

# SCM Bachelor Thesis - Topic Overview

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The following abstracts are examples. They should help you to get a better understanding of possible directions you could look into with your bachelor thesis. **We encourage you to think about your research topic and question on your own.**

## Stream 1: Supply Chain Analytics and Operations

A bachelor thesis in Stream 1 requires the application of quantitative methods, such as optimization, simulation, or developing and testing forecasting methods.

### 1. Last mile supply chain & Vehicle routing

The last mile in supply chain management refers to the final stage of delivering products from a distribution center to the end customer. This phase is crucial as it directly affects customer satisfaction and can be the most complex and expensive part of the logistics process. Challenges in the last mile include traffic congestion, diverse delivery locations and options, and the need for timely deliveries. Companies employ strategies such as using local delivery hubs, crowd-sourced delivery services, and route optimization to tackle these challenges. Advanced algorithms and technologies help in planning the best routes. Effective vehicle routing enhances delivery speed, reduces operational costs, and improves overall service quality, making it a vital component of modern supply chain strategies.

### 2. Sustainable scheduling & closed loop supply chains

Sustainable scheduling and closed-loop supply chains are key concepts in advancing eco-friendly supply chain management. Sustainable scheduling focuses on optimizing production and transportation schedules to minimize energy consumption and reduce carbon emissions. This involves using advanced algorithms to balance efficiency with environmental impact. Closed-loop supply chains, on the other hand, emphasize the reuse, recycling, and remanufacturing of products. By integrating processes that return end-of-life products back into the supply chain, companies can reduce waste, conserve resources, and create a circular economy. Together, these practices contribute to a more sustainable and responsible approach to supply chain management, promoting long-term environmental and economic benefits.

### 3. Inventory management

Inventory management is a critical aspect of supply chain management, involving the oversight of goods from manufacturers to warehouses and finally to the point of sale. Effective inventory management ensures that the right quantity of products is available at the right time and place, minimizing both excess stock and stockouts. This balance helps reduce holding costs, improve cash flow, and increase customer satisfaction. Techniques such as just-in-time (JIT), economic order quantity (EOQ), and advanced forecasting tools are often used to optimize inventory levels.

#### 4. Production & Job Flow Scheduling

Production and job flow scheduling are essential components of supply chain management, focusing on the efficient allocation of resources and sequencing of tasks. Production scheduling ensures that manufacturing processes are planned to meet demand while optimizing the use of materials, labor, and equipment. Job flow scheduling, a subset of production scheduling, involves organizing the sequence of jobs on the production floor to minimize delays and maximize throughput. These scheduling activities aim to reduce production time, lower costs, and improve delivery performance.

#### 5. Health Care Operations Management

Healthcare operations management focuses on optimizing the efficiency and effectiveness of healthcare service delivery. This discipline involves coordinating a wide range of activities, including patient flow management, staff scheduling, resource allocation, and supply chain management, to ensure high-quality patient care. By strategically managing these elements, healthcare operations aim to reduce waiting times, streamline patient admissions and discharges, and improve the overall patient experience. Effective operations management also enhances the utilization of medical facilities by ensuring that hospital beds, diagnostic equipment, and surgical suites are used to their full potential without unnecessary delays.

#### 6. Forecasting

Forecasting is a critical component of supply chain management, enabling businesses to predict future demand, inventory requirements, and production needs. By utilizing statistical methods and advanced algorithms, companies can generate accurate forecasts that inform strategic decisions and operational planning. Effective forecasting helps in aligning supply with demand, reducing excess inventory, and minimizing stockouts. It also supports better budgeting and resource allocation. Tools like Python, R, and specialized forecasting software can be employed to develop robust forecasting models, which consider historical data, market trends, and external factors.

#### 7. Real-Time Data Integration in Supply Chains

Real-time data has become indispensable in modern supply chain management, offering unparalleled insights and agility. Supply chain professionals can access up-to-the-minute information on inventory levels, production status, transportation routes, and customer demand. This real-time visibility enables proactive decision-making, such as rerouting shipments to avoid delays or adjusting production schedules to meet changing demand patterns. For example, it is now possible to adjust routes on the fly if the journey time on the planned route increases significantly due to traffic jams or roadworks. Consider the problem of finding the fastest possible round trip through a given selection of cities.

## Stream 2: Strategic Supply Chain Management

A bachelor thesis in Stream 2 requires the application of qualitative or empirical methods, such as case studies, comparing and reviewing reports or literature, or conducting expert interviews and surveys.

### 8. ESG and Sustainability Management

ESG (Environmental, Social, and Governance) considerations and sustainability reporting are increasingly integral to supply chain management (SCM). In today's business landscape, stakeholders demand transparency and accountability regarding environmental and social impacts throughout the supply chain. Effective SCM practices incorporate ESG factors by assessing and mitigating risks related to carbon emissions, resource depletion, and labor conditions. Sustainability reporting in SCM involves measuring, monitoring, and disclosing relevant ESG metrics, such as greenhouse gas emissions, water usage, and supplier diversity. Research aims to identify and develop best practices for benchmarking and comparing ESG performance across different companies and industries.

### 9. Strategic Sourcing

Strategic sourcing is a proactive approach to procurement aimed at maximizing value while minimizing risks in the supply chain. It involves identifying the optimal suppliers, negotiating contracts, and managing relationships to ensure a reliable and cost-effective flow of goods and services. By analyzing factors such as supplier capabilities, market dynamics, and total cost of ownership, organizations can develop sourcing strategies that align with their business goals. Strategic sourcing goes beyond just cost reduction; it emphasizes long-term partnerships, supplier diversity, and risk mitigation strategies.

