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Startup Supply Chain – Scalability through Artificial Intelligence

Opportunities and Challenges

Operations and Supply Chain Management
Bachelor's thesis

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Startups play a vital role in both the economy and society, yet their chances of success are relatively small. This makes the exploration of their survival and scalability an important area of academic discussion. Therefore, this thesis aims to contribute to the discussion by examining the key processes of supply chain management (SCM) within the context of a startup's scalability. The study focuses on modern SCM practices that have emerged due to digitalisation and advancements in artificial intelligence (AI), suggesting that AI serves as a significant driver for process optimisation and competitive advantage. For this reason, the study seeks to identify the factors that differentiate a startup from an established firm and why the adoption of AI in startups may present unique opportunities and challenges due to their distinct characteristics.

The findings highlight that AI can help both established and emerging companies solve SCM challenges, as AI applications are widely utilised in various SCM processes to improve efficiency and decision-making. The research recognises that startups can address common SCM pain points in scaling their supply chains through the implementation of AI technologies in areas such as customer relationship management (CRM), demand forecasting, procurement, inventory management, and innovation. Additionally, the study identifies notable challenges for startups related to AI in SCM, including the lack of resources, complexity, and ethical concerns.

All in all, the findings suggest that integrating AI technologies into supply chain processes can help startups compensate for their limited resources and support decision-making in their uncertain and dynamic business environments. However, due to the associated risks, startups shouldn’t blindly trust AI. Understanding these opportunities and challenges can be seen as essential for supporting startups' survival and growth.

Key words: artificial intelligence, scalability, supply chain management, startup

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Startup-yritykset ovat elintärkeitä organisaatioita sekä taloudelle että yhteiskunnille. Niiden selviytymiseen ja skaalautumiskykyyn liittyen on kuitenkin tärkeää herättää lisää akateemista keskustelua, sillä todennäköisyys startupin menestymiselle on pieni. Tämä opinnäytetyö osallistuu keskusteluun tarkastelemalla toimitusketjujen hallinnan keskeisimpiä prosesseja startup-yrityksen skaalautuvuuden näkökulmasta. Tutkimus syventyy digitalisaation ja tekoälyteknologioiden myötä syntyneeseen moderniin toimitusketjujen hallintaan, jossa tekoäly nähdään merkittävänä ajurina prosessien tehostamisessa sekä yrityksen kilpailuedun saavuttamisessa. Tämän vuoksi tutkimus pyrkii selvittämään, mitkä tekijät erottavat startup-yrityksen vakiintuneesta yrityksestä ja miksi tekoälyn käyttöönotto startupissa voi piirteistään johtuen kohdata uniikkeja mahdollisuuksia ja haasteita.

Tulokset korostavat, että tekoäly voi auttaa sekä vakiintuneita yrityksiä että startupeja ratkaisemaan toimitusketjujen hallintaan liittyviä haasteita, sillä tekoälysovelluksia hyödynnetään laajasti erilaisissa toimitusketjujen hallinnan prosesseissa tehokkuuden ja päätöksenteon parantamiseksi. Startup-yritys voi ohittaa monia tavallisia kipukohtia toimitusketjunsa skaalaamisessa hyödyntämällä tekoälyteknologiaa muun muassa asiakassuhteiden hallinnassa, kysynnän ennustamisessa, hankinnassa, varastonhallinnassa ja innovoinnissa. Tutkimus tunnistaa myös merkittäviä haasteita tekoälyn hyödyntämisessä toimitusketjujen hallinnan tukena, joista keskeisimpinä voidaan nähdä resurssien puute, monimutkaisuus ja eettiset riskit.

Tutkimuksen perusteella voidaan todeta, että tekoälyteknologioiden käyttäminen startupin toimitusketjun prosesseissa voi auttaa startupeja kompensoimaan rajallisia resurssejaan sekä tukea päätöksentekoa startupille luonteenomaisessa epävarmassa ja muuttuvassa liiketoimintaympäristössä. Tunnistettujen haasteiden vuoksi startup-yritysten ei kuitenkaan tulisi luottaa sokeasti siihen, mitä tekoäly mahdollistaa. Näiden mahdollisuuksien ja haasteiden tunnistaminen voi tukea startupin selviytymistä ja kasvua.

Avainsanat: tekoäly, skaalautuvuus, toimitusketjun hallinta, startup

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1 Introduction

1.1 Background and Context

The term startup is usually applied to a temporary organisation aiming to rapidly scale into a large company under the conditions of extreme uncertainty (Koskinen, 2020; Marmer et al., 2011; Ries, 2011). In recent years, the importance of startups and their economic impacts on societies has been addressed by many researchers, economists, and industry stakeholders. These ventures are beneficial to nations and the world as a whole because of their ability to create high levels of wealth and solve social and environmental problems (Pigola et al., 2023). Yet, on average, a startup's survival is no more than five years, and the statement "nine out of ten startups fail", which is frequently mentioned in various literature, has become a symbolic representation of startup challenges (Koskinen, 2020; Pigola et al., 2023; Ries, 2011).

Startups play a vital role in building a better future (Wagner, 2021). However, these ventures need to survive to generate economic and societal benefits. As business environments become increasingly dynamic, startups must build capabilities from the beginning to adapt to environmental changes according to ever-evolving internal and external conditions (Pigola et al., 2023). The problem that most startups have is the limited capital and human resources, which makes building these capabilities more difficult than for a large, established corporation (Tripathi et al., 2019). Therefore, to achieve higher growth and financial health, startups must be open to innovations in their firm (Ardolino et al., 2025).

In an era where digitalisation and disruptions are all-encompassing, supply chain management (SCM) has transformed, as the field has been provided with a lot to be excited about and, in contrast, a lot to consider (Arinez et al., 2020; Nafizah et al., 2024; Ardolino et al., 2025). Consequently, a major factor in a startup’s ability to scale into a large company is the strength and optimisation of its supply chain (Marmer et al., 2011; Singh et al., 2024). In a business context, scalability means the capability of a business to efficiently handle growth and stay flexible by expanding or reducing its operations without compromising its performance (Bondi, 2000; Accenture, 2014; Büyüközkan & Göçer, 2018). When supply chains are integrated with capabilities that digitalisation makes possible, scalability becomes less of an issue (Büyüközkan & Göçer, 2018). These digital capabilities refer to the skills, technologies, and processes that enable organisations to effectively adopt and utilise digital tools to enhance their operations and

competitiveness. Furthermore, in today's volatile environment, implementing robust digital capabilities is essential for supply chains (Ardolino et al., 2025).

The future of SCM is digital and networked, with a significant focus on scalability (Accenture, 2014; Büyüközkan & Göçer, 2018). In general, existing studies have shown that digital technologies have transformed the traditional approach to organisations' SCM by providing ways to improve their supply chain performance on many levels (Yang et al., 2021). Currently, there are many technologies that organisations utilise to enjoy the benefits of a digital supply chain, which is defined as an intelligent system that connects the different elements of a company's supply chain by utilising data, software, and networks (Chopra & Meindl, 2010; Büyüközkan & Göçer, 2018). Notably, Abdelhamid et al. (2024) present that one of the main technologies the future supply chains will be based on is artificial intelligence (AI). AI can be defined as the capability of a system to accurately interpret external data, learn from it, and utilise those insights to achieve specific goals and tasks through flexible adaptation (Haenlein & Kaplan, 2019, 5). It is seen as one of the major catalysts behind a modern, digital, and scalable supply chain (Woschank et al., 2020). In addition, AI as a field has become one of the most trendy and dynamic areas for pursuing entrepreneurs, and these AI-based entrepreneurial opportunities are attracting a significant amount of venture capital (Chalmers et al., 2021), making this area an interesting research field due to its substantial impact on the economy. As a result, entrepreneurs have an increasing interest in building AI-driven ventures, but in the process of adopting technology to address supply chain challenges, they often lack the knowledge on what strategic decisions to make (Ardolino et al., 2025). Namely, what are the opportunities and challenges?

