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Review

Supply Chain Management: A Structured Narrative Review of Current Challenges and Recommendations for Action

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Abstract: *Background:* By examining the recent advancements in technology, particularly the transformation of material into digital flows and its impact on customer demands, the aim of this paper is to investigate supply chain management (SCM) by analyzing seven key constructs: uncertainty, perspective, topicality, coordination, flow, job to be done, and connection. These constructs were chosen since they reflect evolving SCM practices that motivate this study. *Methods:* We conducted a broad, structured narrative review to comprehensively address the extensive SCM literature. This approach allowed us to evaluate the current state of SCM research and offer recommendations for overcoming prevailing challenges. *Results:* Our findings reveal the significant impact of technological advancements on SCM operations, requiring companies to adapt and remain competitive. We envision future supply chains as dynamic networks of networks, necessitating the adoption of a value architecture concept that extends a firm's business model to an ecosystem business model. *Conclusions:* Considering these changes, our study recommends exploiting uncertainty, adopting demand-driven systems, offering on-demand customized services and products, utilizing prescriptive analytics, prioritizing information flows and services, and embracing open systems with high interoperability. Summarizing these opportunities and challenges that arise with changes in SCM provides interesting venues for future research and valuable insights for practitioners.

Keywords: supply chain management; uncertainty; on-demand; interoperability; ecosystem; job to be done

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1. Introduction

In the last decades, the world of supply chain management (SCM) has evolved into a "new" one characterized by digitalization, servitization, sustainability orientation, and changing customer behavior and expectations. The Internet, Internet of Things (IoT), data analytics, social media, and socially linked data are changing processes, systems, and ways of thinking [1] and working [2]. Digitalization and additive manufacturing enable the transformation from material to digital flows [3]. Servitization and customization lead to higher customer orientation [4]. Sustainability increases perceived economic, environmental, and social responsibility [5]. Generation Z displays new buying behavior and customer expectations [6]. All of this provides new opportunities and challenges further amplified by supply chain (SC) disruptions and volatile business environments.

Complex and dynamic global industrial SCs were first addressed by Forrester [7], and SCM was introduced in the early 1980s [8]. The work of Houlihan [9], which precedes modern SCM, integrates various organizational areas to improve the flow of goods from suppliers to the end consumer via production and distribution chains. Over the years, SCM has been defined as managing the flow of a distribution channel from the supplier to the end customer [10], managing processes to provide horizontal value to customers [11], and coordinating business functions and tactics to improve long-term performance for individual companies and the SC [12]. The generally accepted definition of SCM comes from the APICS Foundations, which define it as "the design, planning, execution, control, and monitoring of SC activities to create net value, build a competitive infrastructure, leverage worldwide logistics, synchronizing supply with demand, and measure performance globally" [13].

At its inception, Houlihan [14] argued that changes in the economic and competitive environment required a new approach to logistics. Given the drastic changes over the last four decades, the question arises whether the current SCM concepts and practices are still the right approach to meet present and future challenges. Intrigued by changes in SCM practice, we started by exploring key constructs of change. We then conducted an in-depth literature analysis for each of these constructs. Given the sheer size of the literature of interest, we used a narrative literature review to support our argumentation by the literature and not to create a complete (or representative) sample. From our perspective, the true value of a literature review lies in the qualitative integration of the field. It is the profound qualitative insights that transcend mere statistics. Although a diverse array of quantitative analysis tools exists, such analysis consistently remains limited in the context of wide, loosely defined concepts. Considering that the area under examination in this study is still evolving and notably intricate, especially concerning data retrieval, a qualitative approach was deemed necessary. Employing a quantitative approach would assume the existence of a pre-existing 'dictionary' or set of rules and unequivocal search and presentation parameters. However, such a premise does not hold in this study, as the objective is to distill the future landscape of SCM from a comprehensive range of ongoing changes necessitating interpretation. To our knowledge, no software can rival human insight's inherent interpretative capacity.

The paper itself is an argument that seeks to answer the following research questions: (1) What relevant changes over the last four decades have led to the current challenges in SCM practices? (2) What concepts, frameworks, and approaches are needed to overcome the current challenges? The questions are kept general to allow for a broad literature search. In an initial search, and based on broadly industrial practice, we found that current SCM practices are encountering challenges in mainly seven constructs (uncertainty, perspective, topicality, coordination, flow, job to be done, and connection) that companies must address to survive in the future. Our study will focus on these key constructs, providing indications for future research and practicing managers alike. The remainder of the paper is structured as follows: First, we describe the applied research methodology. Then, we examine how past and future developments in SCM can meet emerging challenges. Finally, a discussion and conclusion summarize the findings from the reflection of the SCM literature and describe possible future developments in the field.

