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Operations & Supply Chain Management: Principles and Practice

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Abstract

Operations and Supply Chain Management (OSCM) has continually evolved, incorporating a broad array of strategies, frameworks, and technologies to address complex challenges across industries. This encyclopedic article provides a comprehensive overview of contemporary strategies, tools, methods, principles, and best practices that define the field's cutting-edge advancements. It also explores the diverse environments where OSCM principles have been effectively implemented. The article is meant to be read in a nonlinear fashion. It should be used as a point of reference or first-port-of-call for a diverse pool of readers: academics, researchers, students, and practitioners.

Keywords: review; encyclopedia; theory; practice; principles; strategy.

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to optimise availability and net profit for all members of the supply chain (Dagne et al., 2020). Another paper explores the design of closed-loop supply chains for durable products, highlighting the complexities of managing return flows and the need for compliance with legislative recovery targets (Jeihoonian et al., 2016).

Similarly, the rapid growth of e-commerce has introduced distinct operational complexities, such as the need for efficient last-mile delivery and inventory management in a digital marketplace (Janjevic and Winkenbach, 2020). In the context of e-commerce, Calzavara et al. (2023) investigated different strategies for e-grocery logistics, comparing the costs and performances of various network designs to determine the most efficient approach in response to fluctuating online demand. Another paper (Agac et al., 2023) introduced a novel mathematical model using Mixed-Integer Nonlinear Programming for optimising blood supply chain networks, focusing on location, allocation, and routing. A variant of the Genetic Algorithm is applied, and the model's effectiveness is demonstrated through a case study in the Eastern Black Sea Region of the Turkish Red Crescent.

Several case studies illustrate these concepts in practice. Apple, for example, is known for its highly efficient global supply chain, which relies on a vast network of suppliers while maintaining strict control over key components. Zara, the fashion retailer, exemplifies agility and speed in supply chain management. Their approach involves nearshoring and vertical integration, enabling rapid response to changing fashion trends and quick turnaround from design to store shelves. Toyota's supply chain, particularly its Just-In-Time (JIT) methodology, has long been a model of efficiency. However, some disrupting events revealed the vulnerabilities of this approach, prompting the company to re-evaluate its strategy, demonstrating the necessity of balancing efficiency and resilience.

In conclusion, supply chain network design is a critical aspect of supply chain management that must navigate a range of complexities and challenges. Current issues such as disruptions, sustainability, digital transformation, and the tension between globalisation and rationalisation are driving significant changes in how supply chains are structured and managed. Insights from recent literature and practical case studies highlight the importance of adaptability, technological integration, and a balanced approach to designing supply chain networks. As the global business environment continues to evolve, supply chain managers must remain proactive in adapting their supply networks to meet both current challenges and future demands.

3.4. *Outsourcing*²⁶

Outsourcing can be broadly defined as the practice of contracting out specific operations or services to external providers instead of performing them internally (Simchi-Levi et al., 2021). Outsourcing has become a critical element in the modern businesses, especially in the fields of operations and supply chain management. Firms constantly need to make a boundary decision regarding how to carry out activities (Fine and Whitney, 2002). One way of doing this is internalisation that is the firm dedicates its own resources to carry out activities in-house for example, for the need have a better control of the processes (Holcomb and Hitt, 2007). Sometimes, many firms choose to organise their activities by outsourcing, meaning they rely on third-party providers to access the capabilities and resources they need (Holcomb and Hitt, 2007).

²⁶This subsection was written by Byung-Gak Son.

Historically, outsourcing was primarily driven by the desire to reduce costs. A notable example is the manufacturing outsourcing boom in the electronics industry during the 1990s, where companies outsourced to cut expenses and improve operational efficiency (Harland et al., 2005). However, in recent years, outsourcing has evolved into a more sophisticated strategy. Modern companies now use it to enhance their competitiveness by acquiring specialised capabilities and cutting-edge technologies, helping them stay ahead in rapidly changing markets (Holcomb and Hitt, 2007; Kremic et al., 2006).

There are many reasons why firms consider outsourcing. Firms' decisions to outsource are often closely aligned with their broader operational and corporate strategies, including goals related to growth, innovation, and maintaining a competitive edge (Simchi-Levi et al., 2021). Outsourcing enables companies to focus on their strategic objectives while leveraging the capabilities of external partners to improve efficiency and flexibility.

One of the primary reasons firms outsource is to achieve cost efficiency. By outsourcing in-house activities, firms can significantly reduce their capital expenditure and operational costs, freeing up their limited and valuable resources for other priorities (Harland et al., 2005; Hendry, 1995). This is particularly advantageous when outsourcing partners possess specialised capabilities or are located in regions with lower operational costs (Simchi-Levi et al., 2021).

