A Moderated Mediation Model of Lean, Agile, Resilient, and Green Paradigms in the Supply Chain

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***Abstract*— Theorizing and moderated mediation analysis enables supply chain management scholars and practitioners to extend the boundaries of our present knowledge by examining how, when, and why lean, agile, resilient, and green association to capabilities, sustainability, and performance occur. However, only a limited number of studies have addressed this issue because of the complexities associated with their execution. In this article, we provide primary data on capabilities, sustainability, and performance in the supply chain contexts of a detailed model. Also, a widespread review of the literature was presented to motivate the underlying measures associated with the supply chain management paradigms, supply chain capability, sustainability, and performance used to create the study model. This review and subsequent model are intended to support future theoretical and practical investigations of supply chain management paradigms across complex and comprehensive relationships.**

***Keywords*—** Supply chain management (SCM) paradigms, Supply chain capability, Sustainability, SCOR Model

1. Introduction

In today's extremely competitive setting, the marketplace has been gradually defined by manufacturing and competition at an internetwork rather than an intercompany level. As a result, companies are no longer competing with one another; conversely, all supply chain members compete with other supply chains. To survive in this setting, supply chains must encourage and follow new management paradigms in various strategic supply approaches related to sustainable performance [1], [2]. Numerous paradigms have offered contributions based on research, such as lean, agile, resilient, and green paradigms. These paradigms are related to what are known as supply chain management (SCM) paradigms, which ultimately allow companies to become more competitive and sustainable in an unstable and high-demand environment [1].

SCM paradigms are becoming increasingly important. The lean paradigm encourages quality and productivity through the disposal of waste in its various forms while reducing expenses and time as well as improving customer satisfaction [3]; lean focuses on process optimization, facilitation inspection, and the reduction of no value-added operations for the entire supply chain [4]; [5].

The agile paradigm relates to the ability to react quickly and cost-effectively to unexpected market modifications and rising environmental disruption rates, both in terms of quantity and diversity [2]; [6]; [7]. The green paradigm is seen as a philosophy and operational strategy directed to minimize an organization's unfavorable ecological conduct and improve their operations' environmental efficiency while remaining financially sound [1]; [8]; [7]. The resilience paradigm seeks to restore the required scenario within a reasonable timeframe and at a fair cost when a state of confusion happens and to overcome the potential threat in future [1]; [9]; [10]; [3].

SCM paradigms enable firms and their networks of partners to acquire new supply chain capabilities and core competencies [3]. Supply chain capabilities are commonly defined in this context as underlying latent factors and a source of competitive advantage for successful supply chains [11]. So far, considering SCM paradigms a bundle of various resources and capabilities, the competitiveness of such chains comes from their ability to utilize their resources and exploit the supply chain entities' capabilities as a group. Moreover, [12] stressed that supply chain capabilities are a key prerequisite for sustainable supply chain design. As such, it is crucial

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to build SCM capabilities that reflect economic, social, and environmental performance. Consequently, insights into the constitution of supply chain capabilities have a significant effect on sustainability and performance.

An efficient and effective supply chain needs continuous assessment to keep its performance on track. Performance measures should provide inherent mechanisms of how supply chains and their networks are sustainable and competitive [13]. Recently, several performance measures have been found in the literature as well as in practices. One of the most famous performance measures is the Supply Chain Operations Reference (SCOR) model, which has been extensively applied by scholars [14]. The SCOR model adds not only a way to understand how a firm is doing but also provides a collective frame of reference and language across the supply chain networks [15]. Indirect effects on performance are often crucial, but they seem unable to fully capture the complexity of the business reality [16]; thus, the supply chain's complexity has been recognized as the main area of management concern. Yet, the previous research did not address such important impacts theoretically or undertake empirical testing. In this article, we focus on product complexity as a key element of overall supply chain complexity. The main goals of this article are (i) to develop a conceptual framework and analyze the relationships between SCM paradigms and the performance of supply chains emphasizing SCOR performance attributes, (ii) to examine and interpret the roles of supply chain capabilities and sustainability as mediating constructs, and (iii) to illustrate how product complexity relates to these interactions.

This article focuses on the following research questions:

(i) How can lean, agile, green, and resilience paradigms be diffused in the supply chain context? What are the main practices, characteristics, and dimensions of these paradigms?

(ii) How can lean, agile, green, and resilience paradigms contribute to improving supply chains' capabilities, sustainability, and performance? What are the underlying dimensions of those paradigms?

(iii) What are the effects of product complexity on the relationships between SCM paradigms and supply chains' performance?

