniques across global supply chains. The research used a desktop technique. Desk research pertains to secondary data that may be gathered without doing fieldwork. Desk research entails the collection of data from pre-existing resources, making it a cost-effective

method relative to field research, since the primary expenses are associated with executive time, telephone rates, and directories. Consequently, the research depended on previously published studies, reports, and data. This secondary data was readily accessible via online journals and the library. The results indicated a contextual and methodological gap for cross-cultural strategic management approaches.

Ekrem Tatoglu (2021) noted that the three linked dimensions of the triple bottom line—environmental, social, and economic sustainability—are generally recognized; yet, they have been inadequately addressed together in the supply chain management literature. The study comprehensively investigated whether environmental and social performance mediate the connection between environmental management practices and operational performance, and whether operational performance mediates the relationship between environmental and social performance and financial performance. Utilizing a dataset of 208 enterprises across several industrial sectors, the predictions were evaluated via structural equation modeling. The research backdrop for the study was Turkey, a significant emerging market and a critical junction of European and Asian supply chains.

Rebeca B. Sanchez-Flores (2020) observed that in recent years, interest in sustainable supply chain management has markedly expanded in both commercial and academic spheres. This is seen in the increasing quantity of papers, conferences, specialized publications, and websites dedicated to the topic. Nevertheless, sustainable development in developing nations has only just begun to acquire significance. The essay aimed to comprehensively examine the available literature on sustainable supply chain management (SSCM) in developing economies from a global viewpoint. A comprehensive literature review was conducted, examining 56 papers published between 2010 and April 2020 via a descriptive and content analysis technique.

III. OBJECTIVES OF THE STUDY

1. A research based on the Global Reporting Initiative (GRI) framework to investigate the scope of sustainability measures in supply chain management of industrial organizations.
2. In order to evaluate the degree of sustainability in supply chain management with regard to economic, social, and environmental characteristics.

IV. RESEARCH METHODOLOGY

In study design, data collection via large-scale surveys is crucial. Gathering data for the development of the instrument's validation and testing the predicted correlations among variables in the study model are the primary goals of the large-scale survey.

In this section, we will discuss data collecting and research methods used in the large-scale survey.

Using quantitative modeling in empirical descriptive research, the major technique of data collection in the large-scale survey is a quantitative approach. Consequently, a quantitative survey was conducted in India utilizing a standardized questionnaire to gather data from middle and high-level executives of multinational manufacturing organizations.

Questionnaire surveys and in-person interviews provide the backbone of this study's data gathering methodology.

In order to measure sustainability activities in the supply chains of industrial organizations in accordance with the GRI framework, a valid instrument is produced for economic (EC), environmental (EV), and social (SF) factors by quantitative modeling. Focus groups and a pilot scale study were used to check the items of the instrument.

The following paragraphs will detail the methods and technique for data collection, after which you will receive respondent profiles.

4.1 Data Collection for Large Scale Study

In order to validate the produced instrument and evaluate the predicted correlations among variables in the research model, a large-scale survey is used to gather data.

The use of a sample survey technique allows for the collecting of data on a broad scale. Researchers claim that surveys are useful for gathering data because they may gather a lot of information that can be used to test hypotheses about the correlations between variables. Researchers used Google Forms to administer the survey because, as they note, digital and

social media have permeated every level of modern organizations, making data collection via this medium appealing and appropriate for all parties involved. But this kind of study might also have its limitations.

Consequently, efforts were made to enhance the response rate. Because executives in upper and middle management were the ones that filled out this poll. Therefore, they were called and asked to meet in person, with the promise of sharing survey findings upon completion of the study. Executives from manufacturing organizations have limited time, so they were contacted on LinkedIn for engagement and were given gentle reminders, requests and follow-ups to gather/understand survey details. The potential respondents in this survey were meticulously selected. The respondents held positions as manager, director, vice president, or CEO/president and had awareness of their organization's efforts and sustainable policies across the supply chain. The respondents held various employment roles, including corporate executive, buying, manufacturing production, retail, transportation, sales, and others.