1.2 Aim of the Thesis

Today's startups and their supply chains are faced with the recent radical changes in digital technology, but their approach to this change is different from that of established companies because of their unique challenges (Wagner, 2021). In addition, smart solutions that use complementary digital technologies, such as AI, are still in their infancy with startup companies (Hahn, 2020). To this day, the academic literature on SCM has only given slight attention to startups (Wagner, 2021). Many studies on digital capabilities have remained at the level of theoretical frameworks, but they often fail to dive deeper into the relationship between the adoption of digital technologies, their potential, and their risks, especially in the context of small companies such as startups (Ardolino et al., 2025). In addition, there are many factors that can inhibit the

success of a startup. For instance, scaling a business at the right time in relation to market growth is seen as a critical factor for a venture's success (Marmer et al., 2011). As the goal of a startup is to scale rapidly, its supply chain must be able to keep up with the growth and be prepared to deal with disruptions, limited resources, and constant uncertainty. Moreover, recent technological developments have enabled new ways to enhance the supply chain, which is why it is relevant to explore these possibilities as a catalyst for the scalability of startups' supply chains.

The aim of this thesis is to explore the use of AI as a strategic tool for building sustainable startup growth through adopting AI technology and its applications into a startup's supply chain processes. The main research question of this thesis is as follows: How can AI enable the scalability of startup supply chains? The sub-questions used in this thesis to answer the main research question are as follows:

- What are the key ways AI is used to drive supply chain scalability?
- What opportunities and challenges do startups face in AI-driven supply chain scalability?

This thesis mainly focuses on innovative, disruptive, and technology-driven startups that aim for rapid growth. However, the findings can be applied in many different startup contexts across all industries. As digital capabilities are more associated with a digital supply chain than a traditional supply chain, the emphasis of the thesis is on the digital supply chain. In addition, to answer the research questions of this thesis, it calls for a startup-specific approach when analysing SCM challenges.

Ultimately, given the importance of startups in building a better future, my thesis aims to contribute to the understanding of how startups can harness the potential of AI applications to enhance the scalability of their supply chains. By analysing the relationship between innovative AI applications and supply chain dynamics in the context of startups and their unique business environment, this thesis seeks to offer valuable insights for both researchers and practitioners in the field of startups and SCM. The findings will help startups looking to adopt innovative solutions into their supply chain strategy to make more informed decisions and approach scalability challenges more efficiently.

1.3 Methodology

The thesis is conducted as a literature review based on various academic literature addressing its key research topics, including SCM, startups, scalability, and AI and its key applications and subsets in driving supply chain scalability. When exploring and selecting sources for this thesis, priority was given to peer-reviewed and the most recent publications related to the topics of this thesis. These selection criteria were important because research on AI is constantly developing, and the environment of startups is dynamic and ever-evolving. The goal of this literature review is to summarise the existing literature in the light of the research questions, recognise research gaps, and identify suggestions for future research on the topic of using AI as a catalyst for the scalability of startup supply chains.

1.4 Structure of the Thesis

The thesis begins by introducing the distinct characteristics and challenges that startups and their supply chains have in the context of scalability. The focus is then placed on exploring AI and how its applications are used to improve supply chain processes in general and in a startup environment. In relation to AI, a deeper exploration is made into its key applications, as they're significant contributors to AI-driven SCM. Eventually, the thesis delves into the opportunities and challenges for startups to leverage these applications to support constructing a scalable supply chain. To conclude the thesis, the last chapter presents conclusions, discussion, and limitations of the research.

2 Startups in the Supply Chain Ecosystem

To understand the opportunities and challenges in using AI to scale a startup's supply chain processes, it's important to define the context in which today's startups are operating. When discussing the use of technologies in optimising supply chain operations, it's a matter of a modern digital supply chain (Aliyev et al., 2024). A digital supply chain can be characterised by its complexity and technology-driven nature. It's a network whose key principles are technology utilisation, customer focus, collaboration, and flexibility. (Akın Ateş et al., 2022.) Furthermore, this chapter explores the key characteristics of a digital supply chain ecosystem, particularly from the perspective of startups and scalability.

2.1 Characteristics of Startups and Their Supply Chains

Ries (2011), the creator of the renowned Lean Startup methodology, explains a startup as a human institution with the common interest of innovation designed to create new products and generate interest under extreme conditions of uncertainty. Due to the all-encompassing uncertainty in a startup's business environment, scholars have identified various definitions for a startup to demonstrate it. Koskinen (2020) applies the term startup to a young company that has discovered or is developing a novel innovation, which accurately describes the primary focus of this thesis: technology-driven startups. These ventures are associated with innovation, emerging technologies, digitalisation, and disruptive business models (Wagner, 2021). Moreover, Koskinen (2020) highlights that startup entrepreneurship is somewhat routinely associated with technology and internet-based services.

One way to understand startups' supply chains is to place them in the uncertainty framework created by Lee (2002, 108). As startups have innovative products and their supply process can be described as dynamic and ongoing, they experience both supply uncertainty and demand uncertainty (Lee, 2002). Therefore, they can be placed in the bottom right column of the framework. Figure 1 presents a modification of Lee's (2002) uncertainty framework and further findings of his review to demonstrate where startups stand in the framework compared to more stable businesses, such as companies offering functional products. Overall, Lee's (2002) study suggests an agile approach for startups to use as their SCM strategy and reduce uncertainty.

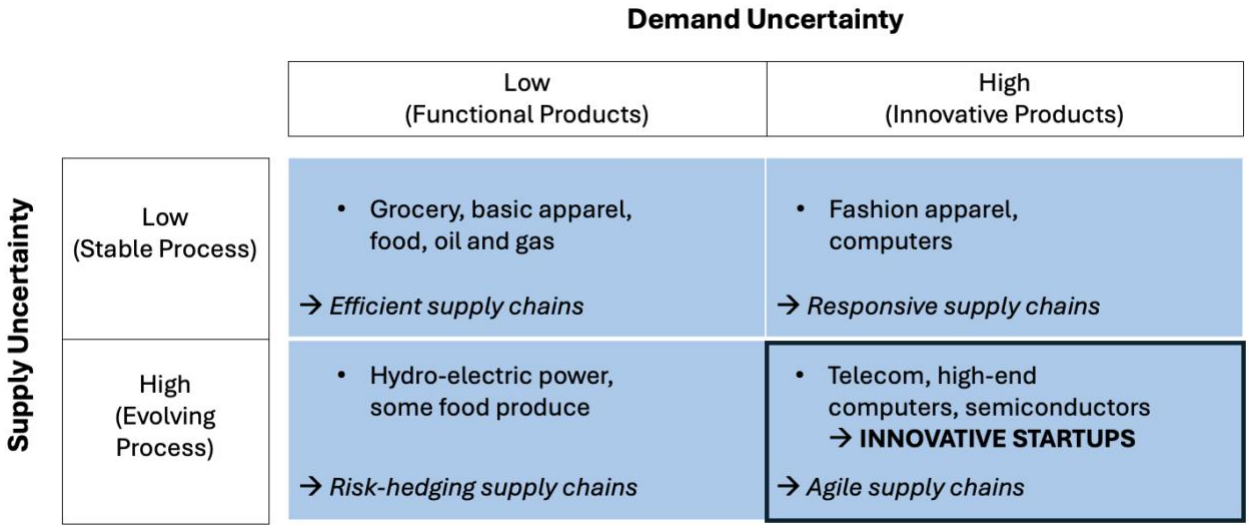

Figure 1 Startups in the uncertainty framework (modified from Lee, 2002).