2. Theories and Related Literature

2.1 Lean Supply Chain

The lean concept focuses on the company's continuous improvement by decreasing expenses through ensuring zero manufacturing defects, keeping small inventories levels close to zero, and having infinite product variety [2]; [17]; [18]; [19]. In the supply chain context, the lean paradigm emphasizes achieving supplier productivity by eliminating the major sources of intraorganizational waste and incorporating the value stream by eliminating interorganizational waste. This implies eliminating no value-added activities and using lean tools not only in the organization but also in the firm's supply networks [1]; [20]. [13] Identified lean supply chain as an approach based on cost saving and flexibility, dedicated to processes improvements, waste disposal from the product design to the product selling, from the customer order to the delivery. In the supply chain context, lean characteristics should incorporate [21]: (i) waste disposal, (ii) a smooth flow of operation, (iii) high efficiency levels, and (iv) quality assurance.

As such, the lean supply chain paradigm should be endorsed by suitable SCM practices, for instance, stock minimization, higher information sharing, just-in-time practices, customer relationship management, a higher resource utilization rate, suppliers' participation in product development, and lead time reduction in both order and information lead times [1]; [22]; [2]; [23]; [3]. Measurement of the lean supply chain requires defining the lean supply chain paradigm's main characteristics and indicators as shown in Table 1.

2.2 Agile Supply Chain

According to [28], an agile supply chain represents the rapid response of all a firm's partners to the ever changing and continually fragmenting markets. In addition, [21] asserted that an agile supply chain is designed to react rapidly and cost-effectively to unexpected changes in markets and high-turbulence settings. A true agile supply chain should therefore have set goals and characteristics, namely [2]; [21]:

- Market sensitivity that can read and respond to actual demand.
- Being virtual, in which information is not only based on inventory.
- Integration of processes to guarantee collaboration between customers and vendors.
- Network committed to closer and more responsive customer relations.

In the supply chain context, these indicators were used to measure agility, incorporating the response to changes in mode and client taste, and flexibility in manufacturing processes and quantity [29]; [18]. Other works such as [2]; [21]; [30]; [21] proposed customer sensitivity, virtual integration, and the integration of processes and networks, as shown in Table 2:

Table 1: Lean supply chain dimensions

Major Dimensions/ Lean supply chain	Indicators	Supporting references
1. Quality: (Bring unlimited product or service range to clients that fulfil their expectations. This goal can be achieved if the organisation has close relationships with suppliers and clients, including a sophisticated customer relationship system)	Product and/or service quality; quality of the partnership ; customer reject rate; in plant defect fallow rate; and quality of information sharing	[1]; [24] ; [25] ; [2] ; [18] ; [26] ; [3] ; [27]
2. Cost: includes (Accretion a value flow to decrease waste, involving time, quality inspection and delivery time to customers, the logic behind expenses is to assign value streams for each product or service from idea generation to consumption and optimize this value stream into intra-organization and extra-organization)	costs of production; cost-effectiveness of quality inspection and enhanced integration of design effort; cost per hour of operation; elimination non value-added activities; flexibility in new products development	[1]; [2]; [18]; [26]; [3]; [27]
3. Lead time :(This involves a reduction in the time required to transport the raw material from the seller, as well as a short order positioning and delivery)	lowering in supplier lead time; lead time from order placement to delivery; cycle time of manufacture,	[1]; [2]; [18] [26]; [3]; [27]

Table 2: Agile supply chain dimensions

Major Dimensions/Agile supply chain	Indicators	Supporting references
1. Customer sensitivity: (focuses on creating cooperative customer relationships in terms of understanding customer needs and responding quickly to the evolving aspirations of the customer)	Market knowledge ; proactive search for fresh emerging markets ; enrichment of customers ; market reaction; separately handled customers	[1]; [31]; [32]; [21]; [30]; [21]
2. Virtual integration: (involves leveraging information across the supply chain ; it embraces the system that links upstream and downstream suppliers, retailers, distributors and all supply chain members	Leveraging information in the daily company and supply chain framework ; cooperative organizational work	[1]; [32] ; [34] ; [21]; [30]; [21]
3. Process integration: (emphases on core competences for changing business processes)	Building teams of buyers and vendors ; joint product development ; common systems and shared information; information sharing	[1]; [33] ; [32] ; [34] ; [21]; [30]; [21]
4. Network integration: (the use of information throughout the supply chain; coordinate supply chain activities to maximize supply chain performance)	coordination with partners; leverage the strengths and competencies of partners	[32] ; [34] ; [21]; [30]; [21]