The questionnaire was disseminated to approximately 600 respondents from organizations with a nationwide presence in India via LinkedIn and emails, utilizing a database compiled from Yellow Pages, exportersindia.com, and the NASSCOM product/engineering database. Respondents were also contacted through telephone calls and personal visits to select manufacturing organizations in North India. The entities were both global multinational corporations and small to medium-sized enterprises operating in India.

V. RESULT

A small number of multinational corporations (MNCs) control the vast majority of goods and services produced and consumed in Europe's free-market economy. This means they exacerbate the problem of the overuse of natural resources, a leading driver of environmental deterioration. According to reports, 71% of all greenhouse gas emissions since 1988 have been caused by only 100 MNEs.

By rethinking production and consumption patterns, the Circular Economy (CE) model seeks to fix development patterns that aren't sustainable. Economic operations aim to maintain items and resources in use, thereby preventing their waste, which rethinks the end-of-life idea. Multinational enterprises (MNEs) may help achieve the Sustainable Development Goals set forth by the UN by supporting CE-solutions via their extensive supply chain networks on a global and multi-tiered scale.

In this light, numerous MNEs have gone public with their adoption of CE practices, such as making sustainable and repairable goods, implementing solutions to increase product lifetimes, encouraging recycling and remanufacturing in feedback loops that follow, and powering their supply chains with renewable energy. Instead of investigating large and representative samples of MNEs coordinating global supply networks, research on the circular economy has mostly focused on ad hoc case studies in specific contexts and sectors, and on the adoption of CE practices in small samples of companies. Additionally, the factors that led to the spread of CE practices have not been adequately addressed. Green and sustainable supply chain strategies have previously been associated with institutional pressures and supply chain integration (SCI), which may also be associated with CE concerns.

TABLE 1

MULTINATIONAL ENTERPRISE SAMPLE BY SECTOR - MANUFACTURING, AGRI-FOOD, SERVICES, ENERGY

Manufacturing	Agri-food	Services	Energy
Volkswagen AG	Carrefour	AXA Aviva	Royal Dutch Shell
Daimler	Tesco	Allianz BPCE	BP plc
FCA	RA Delhaize	BNP Paribas Vodafone	Total
BMW Group	Auchan	Prudential Telefonica	Enel
Siemens	AB InBev	Ass. Generali ING Group	Uniper
Bosch Group	Louis Dreyfus	Banco Santander Legal & General Group	ENI
Airbus Group	Finatis	Deutsche Telekom Lloyds Banking Group	EDF
Peugeot		Credit Agricole CNP Assurances	Engie
BASF		HSBC Holdings	Equinor
ArcelorMittal		D. Post DHL Gr.	
Renault		Munich Re Group	
Unilever		Societe Generale	
Bayer		Aegon	

TABLE 2
THE SAMPLE BY COUNTRY - FRANCE, GERMANY, UK, NETHERLANDS, ITALY, SPAIN

Country	Companies
France	14
Germany	12
UK	9
The Netherlands	6
Italy	4
Spain	2

TABLE 3
TYPE OF REPORT - DEDICATED SUSTAINABILITY REPORT VS. SUSTAINABILITY INFORMATION IN THE ANNUAL REPORT

Reporting Standards	Companies
Dedicated Sustainability Report	37
Sustainability information in the Annual Report	13