Furthermore, Wagner (2021) presents an overview of how startups approach their own supply chains, effectively demonstrating the uncertain environment in which they operate and supporting Lee's (2002) earlier research. Table 1 presents the key themes related to startups' supply chains to illustrate startups' unique characteristics compared to established firms in the SCM context. As startups operate in a more dynamic and uncertain environment than established firms, they face evolving supply and demand, pressure to scale rapidly, limited and unreliable sources, fragmented logistics and distribution, high dependence on outsourcing, frequent operational changes, and low alignment. In contrast, the environment of established firms can be described as stable, which enables them to scale gradually, benefit from multiple and reliable sources, use strategic outsourcing primarily for efficiency, and enjoy optimised logistics and distribution in addition to overall high alignment and stable operations. (Lee, 2002; Wagner, 2021.) Moreover, correlating with the newness and uncertainty of startups, it's important to note that one fundamental difference they have from established companies is their lack of resources, which affects their whole supply chain (Ries, 2011; Wagner, 2021; Stallkamp et al., 2022; Nafizah et al., 2024).

Table 1 Typical SCM themes in startups compared to established firms (modified from Lee, 2002; Wagner, 2021).

Supply Chain Theme	Established Firms	Startups
Supply and Demand	Stable	Evolving
Uncertainty	Low	High
Scaling & Internationalisation	Gradual	Rapid
Sourcing	Multiple and reliable sources	Limited and unreliable sources
Outsourcing	Strategic outsourcing to achieve efficiency	High dependence on outsourcing
Logistics & Distribution	Established and optimised	Fragmented
Operations	Stable	Frequent changes
Alignment	High and strategic	Low and challenging

Tatikonda et al. (2013) explain startups through three distinct phases, which are the initial start-up phase, growth phase, and stability phase. Tripathi et al. (2019) argue that the initial startup phase can be divided into formation and validation, followed by the growth phase, which is similar to the analysis of Tatikonda et al. (2013). Dividing the initial startup phase into formation and validation effectively characterises what happens in a startup before the growth phase. It is evident that startups and their supply chains have different characteristics from established firms (Lee, 2002; Hahn, 2020; Wagner, 2021; Behl, 2022). Consequently, they face unique SCM-related challenges in the different phases of their life cycle (Wagner, 2021). Furthermore, Wagner (2021, 1142) makes use of the findings of Tatikonda et al. (2013) and presents a figure to outline the three stages of startups and the SCM boundary focus areas associated with them. Table 2 presents a modification based on Tatikonda et al. (2013) and Wagner (2021) to highlight the SCM-related themes in each phase. During the growth phase, on a supply chain level, a startup focuses on increasing its customer base, expanding channels of distribution, and leveraging supplier management competencies. Meanwhile, within the firm, the startup aims to increase its production volume to serve the greater demand, reduce lead times, obtain a greater gross margin, and integrate products with services. Considering the research questions of this thesis, the boundary focus areas can be considered as SCM challenges, and the growth phase can be considered as the stage where a startup scales its operations. Therefore, the presented boundary focuses associated with the growth phase are the most significant to explore in this thesis.

Table 2 SCM-related challenges along startup phases (modified from Tatikonda et al., 2013; Wagner, 2021).

Boundary Focus	Initial Startup Phase	Growth Phase	Stability Phase
Across the startup firm boundaries (supply chain)	• Ensure high customer responsiveness and rapid delivery	• Increase customer base • Expand channels of distribution • Leverage supplier management competencies	• Integrate suppliers for lead time reduction • Engage with suppliers for lean practices and productivity • Ensure sustainable supply chain
Within the startup firm (operations)	• Increase inventory turns to preserve working capital deployable to product and market development	• Increase production volume to service greater demand • Reduce lead times • Obtain internal returns (greater gross margin) to support scale-up	• Continuously reduce lead times and increase reliability • Increase employee productivity to support greater unit output • Ensure sustainable operations
Within the startup firm (R&D, product and service, and technology commercialization)	• Choose of breadths and depths of idea and innovation search • Select mode of technology commercialization (internal vs. externalized) • Organize and protect intellectual property rights (IP)	• Integrate products with services	• Diversify and augment products

According to Lee (2002), innovative products with unpredictable demand and evolving supply processes encounter significant challenges in their supply chains. In other words, startups have more issues to tackle in their SCM than established companies. Combining startups' already complicated business environment with the enormous pressure due to globalisation and

digitalisation, it’s essential for them to establish capabilities to survive (Ardolino et al., 2025). Ultimately, to be able to innovate, satisfy customer needs, and eventually scale, adopting digital capabilities and resources associated with them into SCM can be seen as a critical determinant of a startup’s success (Stallkamp et al., 2022; Nafizah et al., 2024; Ardolino et al., 2025).

2.2 Digitalisation and SCM

Traditionally, the supply chain has been defined as a network of all parties directly or indirectly involved in fulfilling a customer order. It includes manufacturers, suppliers, transportation companies, warehouses, retailers, and customers. The design, production, distribution, customer service, and continuous flow of information, products, and resources between various stages are all parts of the supply chain. (Chopra & Meindl, 2010.) Indeed, the supply chain encompasses all the steps that affect a company's processes, from the design of a product or service to the end customer. These connections provide the supply chain with many opportunities but also lead to numerous challenges in the modern world, which is why innovative SCM is necessary. SCM is an essential part of business operations, and according to Lee (2002), it has become one of the key areas where modern companies can achieve a competitive advantage. It involves optimising the previously mentioned activities, aiming to improve the overall efficiency of the supply chain and maximise its total value creation and benefit to the end customer (Chopra & Meindl, 2010). Furthermore, Daios et al. (2025, 3) present a figure demonstrating the components typically included in an SCM framework: inputs, processes and outputs. From Figure 1, one can identify the key processes in the framework, which are procurement, customer relationship management (CRM), inventory management, transportation, resilience, demand forecasting, and risk management (Daios et al., 2025). These activities play a crucial role in both the internal and external aspects of a company and can be understood as a complex system involving inputs, internal processes, and outputs (Daios et al., 2025).

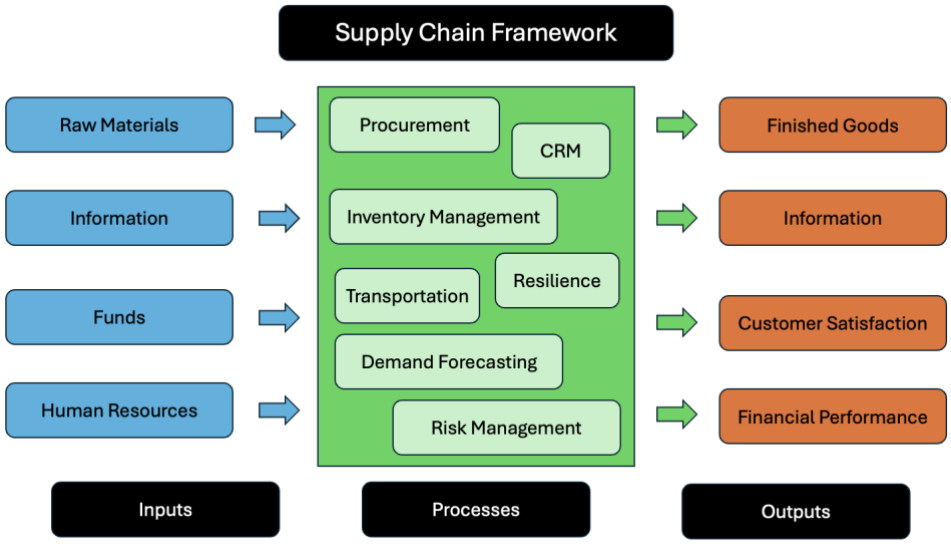

Figure 2 Supply chain management framework: inputs, processes, and outputs (Daios et al., 2025).

