

SUPPLY CHAIN PERFORMANCE MANAGEMENT: A COMPREHENSIVE RESEARCH ANALYSIS

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Abstract. Organisations need supply chain performance management (further in the text - SCPM) to boost competitiveness and accomplish strategic objectives. This research integrates various viewpoints and scholarly contributions to provide a thorough definition of SCPM, crucial metrics, technological integration, difficulties, and solutions. The objectives of the research are: to clarify the concept of SCPM; to explore challenges and approaches in SCPM; to assess technological impacts on SCPM; to suggest practical suggestions for SCPM and improvement directions for further research of SCPM. The study emphasises the necessity of a cohesive strategy by highlighting the strategic alignment of supply chain plans with organisational objectives. The revolutionary influence of digitalization and technological integration, especially Artificial Intelligence (AI) and Internet of Things (IoT), is presented together with key performance measures including order fulfilment rate, inventory turnover, and on-time delivery. The study highlights how crucial it is to collaborate, be resilient, and adapt continuously in order to successfully traverse changing corporate contexts. Through the integration of theory and practice, the study provides practitioners with practical suggestions to enhance SCPM practices. Future research directions are also identified, such as innovative approaches to performance measurement and the usefulness of developing technology. In the end, this research fosters a deeper understanding of effective SCPM techniques in achieving organisational resilience and competitiveness in the dynamic supply chain landscape of today, serving as a guide for practitioners and scholars.

Key words: supply chain performance management, metrics, technology integration, SCPM challenges, SCPM solutions.

JEL code: D29, L29, L60, L69, O14

Introduction

Modern businesses attempting to successfully navigate difficult operating situations must have a firm grasp of such extensive subject as supply chain management. This study explores deeply into the topic of supply chain performance management, examining several aspects to reveal the challenges, methodologies and advancements impacting this crucial field. To better understand the purpose of supply chain performance management—which is to systematically assess, evaluate and improve the effectiveness and efficiency of supply chain operations to align with corporate goals—the study examines definitions provided by various prominent academics such as Simatupang et al., Ivanov and Dolgui, Chopra and Meindl, Christopher and Peck, and Sridharan et al. By using a mix of theoretical frameworks, this study aims to shed light on the intricate interplay between technology integration, performance metrics and the ever-changing challenges faced by supply chain practitioners.

People working in the field of supply chain management as well as those studying the topic will find this work useful, since this study provides actionable recommendations for enhancing supply chain efficiency by elucidating critical characteristics such as order fulfilment rate, inventory turnover and on-time delivery, amongst others. Researching the interplay of technologies, such as blockchain, the internet of things (IoT) and artificial intelligence (AI), paves the way for making use of digital developments to boost efficiency, transparency and response time. This study critically examines problems and proposed solutions in the fast-paced business environment; it stresses the need of organisational agility, resilience and cooperation in achieving success. By shedding light on possible avenues for future study and encouraging dialogue between academics and business leaders, this study not only answers important questions, but also paves the way for additional adaptation and innovations in the area of supply chain performance management.

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Materials and methods

For the purpose of this research, various qualitative methods have been used, such as systematic literature review, followed by meta-analysis and content analysis, as well as thematic analysis, synthesis method and logically constructive method to draw conclusions of the research and suggestions for future research.

Research results and discussion

1. Definitions of supply chain performance management

By systematically measuring, evaluating and improving many aspects of supply chain activities, supply chain performance management aims to accomplish strategic goals and deliver value to stakeholders. The complexity of this field is exemplified by the diverse classifications offered by researchers and academics.