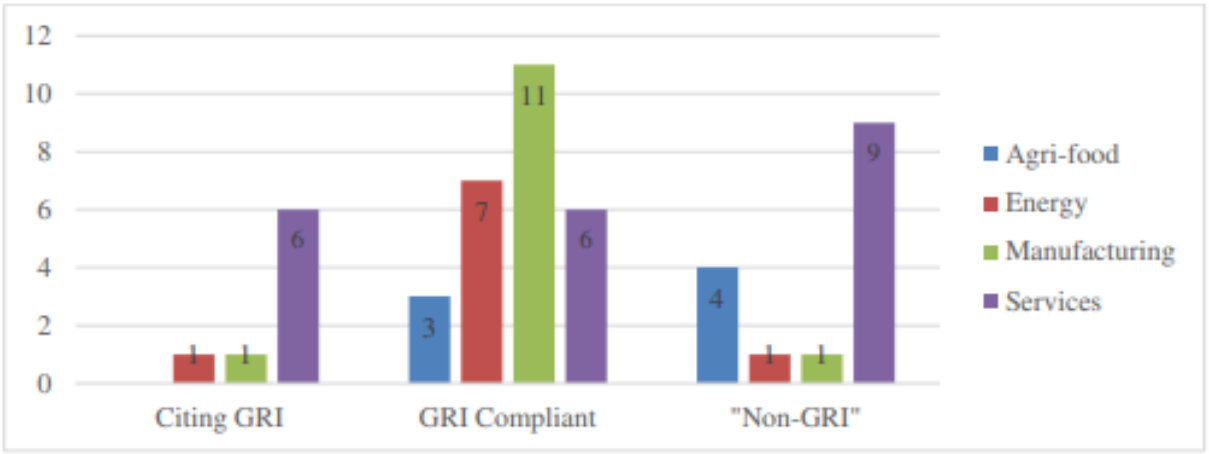

FIGURE 1: Reporting on GRI Compliance by Industry

The group is made up of four types of well-known multinational companies that do business around the world (Table 1). Table 2 shows that more than half of the organizations are based in France and Germany. Equinor and EDF are the only companies that are not owned by the government. All the other companies are private, though some, like Enel, Volkswagen, and Deutsche Post DHL Group, have some kind of government involvement. Most of the companies (37 out of 50) put information about their green success in a report just for that purpose (Table 3). Even though the services and agri-food sectors aren't always following them, GRI reporting standards seem to be generally accepted (Figure 1): 35 organizations either follow these rules or make a clear reference to the GRI structure; they only don't have a GRI index.

A breakdown of the survey data from multinational corporations according to industry. The manufacturing sector is comprised of businesses operating in the automotive, aerospace, chemical, pharmaceutical, and fast-moving consumer goods (FMCG) industries; the agri-food sector is comprised of farms and food and drug stores; the service sector is comprised of banks and insurance companies; and the energy sector is comprised of energy generators and retailers.

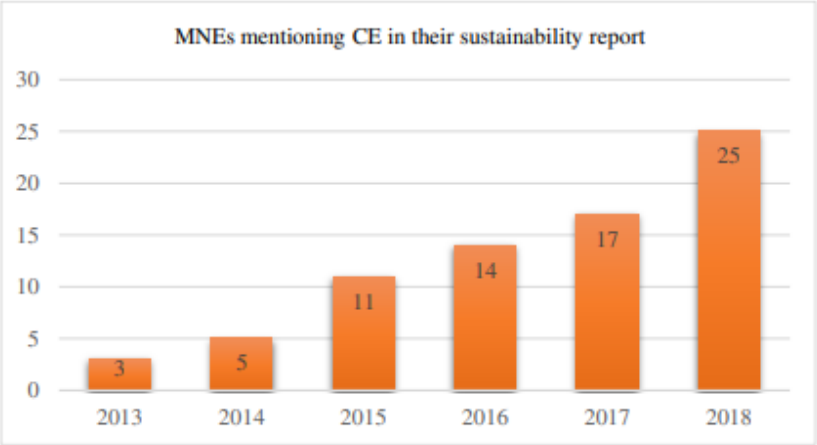

FIGURE 2: The Development of Top 50 EU Organizations' CE Interest

The notion of CE has just recently attracted the attention of organizations; in 2015, only three out of fifty enterprises were referencing it. This might be seen as a direct result of the European guidelines (2015) and the public discussion around CE. Figure 2 shows that in 2018, half of the investigated enterprises made reference to the CE concept in their CS reports, which was the highest level ever documented. Still, only nine organizations included a CE section in their 2018 reports, which may indicate that there isn't a standard way to report on CE procedures.