Digitalisation, however, marks the end of the era of traditional supply chains, and SCM faces new challenges and opportunities (Wagner, 2021). The new digital age has initiated rapid change in supply chains and the logistics industry and has given rise to the concept of the digital supply chain. A traditional supply chain consists of distinct phases. In a digital supply chain, these boundaries are removed, and the supply chain becomes a seamlessly functioning, integrated system (Büyüközkan & Göçer, 2018). Büyüközkan and Göçer (2018) define the digital supply chain as an intelligent system that is best suited to each company's strategy at a given time, based on comprehensive data utilisation and excellent collaboration and communication between digital hardware, software, and networks. What doesn't matter in a digital supply chain is whether the products or services are physical or digital, as the concept of it is more about the way the supply chain is managed. Its goal is to support and synchronise the interaction between organisations by making services and products more valuable, accessible, and affordable while producing consistent, agile, and efficient results. (Büyüközkan & Göçer, 2018). Thus, digitalisation enables the development of more flexible and efficient supply chains that can handle the needs of tomorrow.

The enhancement of competitiveness through digitalisation has motivated companies to increasingly pursue these opportunities of a digital supply chain. According to Büyüközkan and Göçer (2018), several key characteristics are aimed at being achieved by integrating traditional supply chains with digitalisation. These supply chain features include speed, flexibility, global connectivity, real-time inventory management, intelligence, transparency, cost-effectiveness, scalability, innovation, proactivity, and environmental friendliness. To achieve these benefits,

several technology trends can be identified that companies are already applying and could apply better in the future in their digital supply chains. For the purposes of this thesis, the most significant technology among these is AI, which will be discussed in more detail in Chapter 3.

2.3 Scalable Startup Supply Chain

One underlying characteristic that describes a startup is its goal to scale (Wagner, 2021), which means scaling is usually a core aspect of its overall strategy. Scaling up operations is associated with the startup's growth phase (see Table 2), where it has achieved the product-market fit and seeks to serve the increased demand. According to Chalmers et al. (2021), for startups, developing a business model that demonstrates market traction is crucial before scaling up operations. This first stage (see Table 2) itself, which Chalmers et al. (2021) refer to, presents multiple challenges, as it requires these ventures to rapidly adjust their organisational design across all dimensions to build a scalable structure to serve the market (Chalmers et al., 2021). Overall, scalability is an important theme related to SCM, as effectively increasing or decreasing operations on demand can often be problematic for organisations (Büyüközkan & Göçer, 2018). For a company to be scalable, its supply chain must also be capable of scaling. The concept of scalability encompasses various dimensions in the business world, but in this research, the focus is on what supply chain scalability means in the context of the research questions of this study.

In the context of IT infrastructure, Bondi (2000, 195) states that scalability is a desirable property of a network, system, or process whose characteristics and factors that diminish it become apparent only in context. In this context, he defines scalability as the ability of those above to efficiently handle an increasing workload or their capacity to expand in response to this growth. This principle can also be directly applied to scaling a business. Furthermore, according to the Cambridge Dictionary (2025), the primary use of the adjective "scalable" is to describe a business or system that can grow or expand. Büyüközkan and Göçer (2018, 165) add to this definition that a business can also scale "down," meaning that it can reduce its operations instead of focusing solely on growth. Accenture's (2014) publication supports all these previous definitions and adds that growth should occur without degrading performance or disproportionately increasing costs. Therefore, the ability to both increase and decrease operations in each situation is important. In everyday discussions about scaling, it is generally considered to be in the context of business growth.

With scalability in mind, before scaling up operations, new ventures must ensure that their business model demonstrates market traction and can be repeated (Marmer et al., 2011; Chalmers et al., 2021; Koskinen, 2020; Singh et al., 2024). When the customer base increases in the growth phase, a startup needs to serve a greater demand, which is a common operational pain point for startups that are scaling their operations (Tatikonda et al., 2013; Chalmers et al., 2021). To avoid further challenges associated with premature scaling, a startup must focus on ensuring that its fundamental business areas, such as the supply chain processes, are built on a solid foundation from the beginning. That said, a startup must not neglect the optimisation of its supply chain but instead ensure that all the processes, from design to the end customer, are functioning properly, laying the foundation for scalability (Stallkamp et al., 2022). Often, the reason startups fail is that they overlook the importance of conducting their due diligence and building the groundwork as they become too focused on rapid growth and, therefore, end up scaling prematurely (Marmer et al., 2011; Ries, 2011).

When traditional supply chains are integrated with solutions enabled by digitalisation, scalability becomes a minor issue than before. Digitalisation enables easier optimisation and repetition of processes and allows for quicker identification of deviations and errors (Büyüközkan & Göçer, 2018). When real-time data, automation, and networked operations are utilised in digital SCM, the supply chain becomes more adaptable and easily maintains its competitive edge. Therefore, new ventures should leverage the opportunities of digitalisation not only to achieve strategic competitive advantage and attain maximum efficiency, flexibility, and personalised experiences within their modern supply chains (Accenture, 2014). Companies that fail to adopt new, effective digital solutions that enable scalability risk falling behind in a rapidly changing business environment. The following chapters will explore how AI can be used to support startups in enhancing their supply chain scalability.

3 AI in SCM

Intelligent technology is the future, and AI and its implications are here to stay (Abdelhamid et al., 2024). All companies, big or small, must learn to live with AI or prepare to die because of AI. In today's world, AI stands as one of the most powerful technologies driving innovation and significantly enhancing operational efficiency (Aliyev et al., 2024). This might sound dramatic, but the rapid advancement of AI in today's business environment is not just noticeable – it is transformative. Recent advancements in machine learning (ML) and neural networks significantly enhance end-use technologies and the innovation process, potentially driving substantial innovation and growth. Therefore, understanding the incentives and barriers affecting the development and diffusion of these technologies is crucial for research (Cockburn et al., 2019). However, AI can often appear as a multifaceted concept that seems vague or complex, making it essential to clarify its meaning. Understanding AI not only involves knowing its basic principles but also examining its practical applications in real-world scenarios.

In modern times, AI is one of the most widely used technologies in creating innovative solutions to improve and optimise supply chains. It has profoundly transformed the landscape of SCM, enabling companies to optimise their operations and make more informed, data-driven decisions. (Aliyev et al., 2024.) By leveraging AI technologies, businesses can analyse vast amounts of data, forecast demand more accurately, and improve their processes on many levels, ultimately reducing costs and enhancing customer satisfaction (Yang et al., 2021). While AI has opened many new doors to making supply chains more efficient on many fronts, it has also exposed such digital supply chains to new risks. For businesses, understanding AI and its applications is crucial because the awareness helps them identify the potential opportunities AI presents for them while also recognising the associated risks that might come with its adoption (Nafizah et al., 2024).

3.1 Understanding AI

AI can be defined as the capability of a system to accurately interpret external data, learn from it, and utilise those insights to achieve specific goals and tasks through flexible adaptation (Haenlein & Kaplan, 2019, 5). More illustratively, it is a sophisticated mechanism or computer code that outlines the rules for determining which information to deliver, the methods for processing that information, and the appropriate types of responses to generate based on specific instructions or questions. This system works intelligently to ensure accurate and relevant interactions tailored to user needs.