- Simatupang et al., 2017: to evaluate and improve the efficiency and effectiveness of connected supply chain operations, Simatupang et al. (2017) suggest that supply chain performance management provides a thorough framework; the emphasis of their study is on coordinating operational metrics with broad business goals.
- Dolgui and Ivanov, 2020: one can learn more about supply chain performance management thanks to Ivanov and Dolgui's (2020) presentation of it as a dynamic method that uses digital technology to make supply chain performance management more transparent, responsive and resilient. They emphasise the significance of performance metrics in addressing the challenges of Industry 4.0.
- According to Chopra and Meindl (2007), the term "supply chain performance management" refers to the process of systematically coordinating and optimising various activities that make up the supply chain. These activities include logistics, production and procurement. Continuous process monitoring and improvement leads to improved overall performance - that's what it entails.
- The systematic pursuit of supply chain agility and resilience in the face of uncertainty and interruptions is what supply chain performance management is about, according to Christopher and Peck (2004). To succeed in the long run, they stress, that a strong supply chain is required.
- Supply chain performance management is defined in the research of Sridharan et al. (2005) as a proactive use of analytics and metrics to drive strategic decision-making. This definition adds to the existing literature and it entails optimising, and evaluating supply chain procedures on an ongoing basis.

Covering such topics as digital technology integration, resistance to disruptions, continuous improvement, and strategy alignment - all of the above definitions highlight what an extensive topic supply chain performance management is. The table below summarises various scholarly perspectives and views on SCPM, review of which emphasizes the need for a comprehensive plan to manage and to improve supply chain performance in a dynamic business environment.

Table 1

Summary of SCPM definitions

Authors	Definitions
Simatupang et al., 2017	Supply Chain Performance Management (SCPM) according to this definition all parts of supply chain operations are examined, evaluated and improved in a systematic and intentional manner to increase overall efficiency, adaptability providing competitive advantage.
Ivanov and Dolgui, 2020	Performance metrics Cost, time, quality and customer satisfaction – all are the key quantifiable metrics, which are used to measure and analyse various aspects of supply chain operations; the reason behind this is to make sure that the goals of the organization are aligned.
Christopher and Peck, 2004	Technology-Enabled Supply Chain Performance Management describes the process of boosting supply chain efficiency, visibility and decision-making through the use of such state-of-the-art technologies as blockchain, Internet of Things (IoT), and Artificial Intelligence (AI).
Choi et al., 2019	Strategic Alignment in SCPM shows, that by ensuring that metrics and actions directly assist in achieving of organizational objectives is an important part of connecting supply chain performance management methodologies with the larger strategic goals of the organization.
Simatupang et al., 2017	Collaborative SCPM is such supply chain management approach, where the process of enhancing efficiency and achieving shared advantages is achieved through cooperation and coordination among various supply chain participants - including, but not limited to producers, distributors, suppliers.
Ivanov and Dolgui, 2020	Real-Time SCPM The goal here is to make the supply chain more flexible, agile and adaptable, which can be achieved through continuous monitoring, analysis and tweaking in real-time – all made possible by advanced technology and data monitoring.
Chopra and Meindl, 2007	Customer-Centric SCPM Supply chains are purposefully designed to go above and beyond consumer expectations, to meet and exceed them, which can be achieved when performance indicators are aligned with customer satisfaction and desires.
Christopher and Peck, 2004	Adaptive SCPM This term describes the capacity of such supply chain performance management approach, goal of which is to maintain efficiency in the face of ever-changing market conditions, technological developments and company strategies.

Source: author's conclusions based on the above mentioned authors' articles

2. Key metrics

A key component of performance management in the supply chain is the identification of critical performance indicators that allows for effective evaluation and a well-informed and strategic decision-making for the business. These metrics need to be thoroughly investigated to understand the intricate dynamics of various and many supply chain activities. The significance of aligning these metrics with business goals of a particular company has been emphasised by many scholars, one such example is Simatupang et al. (2017) research, in which the author argues that achieving the alignment of the key metrics will ensure a cohesive approach to accomplish broader strategic business objectives. In addition to the mentioned and as pointed out by Ivanov and Dolgui (2020) - the study of performance measurement variations across different industries acknowledges the intricate nature of supply chain dynamics in different sectors; this research reveals the complexity of relationships between performance indicators, as well as particular difficulties and specific needs of various business sectors. By recognising, that a "one-size-fits-all" strategy may not reflect all of the intricacies of different business sectors - the research seeks to contribute a comprehensive understanding of the heterogeneous landscape of supply chain performance management by having a closer look at these industry-specific variances (Simatupang et al., 2017); the purpose of this research is to shed the light on the significance of key performance metrics - how they relate to organisational goals and the specific industry factors that impact supply chain performance management, the author uses a combination of various theoretical insights to support their claims.