2. Methodology

We have chosen to conduct a structured narrative review [15] as it is a suitable research method tailored for subjects conceptualized disparately and explored by different research teams across diverse fields [16]. This complexity hampers the feasibility of a systematic literature review, as the extensive review of every potentially relevant article is impractical and, therefore, necessitates an alternative approach [17]. We found this in the narrative literature review method, which proves to be a valuable tool in SCM research due to its flexibility, adaptability, and ability to capture SCM's multidisciplinary and evolving nature. This approach provides a structured framework for analyzing the current literature and, based on it, discussing current and future changes and identifying key themes. Green et al. [18] describe narrative reviews, including their strengths and a guideline for performing them. Narrative reviews are often used in medicine [19] or dentistry [20] to support research with potential new approaches and provide an overview of a topic. Scientists conducting research in the field of digitalization use narrative research approaches to describe challenges, provide a summary of a topic, or discuss current trends [21].

Our approach was divided into three steps in line with creating a structured narrative review. First, to narrow down the multitude of contributions to SCM, we followed an approach that drew upon our theoretical and practical knowledge and expertise to identify initial thematic constructs where established SCM practices face current and future challenges. Thereby, the literature search and analysis were initiated with a preliminary understanding of the changes and trends within the field.

Second, building on this initial structure, a broad literature search of existing studies, research papers, conference proceedings, and reviews was conducted [18]. Rather than adhering to a strictly predefined methodology, our approach was more exploratory and open-ended. We comprehensively reviewed the existing literature, seeking to confirm, revise, refine, extend, and adapt the presumed initial structure, whereby the final classification into seven constructs was obtained (see Table 1). This approach was driven by capturing the most relevant and significant concepts from the literature, aligning with our extensive experience and expertise.

Table 1. Description of the Seven Identified Constructs.

Construct	Description	Key References
(1) Uncertainty	Demand fluctuations, forecast errors, process instability, quality issues, and breakdowns	[22–24]
(2) Perspective	Supply- or demand-driven systems	[25–28]
(3) Topicality	Orders are agreed upon on a long-term basis (just-in-time) or requested on an ad hoc basis (on demand)	[29–32]
(4) Coordination	Plan (predict) or shape (prescribe) the future	[33–37]
(5) Flow	The flow of material, services, information, and money	[38–40]
(6) Job to be done	Value proposition	[41–43]
(7) Connection	Integrated (closed) or interoperable (open) systems	[44–48]

Third, we performed specific literature searches and in-depth analyses in each of the seven constructs to describe the state of research and, based on this, to synthesize concepts, frameworks, and approaches to address current challenges. A total of 132 sources were included in our final sample. While we acknowledge that our approach may differ from more structured methodologies traditionally employed in constructing conceptual frameworks, this exploratory approach allowed us to capture the nuanced and multifaceted aspects contributing to modern SCM dynamics. Seven constructs were refined through continuous iteration, validation against the literature findings, and peer discussions to ensure accuracy and relevance.

3. Findings

3.1. Uncertainty: From Prevention to Exploitation

For decades, economic uncertainty has been problematic from a material planning perspective. The impact of such changes is amplified by the inertia of the SC and its decision-making mechanisms. Economic uncertainty and inertia cause large inventory surpluses or shortages to develop rapidly. Management's tendency to overreact to these upturns and downturns to create a safety net for the next downturn can exacerbate the problem and inflict further costs and risks. Disruptions, unpredictable events, and uncontrollable stakeholder behavior can occur daily worldwide [49]. SC performance metrics are classified into (1) resource measures (e.g., inventory levels, equipment utilization, energy usage), (2) output measures (e.g., customer satisfaction, number of on-time deliveries, product quality), and (3) flexibility [50]. SC flexibility, specifically volume and go-to-market flexibility, is crucial in mitigating uncertainty in marketing practices and positively impacts companies' financial and market performance [22]. SC risk management is an attempt to systematically deal with risk, uncertainty, disorder, and disruption [51]. Its purpose is to avoid and minimize the negative consequences of SC disruption through certain processes, including risk identification, assessment, treatment, and monitoring [52]. Digitalization helps collect and use more accurate, real-time, and, at best, relevant data—however, this does not mean preventing uncertainty but providing the latest information at short notice [24].

SCs that integrate lean and agile manufacturing paradigms are called leagile SCs [53] and can reduce company-wide inventory levels under modeled conditions [54]. When combining these paradigms with an overall SCM strategy, decoupling point positioning and market intelligence must be considered because the adequate interface of new internal SCs with the market is crucial [55]. Lean manufacturing requires a consistent schedule and achieves leanness by eliminating non-value-added time. Agile manufacturing is best suited for fluctuating demand, and further reduced value-added time is achieved through production engineering breakthroughs. Goldsby et al. [54] develop a conceptual model for leagile SC metrics by evaluating the performance metrics of a modeled SC and the dominant SC paradigm. The viable SC framework within the SC ecosystem encompasses the perspectives of agility, resilience, and sustainability, whereby disruption can be resisted and operations sustained through performance redesign, restructuring, and replanning [56]. Ciccullo et al. [57] derive six integration types between lean, sustainable, and agile SCs.