(Abdelhamid et al., 2024.) Furthermore, Arinez et al. (2020) describe AI as the ability of computers to perform cognitive functions associated with the human mind, such as perceiving, reasoning, learning, and problem solving. In contrast to traditional computer programs, which follow a fixed set of preprogrammed instructions, AI systems possess the ability to learn and can improve and adapt based on experience (Chalmers et al., 2021).

The evolution of AI has a long history and is composed of several key technologies. Based on various academic sources and interview consultations with AI experts and supply chain practitioners, Pournader et al. (2021, 3) propose an illustrative AI taxonomy to explain the basis of AI applications used in SCM. This taxonomy is well aligned with the definition of Haenlein & Kaplan (2019), illustrating AI's nature by dividing its capabilities under the branches of sensing and interacting, learning, and decision-making (Pournader et al., 2021). Figure 3 presents the AI taxonomy proposed by Pournader et al. (2021) to demonstrate the complexity of AI and its branches that contribute to the AI applications used in SCM. The first branch, sensing and interacting, covers topics such as vision, speech recognition, and natural language processing. The second branch, learning, is primarily driven by ML methods. The third branch, decision making, includes simulation and modelling, optimisation, planning and scheduling, and expert systems. All these branches have further subdivisions based on different approaches and techniques. (Pournader et al., 2021). While all AI systems share overarching objectives, such as learning and predicting within their specific environments, Chalmers et al. (2021) point out that there is considerable variability in system functionality and the tools or combinations of tools that contribute to machine intelligence. However, this thesis focuses on the opportunities and challenges of using AI applications in general in SCM.

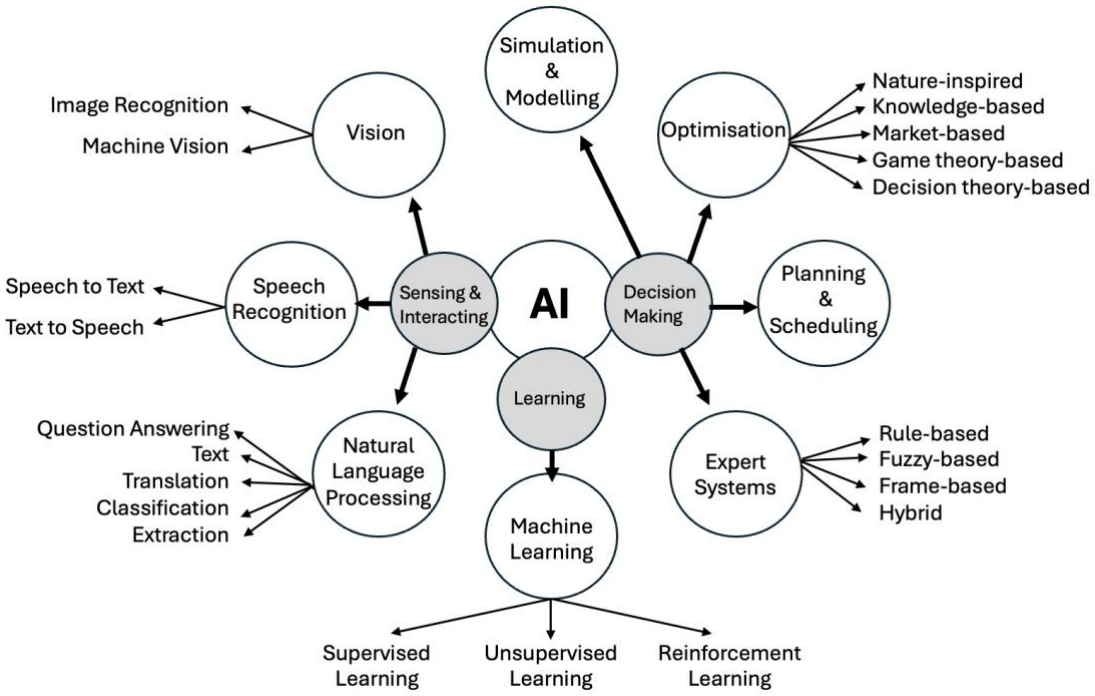

Figure 3 The proposed AI taxonomy (Pournader et al., 2021).

ML and deep learning (DL) can be identified as key elements in today's AI applications (Singh et al., 2024). ML serves as the "engine" of an AI system, detecting patterns and making predictions from unstructured data, as it encompasses deep neural networks (DNNs) and DL (Taddy et al., 2019). However, Taddy et al. (2019) argue that AI is not ML, and that the current wave of ML-driven AI should be viewed as a new class of products growing up around a new general-purpose technology, which is large-scale, fast, and robust ML. DL, on the other hand, is an important subset of ML that has undergone rapid evolution. Drawing influence from human biology, utilises DNNs to establish hierarchical layers of synthetic neurons, each aimed at extracting different patterns from input data (Chalmers et al., 2021). For instance, one layer may focus on identifying the contour of a cat's ear from an image, while another may identify the tip of a tail. When these elements are recognised, they activate specific neurons in subsequent layers, ultimately allowing for accurate classification of the object (e.g., as a cat). As DL further utilises backpropagation methods to enhance the learning process, it has significantly contributed to the development of AI technology (Chalmers et al., 2021). In brief, ML and DL form the basis of most applications we know under the label of AI, as their algorithms enable AI's human intelligence abilities to execute the tasks of recognising, analysing, and functioning human-like (Sharma et al., 2022).

Taddy et al. (2019) underline that ML tools will keep improving in speed and affordability. Furthermore, Cockburn et al. (2018) emphasise the profound implications of these techniques, as

they enable the analysis of expansive, unstructured datasets rather than relying solely on small, well-defined datasets, thereby facilitating the generation of highly accurate predictions regarding both technical and behavioural phenomena. Regarding the future of AI in SCM, the emphasis is on human-centric AI, increasing digital maturity, and addressing ethical and security concerns (Daios et al., 2025).

3.2 AI Applications in SCM

The rapid pace of digital transformation fosters the creation and growth of a global digital ecosystem and virtual relationships in many fields of activity. As it affects most sectors of activity, it also affects SCM, creating new trends and forming modern logistics (Arinez et al., 2020; Aliyev et al., 2024). According to the findings of Yang et al. (2021), research has also shown that SCM has shifted towards more data-driven approaches, such as predicting market demand and optimising production and logistics. Consequently, there are various opportunities and challenges to implementing AI technologies in supply chain processes (see Figure 2), which can be either fruitful or challenging transitions for companies (Daios et al., 2025). Focusing on the key SCM processes, Daios et al. (2025) identify various AI applications that are being adopted into the different processes. These findings are demonstrated in Table 3.

According to Daios et al. (2025), AI applications are being applied to CRM, inventory management, transportation networks, procurement, demand forecasting, resilience, and risk management (see Table 3). These real-world examples presented by Daios et al. (2025) are aligned with the findings of both Sharma et al. (2022) and Cannas et al. (2023), who also explored the role of AI applications in SCM processes. The formation and adoption of these AI applications have been driven by common SCM problems, such as improving human decision-making processes, managing demand uncertainty and high supply risk, maintaining competitive advantage, and remote monitoring (Sharma et al., 2022). Furthermore, Cannas et al. (2023) demonstrate these applications through the supply chain operations reference (SCOR) model, organising the different applications and their benefits in the plan, make, source, deliver, and return processes of the supply chain. The SCOR model in question is a clear demonstration that AI truly appears all-encompassing in a modern digital supply chain. By applying AI to these SCM processes, businesses have been able to develop more agile, flexible, efficient, and resilient supply chains, requiring fewer human resources and capital (Sharma et al., 2022; Cannas et al., 2023; Daios et al., 2025).