Table 2

Summary of SCPM key metrics

Metrics	Definition
On-Time Delivery	Describes the number of orders which are fulfilled by a specified date (Ivanov, D., and Dolgui, A. 2020).
Inventory Turnover	Is a typical approach to determine the quantity of products sold/used within a particular period of time is to divide the cost of items sold by the average inventory value (Ivanov, D., and Dolgui, A. 2020).
Order Fulfilment Rate	Describes the share of completed orders that are dispatched to clients (Ivanov, D., and Dolgui, A. 2020).
Lead Time	Shows the time it takes to complete the whole order processing - from the moment an order is placed until it is delivered in full (Simatupang et al., 2017).
Perfect Order Rate	Is a way to describe the proportion of orders that arrive in perfect condition (Simatupang et al., 2017).
Supply Chain Cycle Time	Shows the total amount of time needed for a product to go from manufacturer to consumer (Chopra, S., and Meindl, P. 2007).
Fill Rate	Describes the proportion of consumer demand that is met only using stock on hand, without the need for extra stock (Chopra, S., and Meindl, P. 2007).
Return on Assets (ROA)	The rate at which assets are used to generate profits, as shown by the proportion of net income to total assets (Ivanov, D., and Dolgui, A. 2020).

Source: author's conclusions based on the above mentioned authors' articles

3. Technology integration

In today's world of supply chain performance management, new technological advancements play a pivotal role in shifting traditional ways of doing business. A comprehensive examination of various modern cutting-edge technologies such as blockchain, IoT and AI, highlights the ways in which all of these advancements are reshaping the efficiency of supply chains. Christopher and Peck (2004) in their research state, that AI facilitates better decision-making and predictive analytics, along with enhanced route optimisation and generalised optimisation of resources. According to another research - the research by Ivanov and Dolgui (2020), the Internet of Things (IoT) allows for real-time tracking and monitoring all the way through the supply chain, which provides unparalleled insight into inventory and logistics management. In addition, supply chain participants are more confident that fraud is reduced when blockchain technology is used, since it ensures that transactions are transparent and traceable – according to Christopher & Peck (2004). Digitalization using these fairly recent technologies enhance transparency, efficiency and responsiveness by providing the observer data insights in real-time, which allows for in time decision making – something that is crucial in many if not all businesses. Systems powered by artificial intelligence can predict potential issues, enable real-time adjustments to inventory levels, distribution routes and many more; although embracing technology can improve collaboration and decision-making, it can also cause problems such as integration, data security and a lack of competent employees, states Christopher and Peck (2004), to merge this all into “the big picture”. Tackling many challenges is necessary to fully utilise technology's ability to enhance supply chain performance; to better understand these revolutionary technologies' role in modern supply chain management, this research aims to illuminate some of the possible advantages and disadvantages of integrating them.

Companies that want to be more productive, agile and more competitive, nowadays are focusing a lot of attention on how to integrate technology into their supply chain performance management. Several scholarly articles shed light on this ever-changing junction; within the framework of supply chain integration- Gligor and Holcomb (2012) highlight the importance of information technology by emphasising

its impact on overall performance and coordination. The potential benefits of radio-frequency identification (RFID) technology for supply chain visibility and traceability are examined by Qu and Williams (2013) in their research. In similar way by analysing IoT integration in supply chains, Kannan et al. (2017) research shows how decisions can be made much better or faster, by using real-time data from connected devices.

Also, to shed light on the challenges and intricacies of technological integration, Pagell and Wu (2009) investigates the link between technology adoption and supply chain performance; all of these articles work together to show how the Internet of Things (IoT) and radio frequency identification (RFID) may improve SCM and how they also offer a sophisticated view of the challenges and opportunities presented by this dynamic and evolving industry.