SC managers seeking to balance risk mitigation with recovery capabilities and analyze the impact of disruption on SCs can rely on Hosseini et al.'s [58] decision-making support guide, which provides a framework and measures for performance degradation and recovery. Davis et al. [59] discuss the relationship between food consumption and environmental variability (e.g., natural disasters, pandemics, economic recessions), while Hosseini et al. [60] review quantitative methods for modeling the SC resilience of complex supply networks. However, the pathway of such effects is not fully known, and research is needed to determine cause and effect. SC managers must learn to anticipate or exploit short-term changes and unexpected situations, as preventing uncertainty is impossible. Antifragility, i.e., emerging stronger from disruption [61], is relevant for success as companies need to immediately reduce capacity when demand is low and increase it when demand is high. Digitalization can promote the development of negligible transformation and switching costs if physical products are replaced by (digital) services or transformed into smart, connected things [62]. Successful enterprises like Netflix follow the concept of antifragility by building an antifragile system where every engineer is an operator of the service, every failure is an opportunity to learn, and there is a culture of blamelessness [63]. Antifragile SCs benefit from disorder [61], are dynamic and fluid, evolve with the unpredictable turmoil of today's business world, and turn challenges into opportunities [64]. Economic uncertainty, disruptions, and risks are inevitable in SCM. Companies should focus on SC flexibility and risk management to address these challenges and integrate leagile manufacturing paradigms. Measuring SC performance through various metrics and promoting antifragility to emerge stronger from disruptions is important. SC managers should rely on decision-making support frameworks to balance risk mitigation and recovery capabilities.

3.2. Perspective: From Supply-Driven to Demand-Driven

For the longest period of its existence, SCM advocated for a supply-driven perspective, where the dominant logic was centered around production push rather than demand pull [65]. Many SCM systems operated on a make-to-stock (MTS) basis, but there has been a shift towards embracing a make-to-order (MTO) approach. Thus, the issue at hand is not merely a dichotomy of push versus pull strategies; rather, it revolves around the strategic positioning of the customer order decoupling point. In a broader context, companies undertake this transition gradually, and a significant challenge arises from the concurrent provision of both MTS and MTO services. The SC is a network on a global scale that delivers services and products, from raw materials to the end customer [13].

The task of SCM is to synchronize supply with demand by providing demand-driven offers, i.e., creating and delivering value for the customer [25]. A purely demand-driven supply means "make-to-order" instead of "make-to-stock", is based on customer orders rather than forecasts, and prioritizes meeting customer needs. Demand-driven companies typically want their SC processes to be cost-efficient while being able to respond to dynamic customer needs [25]. The balancing act of ensuring efficiency and responsiveness is based on the ability to create variants and customizations by decoupling thinking [66]. Strategies for decoupling are, e.g., strategic inventory positions [67], demand-driven material requirements planning [68], segmentation [69], leagility [70], customization [71], transparency [72], and postponement [73]. Ptak and Smith [26] suggest that demand-driven material requirement plans, which combine material requirement planning and reorder point methods, be used at strategic inventory positions to decouple the system. Managers of demand-driven manufacturers could benefit from these strategies when designing and operating their SCs.

Demand-driven SCs are highly dynamic networks of participants with different business processes and modes of control and coordination [27]. It is necessary for companies to participate in multiple SC configurations simultaneously and to switch to new or adapted configurations rapidly. The process modeling framework of Verdouw et al. [27] combines SC design models with information systems development models and instantiates SC configurations from a repository of standard building blocks. Mendes [28] presents a structured and practical roadmap to increase profitability by applying demand-driven SC strategies and components. However, some components (e.g., statistical forecasts and vendor-managed inventory) are consumption-driven rather than demand-driven or based on inventory strategies. A demand-driven production planning system that considers both customer orders and available capacity is introduced by Jodlbauer [74].

The demand chain design is based on a thorough understanding of the market and must be managed to meet different customer needs effectively. Demand chain management is a new business model (BM) that creates value by combining marketing and SC capabilities [75]. It manages (1) the integration of demand and supply processes, (2) the structure of these integrated processes and client segments, and (3) the relations between marketing and SCM [76]. In summary, transforming SCs into demand chains requires management with new manufacturing techniques and improved information flows to decrease inventory, speed up customer responses, and reduce waste and obsolescence to meet customer demand without excess inventory and time delays.