Each multinational enterprise (MNE) was categorized according to the kind of CE practices that were discovered, the degree of implementation, and the engagement of supply chain partners. In the current moment, innovations that are linked with the reuse of products are being overlooked in favor of practices that are associated with reduction, renewable energy, and resource efficiency. These activities are the most popular practices in the sample. The manner in which each company intends to implement CE is impacted by constraints that are particular to the industry. This section contains a summary of CE procedures broken down by industry, as well as an aggregate of those procedures throughout the whole sample. Both the capacity to complete the loop for key materials and valuable components and the creation of first product-as-a-service prototypes are included among the CE practices that are specified in the manufacturing industry. This includes the automotive industry and other relevant industries. Through the use of remanufacturing programs, customized product lines of remanufactured components have been established in order to meet the demands of consumers in the aftermarket. It is possible to recover materials such as aluminum, steel, polymers, batteries, electrolytes, and graphite by using design for resource recovery concepts, which are essential in the process of putting in place a closed-loop supply chain. On the other hand, Bosch was the sole company to emphasize the need of producing products that had longer lifespans overall.

When it comes to the CE, the energy sector views it as having more to do with waste management, especially plastic litter, rather than moving away from fossil fuels and toward renewable energy. Shell and Total, amongst other companies, are among the founding members of the Alliance to End Plastic Waste, which has committed to making a contribution of $1.5 billion over the course of five years in order to discover solutions to this issue. While this is going on, this problem is being addressed by collaboration with new technology companies: A French company called Synova, which produces high-performance recycled polypropylene, has been acquired by Total. Additionally, BP is collaborating with Neste to increase the supply of environmentally friendly aircraft fuel, and Synova has already provided supplies to Bombardier and Airbus.

In general, the banking and insurance sectors, along with the rest of the service sector, demonstrate a lack of knowledge when it comes to CE and the potential role that they may play in aiding the transition from an economy based on products to one that is based on services. Santander and Credit Agricole are among the leading financial institutions that are at the forefront of offering financing tools to assist enterprises such as Blablacar carpooling members and creative startups such as BNP Paribas in getting their operations off the ground. Other financial institutions, such as Allianz and AXA, are also assisting customers in optimizing their financial choices. In addition, various firms in the financial industry often engage in measures such as divesting from carbon fossil fuels and investing in sustainable alternatives, notably renewable energy for residential and commercial use. The agricultural and food business has implemented a significant number of CE practices, which is rather noteworthy. These practices include, but are not limited to, the rejection of packaging for some product lines and the usage of single-use plastic bags for customers, as well as the use of dynamic product pricing techniques in order to reduce the amount of food that is wasted.

Carrefour's CE score may be determined by utilizing the company's CE processes. During the process of computing the CE score, the maximum score for each type is an intermediate step. In the event that more than one practice of a certain type is present, the value of that practice is the highest level of implementation for that type as a whole.

VI. CONCLUSION

In the process of developing the survey instrument, a pilot test and data collection for large-scale research are discussed. The purpose of this study is to assess the sustainability measures that manufacturing organizations have implemented in their supply chain management. It is detailed how the item generation process was carried out in order to design a survey instrument that is both valid and reliable in order to test the hypothesized connection between the variables in accordance with the purpose of the research study. Participation from both academics and practitioners was required in order to carry out focus group research that included structured interviews and comments for the survey instrument. In addition, in accordance with the approach of the research study, which was described in chapter 3, a pilot study was carried out in order to validate the instrument that was designed. The data collection and analysis procedures for the pilot project, which was conducted in order to verify and refine the instrument that was designed prior to the large-scale survey investigation, are also detailed in the thesis. In addition, the chapters include an explanation of the large-scale study data collection that was conducted in order to evaluate the predicted associations in accordance with the integrative model that was built for this piece of research.

The analysis of European multinational enterprises' sustainability reports reveals that Circular Economy practices are being adopted across manufacturing, energy, services, and agri-food sectors, with varying degrees of implementation. The manufacturing sector leads in closed-loop supply chain initiatives, while the energy sector focuses on waste management and plastic reduction. The service sector, particularly banking and insurance, shows emerging interest in financing the transition to a circular economy. GRI reporting standards are widely adopted among the sampled companies, with 35 out of 50 organizations following GRI guidelines. The findings provide a benchmark for manufacturing companies seeking to assess and improve their sustainability practices along the entire value chain.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this research paper.

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