4. Challenges and solutions

There are several challenges to effectively implement supply chain performance management practices in today's complex and changing organisational environments. Data accuracy, the need for integrating different systems as well as the need for cross-functional collaboration - are just some of the common challenges, according to research by Simatupang et al. (2017). Many scholars have proposed technological interventions and cooperative strategies as a way to answer to these complex issues - modern technologies, which include the Internet of Things (IoT) for real-time data and artificial intelligence (AI) for predictive analytics- both of these technologies can enhance accuracy of the data and streamline the flow of information, according to Christopher and Peck (2004). In addition to the aforementioned - alignment of organisational goals is crucial for boosting teamwork and overcoming compartmentalized practices, according to Simatupang et al., (2017); not to forget that new challenges arise constantly due to the ever-changing nature of the corporate environment. Organisational resilience and agility strategies will be up for discussion and since various studies have shown that staying ahead of challenges requires continual change - aligning performance metrics with company goals is another challenge to tackle, according to Simatupang et al. (2017). Not to mention, that getting everyone who is involved in the supply chain, to work together seamlessly - is difficult, since it involves various employees from different departments; this stresses the need of open lines of communication and collaboration across companies departments, according to Sridharan et al. (2005). Ivanov and Dolgui (2020) in their research note, that supply networks are inherently unpredictable due to their dynamic and agile nature, this calls for the development of strong strategies to mitigate the risks.

The necessity for solutions that combine socio-environmental and economic aspects is emphasised by Pagell and Wu (2009) research, whose work also stresses the significance and need for sustainable practices in supply chain management; Qu and Williams's (2013) case study exemplify the advantages and disadvantages of RFID adoption and other technological integrations within the company. Despite the importance of interpersonal contacts in supply chain management, the meta-analysis by Gligor and Holcomb (2012) shows, that these relationships are difficult to maintain and much more difficult to capitalise on; tackling these difficulties highlights the need for a comprehensive and adaptable strategy in supply chain performance management - a strategy that should incorporate sustainable practices, technological advancements and strategic relationship management.

The present discussion on supply chain performance management benefits from this study's examination of these problems and offer of practical solutions, which are based on both theoretical and empirical considerations.

5. Implications for practice

If practitioners are concerned with optimising their own operational procedures, they should pay close attention to the implications of the research findings on supply chain performance management – such as results from Simatupang et al. (2017) who's study shows how important it is to align supply chain strategies with overarching organisational objectives and demonstrating the need for a strategic approach that stands firmly in the real world. One option to improve current supply chain performance management techniques is to integrate sophisticated technologies, such as recent developments in artificial intelligence (AI) and the Internet of Things (IoT) for improved visibility and responsiveness, as is suggested by Ivanov and Dolgui (2020) study. Another important consideration for practitioners in this era of dynamic business challenges, is the data presented by Christopher and Peck (2004) which shows that enhancing the supply chain's resilience is crucial for dealing with disruptions and also according to Ivanov and Dolgui (2020) - organisations can respond to future trends and disruptions by increasing their agility, and also by staying ahead of ever-changing industry landscapes through digitization - with the help of the above mentioned technologies. By providing practitioners with actionable guidance on how to enhance their current procedures and prepare for new ones - these beneficial implications and recommendations contribute to the ongoing conversation of more effective supply chain management.

6. Value of the research

Both academics and businesses can benefit greatly from the research which provides a comprehensive analysis and evaluation of present approaches in the crucial topic of supply chain performance management, and based on the work of Simatupang et al. (2017) - this research delves into the topic of how well company objectives and supply chain strategy align, so that practitioners in the supply chain may benefit from the insights which this research offers. Innovations in supply chain transparency, efficiency and responsiveness may be on the horizon, according to an analysis of digitalization's effects that draws on work by Christopher and Peck (2004) and Ivanov and Dolgui (2020); for anyone who is looking to improve their supply chain performance management methods, they can take advantage of the research's practical insights and put them into practice; by pointing out where there is a lack of study, we may improve our understanding of the opportunities and threats in supply chain performance management and where to direct future academic efforts.