2.3 Resilience Supply Chain

Higher rates of turbulence and volatility could occur in an ever changing marketplace. The supply chain is therefore vulnerable to disturbance [13]. Moreover, [10] Highlighted that resilience can be seen as a new way for supply chains to give a business-driven response to disruptions or threats. It could also be regarded as the supply chain's ability to deal with unexpected disturbances and its ability to return to its original or a new state after being disturbed as well as to avoid these distractions in the

future [1]; [13]. Largely, the resilient paradigm addresses changes in the firm setting in the same way as with agility. Nevertheless, [35] pointed out that agile focuses on the threats and opportunities in the business setting to take advantage of the change, while resilient focuses only on the business' adverse occurrences if the organization is disturbed. Resilient also varies from classical risk management, which primarily involves incidents with a high effect and a high probability of occurrence.

The primary objective of resilience is to effectively respond to disturbances and adverse occurrences. This implies recovering the required situation within an appropriate time period and at a reasonable cost through flexibility and redundancy while also altering a potential threat's efficiency [35]; [13]. In this sense, building resilient supply chains has four main conditions [1]; [36]: (i) choosing supply chain strategies that keep multiple options open, (ii) balancing between efficiency and redundancy, (iii) developing a collaborative working environment with suppliers, and finally (iv) developing visibility and improving speed and acceleration.

To measure resilience in the supply chain context, the resilience paradigm's key dimensions and indicators must be identified. Numerous research-based contributions have identified four measures to assess resilience in the supply chain context, as shown in Table 3.

Table 3: Resilience supply chain dimensions

Major Dimensions/ Resilience supply chain	Indicators	Supporting references
1. Capability: Management's role in responding to environmental factors by adjusting, incorporating, and reconfiguring resources, organizational abilities, and functional abilities to predict and overcome disruptions.	Redundancy; Efficiency; Integration; and Flexibility;	[1]; [2]; [37]; [38]; [39]
2. Design: An enormous number of choices depending on the density, complexity and criticality of the supply chain nodes.	Alternative transportation; backward linkage; alternative market, ; and alternative sourcing,	[1]; [2]; [37]; [38]; [40]
3. Readiness: Take alternative measures proactively to reduce vulnerabilities and get ready to mitigate disruptions.	Forecasting; readiness resource; hedging and security; and readiness training.	[1]; [2] ;[37] ; [38]
4. Response-Recovery: The capacity to return to the original condition after being disturbed.	Quick recovery; Impact reduction; Quick response; Loss absorption,	[1]; [2]; [37]

2.4 Green Supply Chain

With changing environmental awareness and growing societal pressure, customers are forcing companies to efficiently integrate environmental concerns into their leadership procedures [41]. In this sense, the green supply chain covers all supply chain activities, from green purchases to integrated lifecycle management to manufacturers and customers and closing the loop with reverse logistics [42]; [1]; [43]; [44]; [3]; [41]. As such, numerous green practices have been developed, namely: green production and packaging, environmental involvement, green marketing, green distributors, green inventory, and green eco-design. Implementing these practices can help firms achieve sustainable production and a competitive advantage [42]; [4]; [44]; [45]; [46]. [46] pointed out that greenness in the supply chain context can reduce the environmental impact of industrial activity without sacrificing quality, cost, reliability, performance, or energy efficiency; complying with environmental regulations not only minimizes environmental damage but also generates overall economic profits. In particular, the green supply chain should have the following practices [1]; [42]:

- **Green Purchasing**: The integration of suppliers with environmentally friendly manufacturing procedures and business activities using environmentally friendly raw materials. This implies that the company chooses its partners or suppliers on the grounds of several criteria when purchasing products or parts from green vendors. These criteria require suppliers to follow environmental quality standards; suppliers should also monitor hazardous substances and obtain green certificate achievements granted by the International Organization for Standardization (ISO), such as ISO 14001, OHSAS 18000, and/or RoHS Directives.
- **Green Design**: Developing a product or service that promotes the environmental factors related to the safety and health of the environment throughout the product's lifecycle. This includes

using materials and processes that are less problematic than potentially hazardous materials and processes as well as designing under legislation and regulations and designing for remanufacturing; designing for recycling is important, making better material choices.

- **Green Manufacturing/Operations**: Reducing the environmental impacts of all item manufacturing, use, processing, logistics, and waste management aspects once the design has been completed. This also includes pollution decrease and the conservation of renewable and nonrenewable natural resources.
- **Green Distribution:** Green packaging and green logistics are included. Packaging characteristics such as size, shape, and equipment affect the distribution due to their impact on the product's transport characteristics.
- **Reverse Logistics:** A set of arrangements for the recovery of value or value including the planning, implementation, and management of an efficient, cost-effective flow of raw materials into stocks, finished products, and related information from the point of consumption to the point of origin.