3.3. Topicality: From Just-in-Time to On-Demand

The just-in-time concept originates in the Toyota production system [77]. Golhar and Stamm [78] derive four tenets for successfully implementing just-in-time concepts: eliminate waste, include workers in decision-making, involve suppliers, and control quality. At the strategic level, integrating just-in-time, total quality management, and SCM into operations strategy can create value and improve positioning [79]. The correlation between the three practices and their correlation with performance shows that although they have unique characteristics and objectives, they also have shared elements that can mutually reinforce one another. Nugroho et al. [80] support the findings of Kannan and Tan [79] and demonstrate that linkages exist between just-in-time, total quality management, and SCM at all strategic and functional levels. Their research indicates that quality and SCM significantly impact SC performance. While green SC practices combined with total quality management and just-in-time can positively impact operational and business performance, research shows that the synergy between green SC and total quality is more effective than green SC practices and just-in-time [81]. Just-in-sequence is a further development of just-in-time and ensures the delivery sequence of items requested by the customer (i.e., on-demand). Orders, where the customer dictates the sequence to the supplier, complicate production planning to maximize utilization and necessitate reordering [82]. Just-in-sequence technologies positively impact SC effectiveness in the automotive industry [83]. Jodlbauer and Tripathi [84] developed an explicit formula based on Jodlbauer et al. [85] to solve the resequencing problem for a setup-dependent sequence. This reorganization incurs costs for the additional labor and space required and must be put proportionately to the increased utilization.

SCM involves manufacturing products for customers and sourcing the necessary components. However, demand-SCM, which merges innovation with process efficiency, introduces a new aspect of fostering customer relationships and generating value for their operations [86]. Marketing supports demand-SCM by managing customer relationships, creating value, and providing production, sales, and distribution services. An inventory model considers demand as a function of marketing effort, facilitating collaboration in a three-echelon SC with multiple products and members [29]. Chowdhury et al. [30] propose an optimization framework to design and manage an integrated additive manufacturing network in the demand-SC. This framework considers flow networks, resource constraints, and costs at both the process and system levels. Pishchulov et al. [31] provide a service that matches companies for on-demand SC collaborations, as a single company may lack the necessary capabilities and capacities to develop, produce, and deliver customized products. The service assesses potential collaborations based on multiple criteria, including company capabilities, locations, and other characteristics. Just-in-time means delivering a product to a customer on a scheduled date that may be far in the future. However, this does not always meet the needs of consumers who tend to make impulsive, spontaneous, and ad hoc purchases [87] and expect very short delivery times [88] or even delivery on demand [32]. On-demand processes and systems to deliver highly customized services and products on demand and meet ad hoc customer demands pose significant challenges for future SCs. However, they will be critical to vendors' economic success.

3.4. Coordination: From Planning to Shaping the Future

One of the most important pillars of SCM is planning at the strategic and operational levels [89], which determines what should be done, when, and with what resources. SC operational planning [90] and advanced planning for SC coordination [91] are highly relevant. These planning and control paradigms can cause demand forecast updating, order batching, price fluctuation, rationing, and shortage gaming, thus resulting in the bullwhip effect in SCs, where demand fluctuations are amplified as they move up the SC [92]. Jonsson et al. [93] discuss the central planning approach and outline four prerequisites for the successful implementation of centralized SC planning: (1) functional products, (2) vertical integration, (3) a dominant organization with the power and competence to enforce implementation, and (4) the use of a single planning domain that contains all critical planning information. Both centralized SC planning, utilizing advanced planning systems [94], and decentralized SC planning, where manufacturers and suppliers share limited information [95], can positively impact SC performance and enable sound total cost planning. Forecasts and predictive analytics [96] are important for SCM and are used for planning activities (e.g., scheduling, sequencing, quoting dates, and allocating resources) [97]. Customer forecasts received by suppliers further up the SC and for single-order suppliers tend to be lower quality [98]. When complete information about participant demand is unavailable, machine learning techniques can forecast demand at the end of the SC [99]. The coordination occurring in some industries [100], such as networked maintenance operations for petroleum platforms in the sea, has to ensure the delivery of needed goods and, in parallel, the supply of technicians that shall install the item. The synchronization of several supplies, the reduction in all synchronized delivery times, and the optimization of the incurred cost are, in those cases, a challenge. The analysis of their interdependencies and usage improves the synchronization of the supply of goods and service provisions [100]. Furthermore, data-driven methods such as cross-impact analysis [101] can help to explore the interdependencies in such complex networks.

New analytical approaches focus on prescriptive analytics rather than predictive analytics (e.g., forecasts). These approaches aim to shape the future rather than predict it [33]. Diaz et al. [102] developed a prescriptive framework to support SCs in express delivery. The IoT and blockchain drive SC forecasting and planning advances by providing more decentralized data for planning, coordinating, and executing SC processes [34]. Despite these beneficial outcomes for the entire SC, high investment costs for data-driven technologies prove to be a barrier for many companies in their adoption in SCM [103]. While these technologies have not yet been completely established, signs of change are evident. The pace of change depends on cost considerations, which typically decrease over time, increasing accessibility for all [104]. In general, the visibility of goods movement, data collection, communication with partners, and business intelligence [105] allow companies to monitor their products, activities, and processes within their SC networks and overcome challenges such as the invisibility of the upstream to the downstream party, inflexibility in the face of demand fluctuations, lack of control over operational costs, distrust in safety stakeholders, and ineffective risk management [106]. Blockchain deployment in various sectors of the SC ecosystem [107] can provide transparent end-to-end tracking and facilitate time-efficient product recalls [108], as well as enhance trust by improving visibility and reducing the risk of fraud and counterfeiting [109]. Multi-agent theory [110] and decentral autonomous organizations [111] are other enablers for organizing, coordinating, and orchestrating complex dynamic networks with autonomous partners.