7. Future research directions

This study establishes a foundation for future research on the topic of supply chain performance management by identifying critical areas that require further investigation; building on the findings of Simatupang et al. (2017) that additional research into innovative methods of performance evaluation which meet the dynamic demands of contemporary supply chains is necessary. The importance of understanding the impact of Industry 4.0, IoT, AI and blockchain on supply chain performance was emphasised by Ivanov and Dolgui (2020), who examined future trends and technologies - to better inform practitioners, future studies should investigate real-world consequences of application of these technologies. The co-creation of knowledge and the application of research findings in real-world scenarios are greatly enhanced by the continual collaboration between academics and the industry, as advocated for by Christopher and Peck (2004) research. This work seeks to encourage a never-ending conversation between scholars and industry professionals by outlining potential avenues for further dialogue and further study in the area of supply chain performance management.

8. Key takeaways

All things considered, the areas of study and practice have been significantly broadened by this research on supply chain performance management; Simatupang et al. (2017) extensively analyse current approaches highlighting the importance of aligning supply chain strategy with organisational goals and objectives. Discovering key indicators and approaches, delving into technology integration, evaluating industry-specific variants - all contribute to a more nuanced comprehension of supply chain dynamics; integration of new technologies such as AI and IoT, and alignment of performance measurements with organisational goals are just the two examples of how supply chain practitioners might profit from the practical consequences of this research, according to Ivanov and Dolgui (2020) and Christopher and Peck (2004). To add to the above, in the view of the always evolving challenges in the ever-changing corporate environment, Ivanov and Dolgui (2020) and Christopher and Peck (2004) – both researches have emphasised the significance of constant adaptability, resilience and agility as the cornerstones of efficient SCPM. If organisations aspire to be more resilient and competitive in the face of unpredictability and unexpected events, the results show that a good supply chain performance management is crucial for the business, it can make or break it. Based on these findings - academics and industry professionals in the constantly changing field of supply chain management need to collaborate to find solutions to emerging problems, adopt cutting-edge technologies and develop flexible strategies to keep up with the ever-shifting nature of supply chain practices.

CONCLUSIONS

In conclusion, the intricate dynamics of such crucial subject as supply chain management is explained by the comprehensive analysis of various studies on supply chain performance management. This particular study builds on the work of such scholars as Simatupang et al. (2017) to highlight the importance of a well-coordinated strategy for achieving company-wide goals and the strategic alignment of supply chain objectives with those goals. Ivanov and Dolgui (2020) research and Christopher and Peck (2004) study offer a comprehensive overview of modern performance management approaches through their examination of key methodologies, metrics and the revolutionary impact of digitalization and technological integration. Practical advice is provided by these insights, which have effects for practitioners; one such suggestion is to enhance responsiveness and efficiency by incorporating new technologies such as AI and the IoT. Recognising the evolving issues in the ever-changing business climate highlights the need for continuous adaptation, resilience and collaboration, as pointed out by Christopher and Peck (2004) and Ivanov and Dolgui (2020) detailed works. Research provides various important findings, which are listed below.

- 1) The study emphasizes the necessity of integrating supply chain strategy with corporate goals to improve performance and competitiveness. Successful SCPM should easily integrate with business goals to guarantee unity and efficiency.
- 2) The paper examines how cutting edge technologies such as AI, IoT, and blockchain are changing supply chain management, since they enable real-time tracking and decision-making in fast-paced markets by improving supply chain transparency, efficiency, and responsiveness.
- 3) The research shows that supply chains must be agile and resilient to changes and disturbances to stay effective.

- 4) Suppliers, distributors, and consumers must work together for SCPM to succeed. Collaboration is critical for improving efficiency and obtaining mutual advantages in the complex supply chain environment.
- 5) The research identifies key supply chain efficiency metrics, supply chain performance must be measured and improved by aligning these indicators with strategic company goals.
- 6) The article discusses supply chain difficulties and recommends technology solutions and open communication inside and across companies to address these concerns
- 7) The study emphasizes the need for industry experts to adopt cutting-edge technology and novel management methods to improve supply chain operations. Practical lessons from the study can help practitioners in navigating modern supply chains more effectively.
- 8) The paper recommends studying new performance measuring methodologies and how developing technologies affect supply chain management. Investigating these topics will give deeper insights and stronger tactics for meeting global supply chain dynamics.

In the ever-changing world of supply chain management, this research can be used as a roadmap for both academics and professionals; it will aid in better understanding how to manage supply chain performance so that organisations can stay agile, resilient and ahead of their competition.

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