To evaluate greenness in supply chains, five main green dimensions have been recognized based on literature, as shown in Table 4.

Table 4: Green supply chain dimensions extracted from the literature

Major Dimensions/ Green Supply Chain	Indicators	Supporting References
1. Internal environmental management: Management's role in incorporating environmental issues into organisational practices. This includes reformulating present mission and policies and reassessing the potential costs of adverse environmental behaviour.	Environmental mission of the company; Multinational internal policies; Potential responsibility for the disposal of hazardous waste; Costs of waste disposal; Costs of environmentally friendly goods and packages	[1]; [44]; [45]; [41]; [46]
2. Green purchasing: Involving vendors in manufacturing using raw materials that are environmentally friendly; and choosing green suppliers who comply with environmental quality standards, who control hazardous substances and who seek to obtain green international certificates (e.g. ISO 14001, OHSAS 18000 and/or RoHS directives).	Application of technical standards for raw materials; Audit of the environment for suppliers; Controlling Suppliers through ISO14000 certification.	[44]; [45]; [41]; [46]
3. Pollution: this involves waste, energy and pollution reduction ; minimizes environmental hazards ; and improves the goodwill of the community	Reducing negative impacts on soil; Incorporate the reduction of waste water and air pollution into the internal process	[44]; [45]
4. Eco design and packing: rely on eco-design and packaging are based on non-environmentally hazardous materials	Design in accordance with environmental legislation and regulations; remanufacturing design; Design products that can be recycled	[44]; [45]; [41]; [46]
5. Cleaner Production: Contributes to small environmental effects in all manufacturing elements, including usage, handling, logistics and waste management	Lower environmental impact in all aspects of manufacturing of products; multi usage; handling; Logistics and waste management after the design has been finalized	[45]; [41]; [46]

2.5 Supply Chain Capabilities

The current literature offers various definitions and interpretations of the supply chain capabilities concept [47]. In general, *supply chain capabilities* refers to an organization's ability to identify, employ, and absorb both intra-and extra resources or information to simplify the entire supply chain activity [48]; [34]. [11] argues that supply chain capabilities can be seen as building blocks and the main source of a firm's competitive advantage and success; the rationale for capability consideration is comprised of fundamental, hidden factors, which are combinations of SCM practices designed to meet customer requirements. Comparably, [49] pointed out that supply chain capabilities are a set of abilities and resources created through multiple strategic approaches to supply chains; therefore, the value of supply chain capabilities may be influenced by the implementation of the distinct supply chain

paradigms. Supply chain capability is a key part of supply chain strategy and determines all supply chain behavior [3].

Defining supply chain capabilities is difficult to assess [2]; however, several classifications for supply chain capabilities are noted in both the literature and in practices. This involves, but is not restricted to, capabilities for efficiency effectiveness [50] or efficiency-related capabilities and effective-related capabilities. The latter relates to the classification of effectiveness, which achieves logistic performance at a lower cost. The efficiency enables organizations to maintain relationships with supply chain partners and to respond to consumer requirements. As such, it enables firms to establish strong relationships with supply chain partners and to comply with consumer requirements. Other supply chain capabilities as suggested in the literature are categorized as logistical and relational capabilities [51]; [52]; [53]; [54] and technological or informational capabilities [55]; [56]; [57]. Table 5 shows some SCM studies with an emphasis on the capability dimensions extracted from the literature.

Table 5: Supply chain management studies with an emphasis on the capability dimensions extracted from the literature.

Dimensions of Supply chain Capabilities	**Supporting references**
Relational capabilities	[48]; [58]; [53]; [54]; [63]; [64]
Integration capability	[48]; [60]; [61]
Logistics capabilities	[53]; [54]; [63]; [57]; [64]
Supply chain responsiveness	[54]; [56]; [34]
Organizational culture capability	[53]
Technological capabilities	[55]; [57]
Collaborative capabilities	[55]
Information exchange	[58]; [56]; [34]; [11]
Coordination	[48]; [58]; [62]; [56]; [34]
Inter-company activity integration	[56]; [34]
Structural capability	[57]
Customer Service	[50]; [59]; [22]; [11]
Quality	[65]; [11]
Flexibility	[50]; [59]; [11]
Productivity	[11]
Delivery speed	[11]
Demand scheduling	[50]; [59]
Cost optimization	[50]; [59]; [11]