Table 3 Key SCM activities and their corresponding AI apps (Daios et al., 2025).

SCM ACTIVITIES	AI APPS
CUSTOMER RELATIONSHIP MANAGEMENT	Agent-based models, chatbots and virtual assistants
INVENTORY MANAGEMENT	Machine Learning, robots, drones, agent-based models and Large Language Models
TRANSPORTATION NETWORKS	Network theory, graph algorithms, genetic algorithms, ant colony optimization and reinforcement learning
PROCUREMENT	Agent-based models, process automation and Generative AI
DEMAND FORECASTING	Machine Learning, support vector machines, Neural Networks, decision trees, Deep Neural Networks, data mining, fuzzy models, sentiment analysis and Large Language Models
RESILIENCE	Artificial Neural Networks, deep reinforcement learning and Bayesian Networks
RISK	Ensemble learning, Neural Networks, fuzzy logic programming, Machine Learning, Big Data, agent-based systems, Generative AI, Deep Convolutional Neural Networks and Large Language Models

3.3 AI in Startups' Supply Chain Operations

In addition to revolutionising business processes, the recent advancements in AI have broadened the scope for its applications to pervade everyday life. Consequently, AI attracts aspiring entrepreneurs and the resources of venture capitalists (Chalmers et al., 2021). For example, ML and DL enable the image recognition algorithms used by Facebook, natural language processing being applied to Amazon's Alexa, and the technology Waymo uses to build self-driving cars (Haenlein & Kaplan, 2019; Chalmers et al., 2021). ML models are also the driving force behind generative AI, which is the basis of, for example, ChatGPT. ChatGPT is a prime example of an innovative and disruptive startup product built by OpenAI, as it offers many benefits, but also risks, to everyday life and business environments. (Daios et al., 2025.)

An increased interest in AI on-demand solutions has emerged in startup companies. These solutions refer to the AI services and technologies that are asset-light, meaning that they are easily accessible for adoption. (Hahn, 2020.) Furthermore, Hahn's (2020) analysis demonstrates that a transformation of the supply chain operating model and corresponding business processes has shifted towards prioritising scalability and flexibility, even though initially, the integration of digital technologies into supply chain processes focused on improving productivity. AI on-demand services are understandably more and more prevalent in startups' supply chain operations as their adoption doesn't require extensive resources. Moreover, the startups that have embraced these on-demand solutions, such as ML, have navigated today's supply chain challenges more efficiently than the ones that haven't. To stay competitive and sustain growth, utilising AI on-demand solutions can be seen as one key factor. (Behl, 2022.) Because AI is becoming more prevalent, it is more and more important to analyse how AI can be fitted into different operational environments to solve problems (Cannas et al., 2023). Hence, the way AI can be utilised in a startup's SCM can differ significantly from that of established companies.

4 Startup Supply Chain Scalability Through AI

As Daios et al. (2025) outline, it's more than evident that AI is leading the way in revolutionising every aspect of SCM, and AI is seen as the main force to succeed in a highly competitive environment of today. A growing number of startups are being born around digital products and services (Stallkamp et al., 2022), and only the future will show how AI will transform the development and operation of these startups (Chalmers et al., 2021). Aspiring entrepreneurs are often heavily focused on technology-enabled business opportunities, forgetting that it is often the traditional, non-technical scaling requirements that create major differences in market demand and act as bottlenecks for scalability (Stallkamp et al., 2022; Pigola et al., 2023). To be able to scale up and enter the growth phase (see Table 2), a startup needs to make sure that its supply chain processes do not become the bottleneck (Wagner, 2021). That said, SCM is seen as one of the key traditional elements in a business that can determine whether the startup can successfully grow and achieve the stability phase (see Table 2) or not (Wagner, 2021; Pigola et al., 2023).

Based on various academic literature explored in this thesis regarding startups, SCM, AI, and their synergies, Figure 4 provides an overview of the identified startup-specific opportunities for AI-enhanced supply chain scalability and the associated challenges to consider. When applying AI technology into a startup's supply chain to enhance scalability, the areas of opportunity found and discussed in this thesis are CRM, demand forecasting, procurement, inventory management and innovation. Furthermore, the research identifies challenges associated with the opportunities, such as a lack of resources, complexity and ethical risks, as they can be seen as inhibitors for AI-driven SCM in startups. This chapter takes a closer look at these opportunities and challenges through real-life examples.

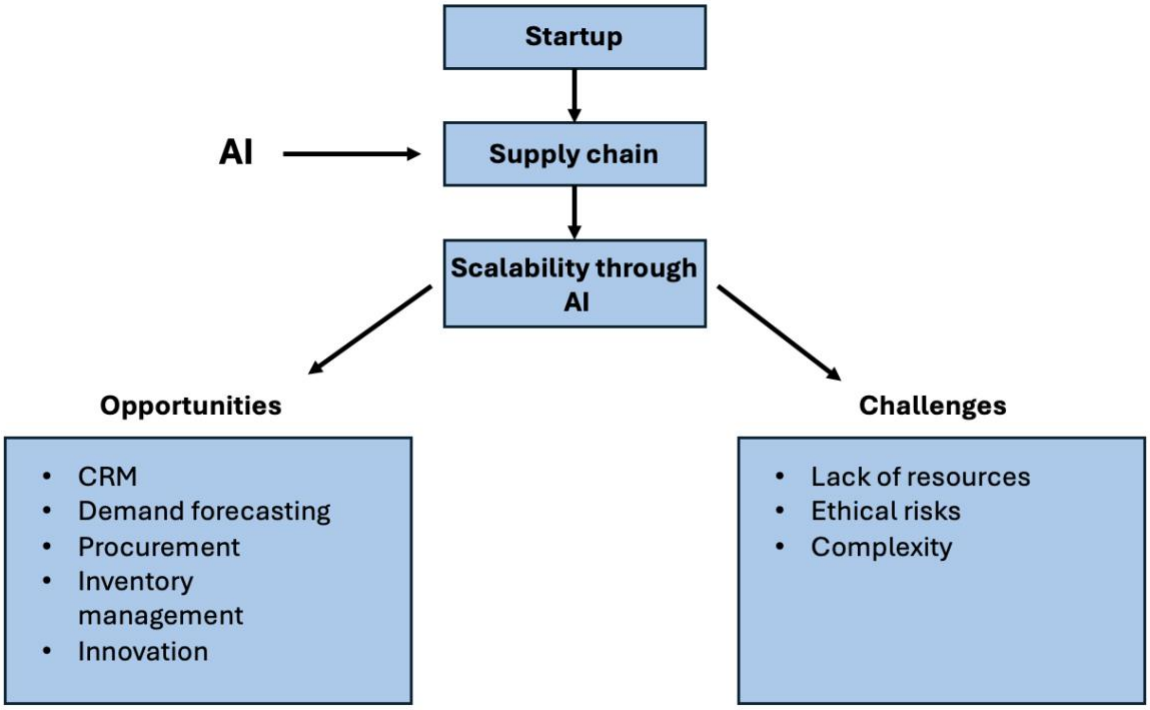

Figure 4 Overview of startup-specific opportunities and challenges in scaling supply chains using AI.

4.1 AI Opportunities for Scaling Startup Supply Chains

AI-driven SCM optimisation offers a range of benefits for businesses, and all in all, startups are encouraged to adopt AI to compensate for their resources and capabilities (Nafizah et al., 2024; Daios et al., 2025). In general, Table 3 showcases which AI applications are applied to which SCM process as presented by Daios et al. (2025). However, in the context of startups and enhancing their supply chain scalability, the key benefits identified in this literature review are CRM, demand forecasting, procurement, inventory management, and innovation. These activities are aligned with the supply chain challenges presented in Table 2 and can be matched with the boundary focus areas of a business in the growth phase (see Table 2).