Consolidating centralized and decentralized planning, control, and coordination to orchestrate autonomous units will be challenging as SCs evolve. On-demand customer requirements, highly personalized products and services, and individualized ad hoc consumer buying behavior are driven by the availability of decentralized data collected through the IoT, platforms, and social media [112]. In such a dynamic and volatile environment, forecasting and planning become more challenging, requiring new approaches to identify customer needs using platform and social media data [35] to better understand impulse buying behavior [113], actively guide customers on their customer journey, encourage them to buy the products the company wants them to buy and implement an on-demand customer order fulfillment process [36]. Traditional planning loses relevance, while competencies to proactively shape the future gain importance, such as using prescriptive analytics, being highly responsive to customer orders, combining centralized and decentralized mechanisms to utilize data, and implementing modularized on-demand ad hoc processes [37].

3.5. Flow: From Material to Information

When the concept of SCM was first introduced, the SC was seen as an extension of logistics [114] and focused on material flow [115]. The SC operations reference model (SCOR) [116], i.e., the first cross-industry SC framework, focuses on the "source, make, and deliver" material flow and planning process. Sustainability goals force companies to develop and implement SC concepts built on cyclic material flows, cyclic transport containers, re-usage of materials, and integration of returns [117]. These measures lead to relevant material flow from customers to suppliers. Sustainable material flow analyses, the collection and use of sustainable data (e.g., CO_2 footprint) [118], and the development of indicators for resource use, waste disposal, emissions to air and water, and the extraction, trade, and use of materials [119] are becoming increasingly important. The coordination of intra- and inter-organizational activities and processes, cross-functional integration, information flow and sharing, service flow, and financial flows are also significant issues: The SC is a system of organizations, people, activities, information, and resources that move a product or service from the supplier to the customer; in the context of services, a distinction is made between service flows directed toward customers (order fulfillment), financial flows (payments), and information flows directed to suppliers (orders) [38]. The direction of flows is changing or will change dramatically due to an increasing sustainability orientation, new BMs, servitization, and digitalization, with information flows becoming more important in contrast to material flows [120].

In data-driven BMs (e.g., as-a-service, sharing economy concepts, pay-per-outcome, and performance-based contracting), the supplier or provider must prefinance the product or service for the customer, thereby assuming the customer's risk and defer the flow of funds until the customer perceives the outcome [121]. Some outcomes customers expect are not directly paid for with money; instead, customers pay their suppliers with data and services [122]. Data-driven BMs can lead to more reliable [123] and better utilized [124] resources. As a result, fewer resources are required to meet market demand, meaning fewer things must be produced, transported, and delivered. The result is lower environmental damage and SCM requirements for material flow and higher standards for information flow and service management to enable data-driven BMs. Servitization, especially digital servitization, is a growing segment [125], and manufacturers are pressured to transform product-centric BMs into service-centric ones [39]. Services and flow to the customer and the supplier are gaining importance [126]. Thus, customers can, should, and will provide and enable several, mainly data-driven, services to their suppliers (e.g., acquisition and supply of field, product usage, and buying behavior data) [127]. In other words, customers will become suppliers, and suppliers will become customers. Section 3.6 addresses the transition from physical products to (digital) services.

Additive manufacturing is a relevant aspect of digitalization that will change SCs [128] by postponing (very close to the product's time of use) and relocating (very near to the customer's location) the material flow. Rapid prototyping and tooling emerged during the 1990s, and with the maturation of SCs, the concurrent reduction in costs, and enhancements in manufacturing quality, the era of rapid manufacturing was inaugurated in the late 2000s; subsequently, since the early 2010s, home fabrication has gained prominence [129], facilitating additive manufacturing's ability to personalize production without high tooling costs and highly complex SCs because printed products eliminate the need to transport and assemble many different components. In short, additive manufacturing substitutes, shortens, and postpones the material flow and transforms it into an information flow [130]. A case study [131] investigates how additive manufacturing alters information flow and enhances decision-making by leveraging data across design and production stages. The study finds that current practices rely on tacit knowledge and experience, necessitating a more precise approach for additive manufacturing integration. Considering this progression, researchers have recognized the importance of assessing the cost dynamics within additive manufacturing. One case study [132] applies a cost model of hospitals' use of biomedical implants to analyze SC costs associated with additive manufacturing facilities (including inventory, transportation, and product lead time). The study concludes that the ratio between additive manufacturing and traditional manufacturing unit production costs, product lead time, and demand levels are critical cost parameters determining the feasibility of additive manufacturing. Furthermore, the integration of software parameterization plays a pivotal role in reducing the number of variants and customer-specific physical products. This strategy maintains the capability for customization and enables the customization of smart connected things through software parameters [133]. Digitalization through software-customized smart connected things will reduce the complexity of SCs and increase the importance of information flow. The IoT, data analytics, and (interactive, immersive, and cross-reality) visualization methods [134] increase SCs' real-time transparency, support decision-making, and make data a key resource and the ability to exploit data as a key process for information flow management [40]. Emergent regulations, exemplified by the Supply Chain Act, and the growing need for accessible and traceable information are compelling SCs to enhance transparency, ensure human rights adherence, establish mechanisms for addressing grievances, and furnish comprehensive activity reports [135]. Customers demand detailed and up-to-date information about products or services; e.g., providing digital twins for each connector is a prerequisite for selling them [121]. The Metaverse, discussed by Mozumder et al. [136] as a collection of technological devices connected to the IoT, blockchain, and artificial intelligence (AI), will enable digital twins that simulate humans and promote socially linked and highly dynamic data. The use of information flow enables new service offerings and new BMs. Flows of materials, services, information, and finance from supplier to customer and customer to supplier must be carefully managed. The importance of the information flow compared to the material flow will increase in the future [39], so companies are expected to understand, exploit, and focus on these information flows, for which the IoT, data analytics, and blockchain can be useful.