From the previous table, it is noted that the relational and logistic capabilities are the most frequently cited, as they reflect efficiency and effectiveness capabilities. In addition, the supply chain's response or responsiveness capabilities can also be considered efficacy-related capabilities, since responsiveness means responding to consumer requirements in order to maintain customer relations. Furthermore, [53] suggest that organizational culture is a new capability when the supply chain operates in a global context. Other studies such as [55]; and [57] propose technological and collaborative capabilities as new capabilities achieved when a company employs an information technology strategy and adopts a new process to interact with customers, suppliers, and other supply chain partners. In addition, the supply chain's remaining capabilities (information exchange, coordination, integration of intercompany activities, structural capabilities, customer service, quality, flexibility, productivity, delivery, speed, demand scheduling, and cost optimization) have been conceived as a second-order construction. Based on the discussion in conjunction with the items in Table 5, we argue that supply chain capabilities can be categorized as follows: (i) logistical capability, (ii) relational capability, (iii) technological capability, (iv) organizational culture capability, and (v) supply chain responsiveness.

Other categorizations have been offered in the literature [48]; [66]; [58]; [50]; [56]; [57]; [59] [11] and can be used as indicators and/or sub dimensions of our categorization in the current study, as these dimensions belong to one or more of the preceding categorizations. For example, logistical capabilities include intercompany integration, quality, flexibility, productivity, and cost optimization. Coordination, flexibility, customer service, and scheduling demands are relational capabilities, while the exchange of information falls under technological capability. Structural capability belongs to organizational culture capability. Lastly, supply chain responsiveness includes customer service, delivery speed, and flexibility.

2.6 Supply Chain Sustainability

Because of the shift in the marketplace and in the company setting, firms' main organizational responsibilities have expanded from an internal to an external level: to supplier, distributor, manufacturer, transporter, retailer, warehouses, and clients within the supply chain [70]. *Supply chain management* refers to the integration of key business processes, starting from original suppliers to end users, by providing products, services, information, and business processes that add value or utility to customers and other stakeholders [71]. Consequently, an observance of the interactions between companies (supply chain actors, e.g., supplier, distributor, manufacturer, transporter, retailer, warehouses, and customers) should be incorporated into the supply chain scope. Scholars have gradually recognized that supply chain actors are likely to be urged by external and internal pressures to act in a manner that is socially responsible and economically and environmentally sound [67]. Recognition of this phenomenon could be the beginning of the discipline of sustainable SCM.

In addition, [68] argued that a sustainable supply chain relates to the strategic, transparent inclusion and accomplishment of the social, environmental, and financial objectives of an organization in the systematic coordination of important interorganizational business processes to improve the long-term financial performance of each company and its supply chain partners. This representation may be linked to the triple bottom line (TBL) principle or the Sustainability Tripartite Model (the economic, ecological, and social dimensions) [69]; [72]; [73]; [74]; [75]. So, sustainable supply chain solutions seem to be profitable, environmentally friendly, and increasingly socially conscious. The unified description of sustainability in the supply chain is, as provided by [76], managing supply chain operations, assets, information, and funds to maximize profitability in the supply chain while minimizing environmental impacts and maximizing social well-being.

As such, capitalizing on environmental performance indices enables companies to reduce environmental influences and to produce better environmental performance in air emissions, wastewater, and solid waste reduction as well as the decreased consumption of hazardous/harmful/toxic materials and the reduction of environmental accident frequency. It also leverages the organization's economic and competitive position [44]. Social well-being relates to how the supply chain can satisfy its staff, clients, and the wider community; it also means a sustainable supply chain that could enable businesses to achieve various goals by maximizing their earnings and lowering their operating costs in light of environmental impacts. However, maximizing social well-being will add to the supply chain's operating costs. These objectives may be conflicting and challenging for supply chain managers when multiple decisions are possible [2]; [76].

The development of sustainability initiatives in the supply chain can be derived from the supply chain strategy itself. As a result, all actors in the supply chain agree on common objectives, and all actors should consolidate those objectives in their operations. Organizations must create sustainable projects and policies that are well managed independently of one another to attain sustainability [68].In addition to that, [77] underscored that to achieve sustainability, organizations must develop sustainability initiatives and strategies very closely in a state of being managed independently of one another. For that reason, the starting point for this perspective assumes that lean, agile, resilient, and green paradigms are likely to have positive impacts on supply chain sustainability. More analytically, information from the carefully chosen literature is used as inputs for analysis, including measurements of perceptions on particular environmental, economic, and social dimensions/performance items observed from distinct industries; see Table 6.