Many startups fail to scale, not because of weak product-market fit, but because they have insufficient CRM capabilities, such as sales, to capitalise on their startup idea (Chalmers et al., 2021). Chalmers et al. (2021) also point out that sales functions require a lot of human effort and routine tasks, significantly impacting the burn rates of a startup because of the high salaries of salespeople. Given this challenge and the existing AI tools available, selling activities can be seen as one of the most promising areas where AI can support startups in the growth phase (Dwivedi et

al., 2021). For example, AI tools can support sales by identifying, qualifying, and funnelling leads (Chalmers et al., 2021). In addition to sales functions, AI tools can be used to boost customer service (for example, chatbots and virtual assistants on websites), marketing operations, and other processes that can be helped with automation (Chalmers et al., 2021; Dwivedi et al., 2021; Daios et al., 2025). With AI enabled agent-based models, startups can track customer experiences and utilise the data to accelerate revenue generation (Daios et al., 2025). With AI as a helping hand in CRM processes, startups can scale rapidly without encountering many of the constraints new ventures traditionally suffer from (Chalmers et al., 2021).

For startups that haven't yet reached the stability phase, where demand is stable (see Table 1), forecasting demand can be difficult. For instance, AI allows for intellectual analysis of market trends, sales records, and marketing trends (Aliyev et al., 2024), which are vital data points for a startup. Supporting demand projection with AI can therefore improve production planning, new-product development, and risk mitigation (Daios et al., 2025). These are key components in the focus areas of a startup in the growth phase (see Table 2), and AI solutions can help to make ends meet in a dynamic environment and ultimately lead to the survival of a startup. As demand forecasting relies heavily on historical data for existing products and services, market trends, and sales and marketing data, AI has been shown to significantly improve demand prediction accuracy because of its capabilities to analyse large volumes of data and support decision-making (Daios et al., 2025). That said, AI can help startups make more data-informed decisions and therefore satisfy ever-changing demand better.

AI can help startups manage their inventory better, as its analysis capabilities can help reveal inventory problems and, for example, determine the amount of inventory corresponding to the demand (Yang et al., 2021; Aliyev et al., 2024) For a startup in the growth phase (see Table 2), using AI tools such as ML and robots can allow for ensuring the availability of goods during times of increased demand, as well as avoiding the waste of resources in the warehouse during times of lower demand (Aliyev et al., 2024; Daios et al., 2025). Consequently, with the help of supply-demand data, AI-based systems can help in more accurate planning, leading to reduced wastage and costs (Sharma et al., 2022). Embracing AI applications in inventory management can therefore help startups to tackle the scalability concerns by helping to manage their limited resources more efficiently.

Finding the right sources of supply can be hard for a startup that needs to operate with limited resources, and it's not efficient to rely on manual work because of the complexity of operations and

the increasing cost of labour (Yang et al., 2021; Sharma et al., 2022). However, evaluating and selecting the right suppliers is a highly important process in SCM, and therefore, using AI to optimise procurement has become increasingly popular (Sharma et al., 2022; Daios et al., 2025). AI-based systems such as agent-based models, process automation, and generative AI can lead to reduced wastage and costs, as AI can analyse procurement data to manage the startup's suppliers and track both procurement and supplier performance (Sharma et al., 2022; Cannas et al., 2024; Daios et al., 2025).

Adding to the presented boundary focus areas (see Table 2) and their corresponding AI-opportunities, Nafizah et al. (2024) show that adopting AI positively impacts the innovation capabilities of a startup. By implementing AI, such as multi-agent systems and ML technologies, companies can innovate and optimise their daily processes in production and logistics (Woschank et al., 2020). Ardolino et al. (2025) showcase how AI combined with real-time data can also significantly optimise product innovation. AI-enabled products like ChatGPT have made innovation easier in everyday life, also allowing startups to benefit from it and other similar on-demand solutions to support innovation and solve everyday problems. Innovation helps companies to survive and capitalise on the market share (Behl, 2022), so it's vital for startups that want to sustain a competitive advantage. AI can be seen as a huge opportunity for startups, as it's constantly developing and therefore enables new technological innovations. Therefore, AI can act as a key enabler for the sustainable growth of startups (Singh et al., 2024). According to Chalmers et al. (2021), one can also expect that as AI becomes more and more widely used, it becomes a focal rather than complementary enabler of new startup ideas. That said, new AI-enabled innovations, in the field of SCM or not, could bring to life rapidly scaling startups that can eventually disrupt the SCM field as a whole.

4.2 AI Challenges in Scaling Startup Supply Chains

Despite the fact that AI tools are increasingly popular in solving SCM problems, there are challenges associated with them (Sharma et al., 2022). Regarding the discussion on scaling, it is important to consider the potential harmful outcomes when utilising AI in SCM. In this literature review, the key startup-specific challenges identified are a lack of resources, complexity and ethical risks. Similar to the opportunities presented earlier, these challenges are aligned with the characteristics of a company in the growth stage (see Table 2).

With almost all companies, big or small, the financial dimension is seen as a significant barrier to AI adoption in SCM (Cannas et al., 2023). This is especially evident for startups, as most often they have to operate in extreme uncertainty with limited financial resources. On another note, implementing AI solutions into a startup's supply chain may not be easy because they require specialised knowledge due to their newness (Sharma et al., 2022). There is a lack of specialised professionals, and especially for a new venture, it can be hard to attract these professionals into the team or benefit from their expertise due to a lack of financial capital (Dwivedi et al., 2021; Chalmers et al., 2021; Daios et al., 2025). The lack of information and financial resources in question also makes measuring the return on investment (ROI) hard, negatively affecting the managers' attitudes towards adopting AI (Daios et al., 2025). Since startups need clear and fast returns, it can be especially difficult to make the decision to invest in AI. This challenge is also related to the further findings of Cannas et al. (2023) on the strategic-organisational dimension when implementing AI into SCM. Their study presents that overall, adopting AI into SCM processes faces a challenge in the lack of readiness from operators, low integration and collaboration among organisational departments and supply chain partners, difficult process changes, and ineffective change management. The study supports the findings of Dwivedi et al. (2021) and Chalmers et al. (2021), who highlight that smaller firms, such as startups, are habitually prevented from the benefits of AI in SCM as they do not have access to the same resources as larger firms. Furthermore, startups need to adopt AI technology in a way that's aligned with the company's overall strategy (Nafizah et al., 2024). Therefore, the lack of resources can pose a significant barrier for a startup wanting to enjoy the benefits of AI because of its infancy and lack of established strategy (see Table 1).

Implementing AI into a startup's SCM can increase supply chain complexity, which can be hard to manage for a new venture already operating in extreme uncertainty. Before implementing AI-based systems, the company's supply chain must have already established a certain degree of digital maturity in its organisational culture context, redefining processes, roles, and responsibilities (Daios et al., 2025). Despite AI tools' effectiveness for solving SCM problems and improving the chances of scaling a startup, one must remember that their effectiveness and accuracy rely on computer software (Sharma et al., 2022). A challenge related to this is that AI algorithms require massive and clean datasets with minimum biases (Lee et al., 2018). Consequently, flawed data can lead to unwanted results. The study of Cannas et al. (2023) highlights that the process of collecting the necessary data for AI solutions to utilise is complex, also supporting the findings of Lee et al. (2018) on the issue of data quality. Furthermore, Chalmers et al. (2021) emphasise that new

ventures should not operate with “blind trust”, as that can lead to negative consequences such as major failures or legal issues, which is also highlighted by Dwivedi et al. (2021). The complexity of data poses a challenge for startups, as proper processing requires established processes and a considerable amount of resources. Since data is already a pain point for supply chains, adding AI solutions into the mix can negatively increase the supply chain complexity, leading to poor operational performance (Dwivedi et al., 2021; Akın Ateş et al., 2022).