3.6. Job to Be Done: From Physical Products to Services

The concept of the job to be done [137] relates to the intended added value for the customer and is expressed by the value proposition in BMs. Traditionally, manufacturers have focused on providing physical products to end customers through the SC. However, to stay competitive, the product-centric value proposition must be expanded or replaced by a service-centric one [39]. For many industries, solving problems, completing tasks, providing situation-specific information, assisting in decision-making, and minimizing risk to the customer are the main objectives of the job to be done [138]. Although materials and products will continue to be necessary to perform this job, generating revenue will primarily depend on completing the job to be done in a customer-oriented manner rather than supplying materials and products [139].

The new market conditions of dematerialization of physical products and its impact on SCs can empower downstream firms. However, upstream firms can still capture the additional value and secure their strategic position in the SC through digital services if their servitized offer includes difficult-to-imitate elements and they deploy unique resources during digital servitization [41]. Servitization-oriented firms should improve their internal integration, external integration with key suppliers and customers, and specific dimensions of SC integration to enhance particular service provisions and facilitate servitization [42]. At a time when meeting sustainability goals is becoming increasingly important, servitization alone is not enough; companies must evolve in the direction of green servitization. Green servitization emerges as a significant strategy within the SC landscape that integrates the principles of servitization with the imperatives of sustainability. Green servitization is a strategy to support flexible and sustainable SCM. Marić and Opazo-Basáez [43] study green servitization frameworks for reverse logistics services and make four propositions: (1) a voluntary environmentally friendly attitude toward product returns, rather than commercial profit or legal compliance, facilitates the development of closed-loop SC models; (2) the implementation of reverse logistics services leads to significant economic, environmental, and social benefits; (3) a common culture and shared values among partner stakeholders in closed-loop SCs lead to efficient reverse logistics services; and (4) the integration of digital technologies through adapted and planned information systems leads to optimized processes related to reverse flows of products and materials.

Companies that want to adapt current SCM practices must understand, exploit, and focus on service flows. Completing tasks, solving problems, and making customer decisions will become more important than delivering materialized products. Companies must adapt to the new digital, servitized, and sustainability-focused world to meet evolving customer expectations and achieve long-term success by combining and exploiting digitalization and servitization to achieve their sustainability goals. Digitalization fosters servitization [41], and both trends can contribute to greater sustainability [140]. In the future, the best customer-oriented job to be done, delivered by exploiting digitalization and considering economic, environmental, and social sustainability, will win the competition—and not, as has been the case so far, products with the highest quality, the best availability, and the lowest price [141].

3.7. Connection: From Integration to Interoperability

SCM entails planning, coordinating, and controlling the flow of materials and finished goods from suppliers to customers via value-added processes and distribution channels [142], intending to synchronize supplier material flows with customer requirements. The success of manufacturing companies relies on efficient SC integration, which balances the competing goals of high customer service, low inventory investment, and low unit costs while improving overall performance [143]. The ability to optimize SC performance and share the generated profits among partners is made possible by advances in information technology that allow partners to share information and work closely together [144]. SC integration is differentiated into internal and external information sharing and comprises the dimensions of information integration, coordination, resource planning, and organizational relationship linkage [145]. The concept of SCM is based on integration [146,147]; therefore, SC integration is strategically and operationally important [148]. While research and practice often assume that greater integration leads to better outcomes [149], few empirical studies and practical applications address integration beyond the dyadic level, and there is a lack of empirical evidence supporting the benefits of SC integration [150].