2.7 Supply Chain Performance and the SCOR Model

In the SCM literature, there are too many performance indices and measurement frameworks to create clear knowledge and select an appropriate one. Generally, supply chain performance measurement frameworks can be commonly classified as singularity or hybrid frameworks [79]. Singularity frameworks have been described as original pieces of work, such as the Activity Based Costing (ABC), the Balanced Scorecard (BSC), and the SCOR models. In contrast, hybrid frameworks are established by incorporating two or more singularity frameworks (partly or completely) into a new structure, thus disabling the singularity frameworks' flaws. The hybrid frameworks developed by [80]; [81]; [82]; or those developed by [87]; [83]; [79]; and [69] are examples of such innovations. Nevertheless, poor harmonization between metrics in two distinct contexts is a prevalent issue with the use of these frameworks.

The SCOR model offers a distinctive framework that connects performance metrics, processes, best practices, and individuals in a unified structure. This model has frequently been acknowledged as a systematic approach to supply chain performance identification, evaluation, and tracking [84]; [79]; [85]. A balanced multilevel performance measurement system has been developed in the SCOR model, covering five key supply chain processes (Plan, Source, Make, Deliver, and Return)

[86], where its function in production planning points to Plan, its connection to ordering and ideal decision-making is representative of Source, and lastly its significant role in creating an optimum model for manufacturing and distribution scheduling points to Make and Deliver and an algorithm for vehicle routing issues in delivery.
The performance indicators are divided into five attributes that preserve the equilibrium between financial and nonfinancial metrics, namely: reliability, responsiveness, agility/flexibility, cost, and asset. The first three metrics are directly linked to the customers and are therefore referred to as "customer facing." The remaining metrics, the measurements within the supply chain's internal operation, are referred to as "internal facing." The SCOR model sees each metric as a performance attribute that can be used separately to evaluate any of the supply chains within this attribute. Largely, the SCOR model is more detailed than other frameworks, owing to its extensive list of 589 well-documented metrics arranged at process detail levels [84]; [79]; and [86].

Table 6: Dimensions of supply chain sustainability extracted from the literature

Major Dimensions/ Supply chain sustainability	**Indicators**	**Supporting references**
1. Environmental sustainability: (The environmental sustainability dimension relates to inputs such as energy, water, materials, etc. and outputs such as waste, emissions, etc.).	Adopting standardized environmental system; Resources utilization; emissions control; ISO 14000 certification; landfill waste; hazardous material content; reduction in energy consumption; reduction in the use of ozone-depleting substances; and reduction in frequency of accidents ;environmental compliance	[69]; [72]; [2]; [44]; [10]; [73]; [74]; [76]
2. Social sustainability: (An organization's social sustainability is how it manages its duties towards its social and human capital).	Society impact; vendor assessment includes social factors; career growth opportunities; salaries/wages; healthcare advantages; and hours of worker safety training	[69]; [72]; [2]; [44]; [73]; [76]; [78]; [75]
3. Economic sustainability: (Economic sustainability of the organization describes the allocation and flow of economic resources among the stakeholders of the organization and its impact on the environment and on society).	Income distribution; efficiency; market competitiveness, order fill lead time; defect rate; product cost; transport cost; level of productivity; profitability ratio ; ISO 9000 certification, quality management system in use and cost of goods/services sold	[69]; [72]; [2]; [44]; [73]; [74]; [76]; [78]

More specifically, the SCOR model consists of three levels of processes. The first level is the top or strategic level that sets the scope and content at the highest level of SCM processes. Processes at this level embrace following: Plan, Source, Make, Deliver, and Return. The SCOR model's second level is the configuration level. Supply chain processes are divided into three categories at this stage: Planning Processes, Execution Processes, and Enable Processes. The planning processes include all the processes necessary for the supply chain's execution. This can be done by crossing over the configuration processes (level 2) and the strategic processes (level 1). (Example: Plan-Supply Chain, Plan-Source, Plan-Make, Plan-Deliver, and Plan-Return). The execution processes are all procedures that convert the state of the basic material supplied to the customer into finished products. The execution processes are classified according to the product type in the SCOR model as follows: a make-to-order product or an engineer-to-order product. The third level is the "decomposition level," which decomposes the second level processes into their corresponding sub processes. Each process is abstractly described at the decomposition level; process inputs and outputs are recognized, the process is connected to its neighboring performance metrics, and the process' best practices are listed [88].

2.8 Product Complexity

The notion of product complexity is related to the number of elements or components required for the product's production [89]. From a technical perspective, [90] define product complexity as the difficulty in the generation or production of parts or components. Product complexity therefore reflects two aspects: (i) structural complexity (number and range of components) and (ii) operational

complexity (element interactions) [91]. Complex products may include elements or components/parts with varying technical specifications and lead times [89]. The more complex the final product, the more difficult it is to define all the requirements and production schedules [90].