In general, AI presents major threats in human societies, such as disruption of the current job landscape, use for unethical purposes, and an increase in inequalities (Dwivedi et al., 2021; Daios et al., 2025). Therefore, Chalmers et al. (2021) argue that not only are policymakers in charge of the potential harmful consequences of AI, but entrepreneurs themselves need to reflect on the costs of the way they might be capitalising on society through their AI-driven ventures. For example, AI can be used to manipulate consumer behaviour, which raises a significant question on ethics (Chalmers et al., 2021). Using AI in CRM can also have a negative effect on customer engagement, as not all customers might appreciate the use of chatbots or AI agents in sales communications, for example (Chalmers et al., 2021). Since startups in the growth phase can’t afford to make many mistakes with customers, they must truly assess where in their supply chain they can implement AI to accelerate scaling and not hinder it.

A widespread concern regarding AI-enabled scaling and ethics is the lack of transparency (Chalmers et al., 2021; Dwivedi et al., 2021). In addition to transparency problems, AI-enabled SCM raises questions regarding data privacy and cybersecurity (Daios et al., 2025). These challenges are severe for smaller companies due to the availability of limited resources (Dwivedi et al., 2021). For example, collecting, using, and sharing personal data for marketing or sales purposes has always raised privacy concerns, but the concern is continuing to grow as machines are being used to extract and process the data (Dwivedi et al., 2021). As AI technologies can be used to exploit massive amounts of data, it has led to significant rewards for founders and venture capitalists (Chalmers et al., 2021). The “destructive creation” described by Chalmers et al. (2021) can be seen as an opportunity for startups aspiring to grow fast, but its ethical aspect is a big risk. Therefore, Chalmers et al. (2021) argue that startups shouldn’t celebrate growth that has benefited a few while harming many. For instance, today, there is also discussion on the environmental harm created by using AI (Dwivedi et al., 2021). All in all, Chalmers et al. (2021) emphasise that “Just because AI can do something, does not necessarily mean an entrepreneur should”. Furthermore, to avoid ethical risks, a company should be able to explain its use of AI and the decisions made by it (Dwivedi et al., 2021).

5 Conclusions

5.1 Discussion

The purpose of this thesis was to explore the use of AI as a strategic tool for building sustainable startup growth through adopting AI applications into a startup's supply chain processes. The aim of the thesis was to explore the opportunities and challenges for startups in improving their chances of successful scaling with the support of existing AI applications in SCM. In this section, I go over the research questions of my thesis, explaining the central findings that lay the foundation for analysing scalability in the context of AI and SCM. Eventually, this section answers the main research question: *how can AI enable the scalability of startup supply chains?*

The first sub-question: *what are the key ways AI is used to drive supply chain scalability?* seeked to identify the key SCM processes where AI can enhance a company's scalability. In more established companies, AI is being utilised to solve existing SCM problems, whereas in emerging ventures, AI can also act as the essence of the whole business, forming new, disruptive technology startups. However, in general, with traditional supply chains transforming into digital supply chains due to digitalisation and an ever-evolving competitive business environment, AI has been implemented into SCM to support specific purposes. The drivers of AI in SCM are common SCM problems, such as demand uncertainty and high supply risk, competitive advantage, risk management and improving processes that require human resources and human decision making. As a result of its widely discussed benefits, such as improving efficiency, flexibility, and scalability, AI appears to be a transformative competitive advantage in a digital supply chain. Therefore, AI applications are seen in all key SCM activities, such as CRM, inventory management, transportation networks, procurement, demand forecasting, resilience, and risk management (see Table 3). Since this thesis defined scalability as the capability of a business to efficiently handle growth and stay flexible by expanding or reducing its operations without compromising its performance, all of the above SCM themes can be seen as areas where AI can drive scalability.

The second sub-question: *what opportunities and challenges do startups face in AI-driven supply chain scalability?* aimed at distinguishing which processes and corresponding AI applications are especially beneficial for startups whose goal is to enhance scalability, and what the startup-specific challenges are in implementing these solutions. The areas of opportunity identified in this thesis are CRM, demand forecasting, procurement, inventory management and innovation. In contrast, lack of

resources, complexity and ethical risks can be seen as challenges for AI-driven SCM in startups. These opportunities and challenges (see Figure 4) appeared in various academic literature, each of which supported similar findings of AI applications considering SCM and startups.

Finally, to answer the main research question on how AI can enable the scalability of startup supply chains, this thesis identified various benefits for scaling startup supply chains through AI. By utilising AI technologies in CRM, demand forecasting, inventory management, procurement, and innovation, startups can improve their chances of scalability and survival because they are better able to compensate for their limited resources and enable more strategic decision-making. In conclusion, AI-enhanced SCM can support startups in both operational efficiency and agility, which are critical factors in startup growth.

All in all, AI can be a significant enabler of startup supply chain scalability. However, startups shouldn't focus blindly on capitalising on what AI makes possible. Today and in the future, it is important to consider the potential harmful consequences of AI-enabled startup growth. Long-term success when scaling through AI can only be achieved if the supply chain has already developed a certain stage of digital maturity, and the "non-traditional" business processes are well-positioned.

5.2 Reflection and Areas for Future Research

As with any study, this thesis doesn't come without limitations. It should be acknowledged that AI, startups and their unique business environment, as well as SCM, are vast areas of study, and this thesis is only a scratch on the surface of the literature exploring their connections. Therefore, this thesis faces several limitations. For instance, information on startups and their supply chain characteristics is scattered and can vary depending on their industry and other characteristics. Second, AI is a relatively new phenomenon in the context of SCM. In addition, AI is constantly developing, and new research on the topic is being published often. Therefore, studies regarding the connections between AI, SCM, and startups highlight that further and deeper research is needed to address the limitations.

Based on the findings in this thesis, more research is needed on the topic of the interconnection of AI and startup-specific SCM. Startup organisations come in many forms, across different industries, and all around the globe, making it difficult to form a clearly defined framework for using AI as a tool for startup supply chain scalability. Future research areas could establish a more industry- or location-specific approach. Other interesting angles for research could be a focus on a certain AI

technology, a startup case, or an SCM challenge. By studying these topics further, researchers and practitioners could gain a deeper understanding of the concrete benefits and risks of using AI in scaling startups. This would help startups optimise their operations, as well as support AI and SCM professionals in advancing research in the field. Consequently, addressing the survival challenges startups face could be done more effectively by potentially developing new solutions.

Although the literature on this thesis's topic is scattered and ever-evolving, this thesis was able to identify a variety of AI opportunities and challenges for startups to consider when entering their growth phase. Therefore, this thesis contributes to the scientific discussion on the topic and serves as a foundation for further in-depth research on the subject. To conclude, despite its limitations, this thesis provides an interesting and novel approach to the common pain points of SCM and how startups can potentially tackle them with AI. While this thesis leaves room in many areas for further and more novel research, it contributes to the discussion on the benefits and risks of AI-enhanced SCM and, most importantly, in the context of startups for whom SCM can be a significant barrier for scaling.

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Disclosing the use of AI

I used the AI tool ChatGPT to support in language editing. For example, I used AI to make my own sentences more formal and to assist with English grammar.