Another key motivation for outsourcing is the ability to focus on core competencies. It is often impractical for companies to carry out all necessary activities internally. As a result, many firms choose to outsource non-core activities, allowing them to concentrate their limited resources on activities that are more strategically important (Arnold, 2000; Harland et al., 2005; Prahalad and Hamel, 2009; Simchi-Levi et al., 2021).

Furthermore, outsourcing also grants firms access to specialised knowledge and advanced technologies that may not be available internally (Harland et al., 2003; Venkatesan, 1992). In industries where technology evolves rapidly and customer preferences change frequently, outsourcing offers a valuable means to stay updated without the heavy investment or risks of internal development (Venkatesan, 1992). As a result, outsourcing knowledge creation to external partners has become increasingly common, particularly in high-tech sectors (Ahuja, 2000; Son et al., 2024).

Lastly, outsourcing provides companies with scalability and flexibility, allowing them to adjust their operations in response to fluctuating demand (Harland et al., 2005; Holcomb and Hitt, 2007). This is especially valuable in industries where demand is difficult to predict and products may become obsolete quickly (Simchi-Levi et al., 2021). The ability to scale up or down through outsourcing helps firms remain agile and responsive to market changes.

Firms often have more than one motivation for outsourcing. A prime example is Apple, which strategically retains core activities such as research and development and marketing in-house—areas critical to its brand identity and product innovation, while outsourcing production to external specialist manufacturers like Hon Hai Precision and Pegatronics (Mudambi and Venzin, 2010). This approach enables Apple to achieve flexibility and cost efficiency without sacrificing the quality or premium image of its products. By heavily relying on outsourcing for manufacturing, Apple can concentrate on its core strengths: fostering innovation, enhancing its brand, and maintaining its leadership in the market (Mudambi and Venzin, 2010).

Despite the advantages discussed above, however, outsourcing presents significant challenges and risks.

Many companies find their outsourcing experiences disappointing (Harland et al., 2005), and a substantial number eventually choose to bring previously outsourced processes back in-house (Handley and Benton, 2009). This means, firms must carefully weigh these risks against the benefits to ensure their outsourcing strategies align with long-term objectives.

One of the primary risks of outsourcing is the potential loss of control, as companies hand over responsibility for certain functions to external providers (Kremic et al., 2006; Simchi-Levi et al., 2021). This can lead to various issues, particularly concerning quality, which becomes especially problematic when the outsourced function is customer-facing. In the early 2000s, many firms outsourced their customer service operations to low-cost locations for cost saving. However, this often resulted in significant challenges related to service quality, leading to widespread customer dissatisfaction (Tate and van der Valk, 2008). As a result, some companies were forced to bring these functions back in-house to regain control and improve service standards (Treanor, 2007).

Another critical risk is the issue of hidden costs. While firms often view outsourcing as a means of achieving cost savings, there are frequently overlooked costs that arise throughout the process (Kremic et al., 2006). These hidden costs can include contracting, coordination, and ongoing monitoring, which many firms fail to fully anticipate (Kremic et al., 2006; Simchi-Levi et al., 2021). For instance, managing relationships with external providers often requires additional resources, and discrepancies between expectations and actual service delivery can lead to further financial burdens eroding potential savings.

Another significant risk tied to outsourcing is the potential loss of competitive knowledge. When firms outsource essential functions, especially those related to core products or services, they run the risk of loss of competitive knowledge to competitors. This can happen when outsourcing providers work with multiple clients, inadvertently sharing insights across different companies (Simchi-Levi et al., 2021). Additionally, over-reliance on external partners for innovation can stifle a company's own capacity to innovate. As firms become dependent on the knowledge and capabilities of their outsourcing partners, they may lose their ability to generate unique ideas and solutions independently (Kremic et al., 2006; Simchi-Levi et al., 2021).

In recent years, there has been a notable shift in outsourcing trends across industries, driven by the need for greater resilience in supply chains. This is because recent global events such as the COVID-19 pandemic, trade wars, and semiconductor shortages have exposed vulnerabilities in these extended supply chains, prompting firms to rethink their outsourcing strategies. The automotive industry, for instance, has begun moving away from outsourcing to regain control over critical components, such as electronic vehicle (EV) batteries and semiconductors (The Economist, 2022). Tesla's vertically integrated model, which includes in-house production of key materials and components, has inspired traditional automakers to shift towards a more integrated approach. Companies like Ford, BMW and VW are planning to make more EV motors in their factories (The Economist, 2022).

For more information on outsourcing, please refer to the book by Simchi-Levi et al. (2021), Chapter 9.