To measure a product's complexity, three dimensions should be recognized as follows [89]; [93]: (i) an integrated design; (ii) the bill of material's complexity; and (iii) the number of operational steps required to build the plant's product. Moreover, [92] identified 14 key factors contributing to product complexity, including the variety of sizes, designs, materials, products, processes, and components, the product modularity, the number of parts/components needed to construct a product, the difficulty in generating the different parts, the interactions between the parts/components, the degree of product novelty/newness, the production volume of running products, the degree of order within the product elements' structure, and the complexity of the product's structure. In addition, [94] found that the product's complexity had a direct impact on the supply chain's performance. According to [95] few studies have suggested a correlation between SCM paradigms (lean, agile, green, and resilient) and the level of product complexity. To this end, this article conceptualizes product complexity as a moderating variable that affects the overall performance of the supply chain.

3. Methodology

To capture the relevant literature, a systematic content analysis technique has been used. Following the guidelines of [96], the criteria for the systemic content analysis include: (i) a selection of appropriate computerized databases; to this end, well-known publishers such as Emerald, Elsevier, Taylor & Francis, etc. were used for searching keywords; (ii) the identification of appropriate keywords; for these criteria, all the names of the supply chain or logistics journals were considered; (iii) a review of abstracts; and (iv) an extensive review of the selected literature. The selection criterion was (i) searching for articles published in peer-reviewed scientific journals in English and (ii) searching for articles published in the last 10 years and selecting articles containing at least one keyword in their title or abstract while (iii) excluding articles on very limited elements or contexts. Following the selection of the most relevant literature, a detailed and comprehensive bibliographic analysis was carried out.

The primary objectives of this article are (i) to develop a conceptual framework and to theorize the connection between supply chain paradigms and supply chain performance underlining the SCOR performance features, (ii) to analyze and interpret the roles of supply chain capabilities and sustainability as mediating constructs, and (iii) to demonstrate how product complexity relates to these interactions.

4. Conceptual Framework

The main premise of this article is that SCM paradigms are needed and should be stimulated to acquire new capabilities and core competencies along the company's supply chain network. However, this may require a low degree of product complexity to reconcile discrepancies among supply chain practices, which will likely result in a sustainable, efficient, and effective performance. The model is illustrated in Figure 1.

4.1 SCM Paradigms and SCM Capability

The lean approach seeks to find methods to manage variability and create supply chain capability through a more effective use of resources than traditional schemes [27]. Such an approach could develop logistical or cost-optimization capabilities over competitors and improve the supply chain's overall performance. The resilience approach also relates to the ability to recover from disturbances related to the development of responsiveness capabilities through flexibility and redundancy [35], thus enhancing the firm's performance. The agile approach is designed to respond quickly and cost-effectively to unforeseen market changes and turbulence [21]. As a result, agile is linked to the development of responsiveness and cost-effective capabilities through flexibility and integration into vertical, process, and supply chain networks, resulting in a high performance. As the green approach is designed to improve a strong ecological image, it is therefore sustainable and maintains a higher level of performance.

4.2 SCM Capability and SCM Sustainability

Supply Chain capabilities are essential for the sustainable development of the supply chain [12]. When supply chain capabilities have been developed, environmentally sound practices can easily be disseminated across a complex network of industrial purchases and sales, where sustainable practices are part of the supply chain's capability [49]. As noted, to provide support for the supply chain's sustainability, it is essential to build capabilities that reflect economic, social, and environmental performance. Besides, when the company reacts to client and community requirements at all, these actions represent the company's social performance. Logistical capability is concerned with cost optimization from upstream to downstream, reflected in strong economic results. Environmental sustainability essentially needs skills

in technology, relationships, and collaboration that reflect relational capability in the supply chain. In addition, there is evidence from the literature on the potential impact of supply chain capabilities on supply chain sustainability. Collaborative capability is deeply concerned with the sharing of materials, information, risk, and resources among supply chain organizations; therefore, cost optimization and resource utilization will improve environmental image and performance.