### 10. Traditional and Agile Project Management

In supply chain management, traditional project management follows a linear approach, suitable for stable projects. Agile methodologies like Scrum or Kanban offer flexibility and adaptability to dynamic SCM environments, allowing teams to respond quickly to changes, break down projects into smaller tasks, and prioritize based on value. While traditional methods have their place, agile approaches better suit the unpredictable nature of modern supply chains, fostering collaboration and innovation. Companies oftentimes need to distinguish and choose between different approaches when planning and implementing projects based on specific project conditions.

## 11. Supply Chain Risk Management

Supply chain risk management (SCRM) is crucial for identifying and mitigating potential disruptions within the supply chain. It involves proactive measures such as diversifying suppliers, implementing robust inventory management, and leveraging technology for real-time monitoring. SCRM helps organizations anticipate and respond to risks, ensuring business continuity and customer satisfaction, even in challenging circumstances. In SCRM it is necessary to identify the most significant sources of risk in modern supply chains and implement best practice strategies to mitigate these supply chain risks.

## 12. Gen-AI

In supply chain management (SCM), Large Language Models (LLMs) are emerging as powerful tools for enhancing decision-making processes and optimizing operations. LLMs, such as GPT-4, offer advanced natural language processing capabilities that can analyze vast amounts of unstructured data from various sources. Since the launch of GPT-4, several questions are arising: 1) What are the key factors influencing the successful implementation and adoption of LLMs in supply chain management? 2) To what extent can LLMs automate routine tasks and decision-making processes in supply chain operations, and what are the implications for workforce roles and skills? 3) How do LLMs contribute to improving supply chain resilience and responsiveness in the face of disruptions such as natural disasters or geopolitical events?

## 13. Smart Factories

Smart factories integrate 3D, VR, and AR technologies to revolutionize supply chain management. They create digital twins for simulations, optimizing production processes before implementation. 3D modeling aids in design and maintenance, while VR and AR enhance training and troubleshooting. By leveraging these technologies, organizations improve efficiency, reduce downtime, and stay competitive in the market. For example, the implementation of 3D printing for on-demand manufacturing can significantly impact the scalability and flexibility of supply chains. AR/VR technologies on the other hand may play an increasing role in enhancing customer experiences and supply chain transparency across different industries.

## 14. eCommerce

As eCommerce continues to evolve, the future of parcel delivery may see a convergence of technologies such as Amazon Key, drones, robotics, smart trunks, and predictive logistics to streamline the delivery process. Beyond traditional methods, companies are exploring innovative solutions to deliver goods to customers faster and more cost-effectively. Before employing such new technologies, companies need to examine and compare the advantages and disadvantages of different distribution approaches and assess their future potential.

## Stream 3: Behavioral Operations in SCM

A bachelor thesis in Stream 3 requires the application of qualitative, analytical or empirical/experimental methods.

### 15. Bullwhip Effect and SC Coordination

The bullwhip effect is a phenomenon in supply chain management where small fluctuations in consumer demand cause progressively larger oscillations in orders and inventory levels up the supply chain. This effect can lead to inefficiencies such as excessive inventory, stockouts, and increased costs. Effective supply chain coordination is essential to mitigate the bullwhip effect. By fostering a more integrated and transparent supply chain, businesses can reduce variability, enhance responsiveness, and achieve greater overall efficiency.

### 16. Human – AI Collaboration

Algorithms can recognize complex patterns in data, but there are situations where humans outperform algorithms due to their unique information and skills. Thus, collaboration between humans and AI emerges as an intriguing approach, where both parties complement each other to achieve better results. However, this may not always be the case. It is thus important to identify the respective strengths and weaknesses of human and artificial intelligence, and assess when and how complementarities can be realized. In addition, humans may be resistant in using algorithms and algorithmic advice. It is thus crucial to pinpoint factors that hinder humans from optimally utilizing algorithms and establishing mechanisms to overcome these factors.

### 17. Decision Biases

Decision biases can significantly impact supply chain management, leading to suboptimal outcomes and increased risks. One common bias is anchoring, where decision-makers rely too heavily on initial information or reference points, leading to errors in judgment. This can manifest in supply chain planning, such as setting inventory levels based on outdated or irrelevant data. Confirmation bias is another prevalent issue, where individuals seek out information that confirms their preconceived beliefs or decisions, potentially overlooking alternative options or risks. In supply chain management, this bias may lead to ignoring warning signs of potential disruptions or dismissing alternative suppliers. Recognizing and mitigating these biases through awareness, diverse perspectives, and data-driven decision-making processes are crucial for improving supply chain resilience and performance.

## 18. Bargaining and Auctions

Bargaining and auctions play a significant role in supply chain management, particularly in procurement and sourcing activities. These mechanisms facilitate the negotiation of prices, terms, and conditions between buyers and suppliers, ultimately impacting costs, quality, and supplier relationships. In procurement, bargaining allows organizations to leverage their purchasing power to secure favorable deals and drive down costs. Auctions, on the other hand, introduce competitive bidding among suppliers, leading to price discovery and efficient allocation of resources. Information asymmetries play an important role in bargaining and auctions, and it is necessary to determine how can they be mitigated to achieve better outcomes.