Electronic data interchange is a tool to facilitate SC integration and enhance efficiency since it can improve order cycle time, product availability, distribution flexibility, information, and disruption [151]. However, adverse effects have been identified; e.g., the electronic data interchange of order data may lead to high inventory and poor supplier service levels [152]. Integrating ERP and SCM with other systems like CRM, PLM, e-procurement, and e-marketplaces enables communication, cooperation, and collaboration across the entire SC [153]. Implementing such integration initiatives involves linking pre-selected partners through predefined interfaces based on business rules specified by ERP and SCM system suppliers, creating a closed system that excludes others. Integration is the process of connecting and redefining parts to create a new entity. It is closely related to modularity, which is limited by transaction, coordination, and standardization costs. The level of interoperability determines the degree of integration, as higher interoperability reduces costs. Interoperability has become increasingly important for logistics and SCM due to the growing trend of cooperation and coopetition [44]. Integrating I4.0 technologies that use the physical internet [154] and achieve interoperability can positively impact profitability [45]. Henninger and Mashatan [155] propose a global network of decentralized record systems that leverage emerging technology layers for a holistic solution. Digital interoperability, facilitated by digitalization, AI, and autonomous systems, will enable upcoming developments. Open innovation can support SC innovation through ambidextrous capabilities of purpose (exploring and leveraging knowledge), span (collaborating horizontally and vertically), and orientation (incremental and radical innovation) [156]. By incorporating horizontal and lateral network entities, along with transformative strategic ideas, SC collaboration and innovation can expand beyond traditional vertical collaboration and incremental improvements. The result is a broader vision of collaboration that jointly exploits untapped resources to share existing resources.

The use of blockchain technology will enable provenance, traceability, transparency, privacy, SC financing, trade credit insurance, and information reliability. Simultaneously, the implementation of blockchain in logistics and SCM presents technical complexities and necessitates substantial financial investments [157]. Multiple case studies have identified hurdles to blockchain adoption spanning various industries and nations. For instance, one case study examining Pakistan's e-commerce sector highlighted challenges such as the elevated installation expenses and stakeholders' resistance to blockchain [158]. In another case study focusing on the Norwegian offshore industry, challenges encompassed the high implementation costs and the limited extent of blockchain integration throughout the SC [159]. While the current high costs and limited adoption of blockchain pose challenges, there is no doubt that Industry 4.0 technologies will ultimately transform procurement [160]. Blockchain can increase end-to-end visibility in logistics and SCM, improving goods tracking and trust-building through secure data [161]. Several of blockchain's characteristic use cases are identified by Verhoeven et al. [161], who stress the importance of choosing the right technology while considering its unique features for effective and cost-efficient problem-solving. Blockchain technology disruptively transforms SCs into digital SCs and networks, making SC integration cost-effective, flexible, and interoperable [46]. The electric power industry has a relatively mature understanding of integrating blockchain and SCM, as indicated by smart contracts [162]. The disintermediation enabled by blockchain applications can disrupt traditional industries (e.g., healthcare, transportation, retail). To increase current security guarantees, Bellavista et al. [47] developed a secure solution for blockchain interoperability with a relay scheme based on a trusted execution environment. Bhat et al. [48] propose an SCM architecture that uses blockchain and IoT to optimize storage, scalability, interoperability, security, and privacy, including personal data privacy, in single-chain agricultural SC systems. Changes such as integrating new partners, terminating existing partners [163], or replacing an ERP or SCM system [164] lead to confusion, risk, long change times, and high costs [165]. Digitalization, socially linked data, and future customer behavior demand interoperability. The overall objectives are to develop and operate systems with high interoperability, to understand and exploit open systems, and to conceptualize and develop value-added ecosystems so that everyone can communicate and collaborate with everyone else without barriers.

4. Discussion and Conclusions

4.1. Theoretical Implications

SCs are about networks that will evolve into highly dynamic networks of networks, i.e., dynamic ecosystems [166]. Firms in business ecosystems gain critical knowledge through coopetition, which positively impacts absorptive capacity and, in turn, is related to improved SC agility and firm performance [167]. Three social factors—trust, commitment, and mindset—are crucial for value co-creation within SC ecosystems [168]. When analyzing, developing, and cooperating in ecosystems, key issues are connections to the end customers [169] and intermediaries appearing and disappearing [170,171]. Velocity and visibility help leverage new digital technologies for SCM because they serve as core elements for real-time operations: velocity emphasizes the rapid flow of working capital throughout the end-to-end SC, while visibility enables speed by providing transparent information on events, materials, and flows to key decision-makers across the extended SC [172]. In process optimization, flow involves integrating end-to-end SCs and transitioning towards relocating global supply bases to nearshore/onshore locations [173]. Besides supplying goods, SCs must fulfill the value proposition, create value for the end customer [174], deliver value to the end customer [175], and capture value for all partners in the dynamic ecosystem [176]. Instead of current SCM practices, the concept of value architecture based on a BM framework extended to ecosystems is needed the most [177]. The value proposition and concept (i.e., value creation, value delivery, and value capture) must reflect sustainability's economic, environmental, and social dimensions [178]. Table 2 presents a summary of the above literature-based discussion. The seven constructs are ordered according to past, present, and future temporal dimensions. Companies are, on the one hand, relying on traditional methods developed in the past and, on the other hand, applying new methods that will continue to gain relevance in the future.