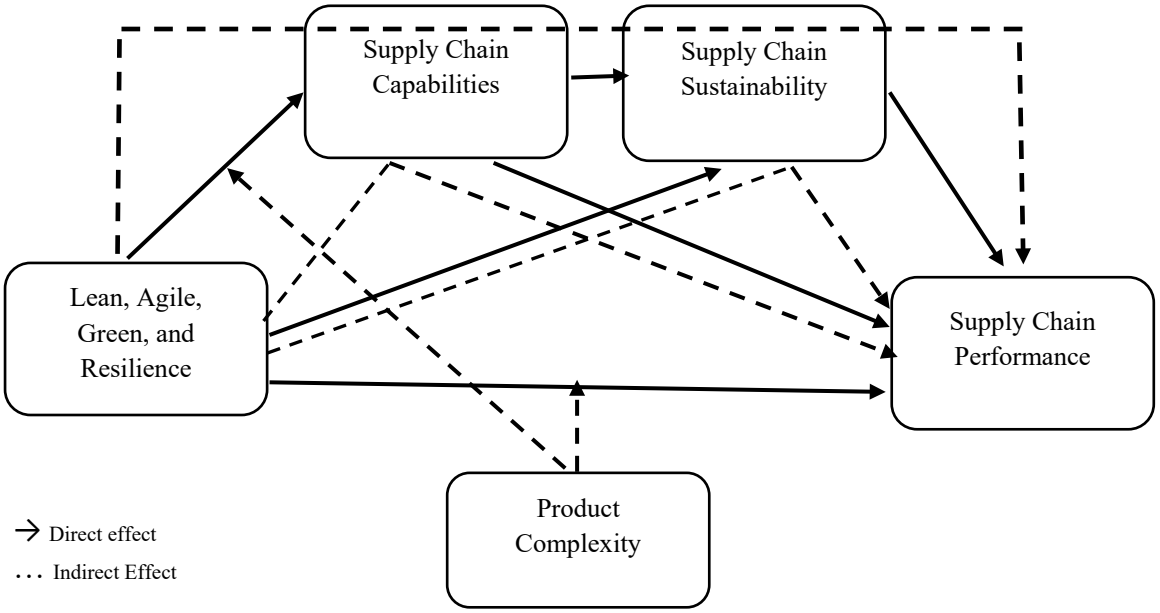

Figure 1. Proposed conceptual model

4.3 SCM Paradigms and Sustainability

The lean philosophy focuses on eliminating nonvalue-added activities, making best use of resources, and reducing costs. This allows firms and their supply chain networks to become economically sustainable. It also focuses on continuous improvement and the implementation of total quality management practices. The aim of the abovementioned arrangements is to provide customers with high-quality products or services and, as a result, to promote environmental performance. The agile paradigm concerns cost reduction and economic sustainability as well as responding to customers and community needs, thereby satisfying them at an appropriate price and quality, in the right condition and place, and at the right time, thus achieving social well-being. The green philosophy concerns the integration of environmental practices into the supply chain network, with a focus on green procurement and production, a reduction in the consumption of hazardous and toxic materials, and a reversal of logistics that fully promotes environmental concerns. In particular, there is empirical evidence in the literature on the potential effect of lean, green, and resilience paradigms on supply chain sustainability e.g., [97]; [74] underscored the beneficial effect of SCM paradigms on supply chain sustainability.

5. Conclusion

In conclusion, this study contributes to the body of literature by first developing a more complex, comprehensive model that investigates the direct relationship between SCM paradigms and supply chain performance and the indirect mechanisms by which supply chain capability and sustainability mediate this relationship. This research also tries to demonstrate how product complexity relates to these interactions by providing a systematic content analysis for supporting the hypothesized model. Second, scholars can develop empirical research studies using the proposed model to better explore the proposed relationships.

Although the study's goal was effectively achieved, the study's limitations should be observed. The SCOR model indicators are underexplored because the SCOR model is more detailed than other frameworks due to its extensive list of 589 well-documented metrics arranged at the process detail level. In addition, no validation of the conceptual model has been carried out. Future research requires testing the relationships derived from the current model and the development of scales for both the SCM paradigms and performance dimension

5.1 Theoretical and managerial contributions

This research's contributions are in twofold. First, this study advances the literature on supply chain management paradigms by expanding research on the capabilities, sustainability and performance of

the supply chain and offering a set of measures for other scholars to consider these variables. These measures were presented to assist scholars and practitioners in developing empirical research studies that could better explore the proposed influences. The study also underlines the notion that product complexity (structural complexity and operational complexity) makes it more difficult for members of the supply chain to define all requirements and production schedules, thus affecting the overall performance of the supply chain. This is an extremely attractive fact, not just for academics and scholars, but also for practitioners.

Second, this article is more useful for practitioners than the traditionalist view of supply chain researches. This is because it sets out guidelines for a moderate mediation analysis to make the appropriate decisions and to make a clear understanding of the factors affecting the overall performance of the supply chain. Such guidelines encourage scholars to broaden the limits of our current knowledge by exploring how, when and why lean, agile, resilient and green linkages to supply chain performance, with particular emphasis on SCOR performance attributes.

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