Table 2. A Summary of the Literature-based Discussion.

Construct	Past	Transition	Future
(1) Uncertainty	Prevention of uncertainty	Ongoing transition: some constructs of current SC are in the past, while others are directed toward the future.	Exploitation of uncertainty
(2) Perspective	Supply-driven		Demand-driven
(3) Topicality	Just-in-time		On-demand
(4) Coordination	Planning the future and predictive analytics		Shaping the future and prescriptive analytics
(5) Flow	Focus on material flow		Focus on information flow
(6) Job to be done	Focus on physical products		Focus on services
(7) Connection	Integration and closed		Interoperability and open

Companies that want to adapt current SCM practices need to (1a) exploit uncertainty, (1b) transform fluctuations into value for customers, the company itself, and all partners, (2a) operate demand-driven systems, (2b) have a strong end-customer orientation, (2c) guide customers through their customer journey to maximize customer-perceived value and value capture for the company itself and the ecosystem partners, (3a) provide on-demand delivery of highly customized services and products, (3b) fulfil ad hoc requirements, (4a) proactively shape the future, (4b) understand and use prescriptive analytics, (5a) understand, exploit, and focus on information flows, (5b) exploit the IoT, social media, and platform data, (6a) understand, exploit, and focus on service flows, (6b) combine and exploit digitalization and servitization to achieve sustainability targets, (7a) develop and operate systems with high interoperability, and (7b) understand and exploit open systems and conceptualize, develop, and operate value added ecosystems. In summary, the literature findings underscore the need for companies to adapt to changing dynamics in SCM. This involves embracing uncertainty, focusing on customer demand, transitioning to service-oriented models, and ensuring interoperability among various components of the SC ecosystem. Embracing these trends can lead to more resilient, customer-centric, and efficient SCs in an increasingly complex business landscape.

4.2. Practical Implications

SCs and requirements of SCs have changed significantly over the last four decades. SCM must be critically reviewed, extended, and adapted to address companies' current and future challenges, such as digitalization, servitization, sustainability orientation, and changing customer behavior and expectations. While more research is warranted, we have identified seven constructs in SCM where challenges could arise. Therefore, research and practice need to adapt current SCM practices: Instead of preventing uncertainty, uncertainty should be exploited. Instead of a supply-driven perspective, a demand-driven perspective that prioritizes value creation and value delivery to the customer should be pursued. It must be prescriptive, shape demand, guide customers on their journey, think, work, and decide for customers, and focus on services. Instead of just-in-time systems, on-demand systems should be established, as there is no concept for antifragile SCs. Traditional SC concepts are focused on forecasting and planning. However, dynamic, demand-driven, and prescriptive concepts will be needed. Instead of planning the future and predictive analytics, the focus should be on shaping the future and prescriptive analytics. Given sustainability goals and new BMs, the focus in the future should be on (digital) information flows instead of material flows. In the job to be done, the emphasis should be on services, not physical products, due to new customer expectations and purchasing behavior. Servitization and customization can contribute to greater customer orientation. Instead of integration and closeness, (digital) interoperability and openness will be the future approach to exploit highly dynamic markets and synchronize customers' requirements with suppliers' material flows in the context of cooperation, coopetition, and increasing data and information exchange to create and deliver value to all customers and to capture value for all stakeholders. Today, SCM is elaborated and established in most companies, and managers pay attention to stabilizing, streamlining, and maintaining their SC. However, we expect radical changes in SCM due to new challenges. The seven constructs described above should motivate managers to adapt established routines, regularly assess whether they are prepared for the coming changes, and actively shape change. We predict that companies that adapt current SCM practices in time will remain economically, environmentally, and socially sustainable businesses.

The use of qualitative analysis is a necessary limitation of our study, along with limitations arising from the chosen structured narrative review methodology. Structured narrative reviews are useful for challenging an idea and encouraging scientific discussion by providing ideas and possible new approaches based on experience and expertise. A more systematic analysis could potentially yield different constructs or insights. Despite every effort to obtain a sample of all the literary sources relevant to answering the research questions, this cannot be guaranteed due to the researchers' bias in developing the structure, choosing the search strings, the databases searched, and the inevitable subjectivity in selecting sources. Therefore, using quantitative methods to further corroborate our findings should be a future research direction. A diverse array of quantitative analysis tools exists that could be best applied to the 'dictionary' or set of rules of the future landscape of SCM distilled in this paper. This basis provides unequivocal search and presentation parameters for quantitative research. By providing a structured overview of the future of SCs, we found that no complete deconstructions examine the various features or the emergence of new features of current SCM practices in relation to each other. We recommend systematically examining and critically analyzing the seven thematic constructs discussed in this paper for further research. This study indicates opportunities and challenges that provide the first promising research venues to help companies stay competitive in a changing world.

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