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The Impact of E-Commerce Adoption on the Turnkey-Ready Truck Manufacturing Industry

An interview study at Volvo Trucks

Master's Thesis in Management and Economics of Innovation

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Abstract:

The turnkey-ready truck manufacturing industry is experiencing significant disruptions due to e-commerce adoption, revolutionizing traditional revenue models and prompting companies to explore new revenue streams such as mobility solutions and smart digital services. This transformation introduces the challenge of the "e-commerce paradox," which complicates profitability by making it difficult to achieve high profit margins solely from service offerings. To address this and understand how companies can maintain profitability in the evolving landscape, this study explores the impact of e-commerce on revenue models through an interview-based approach at Volvo Trucks. The findings, presented through archetypes, illustrate how value can be captured across specific revenue models, showing a shift in user value from hardware and vehicle specifications to factors like convenience, flexibility, and freedom from responsibility. The study reveals that the potential for selling digital services as supplementary revenue is significant across both traditional and innovative models, contingent on effective distribution strategies. It underscores the importance of incorporating a value-based pricing strategy when transitioning to innovative revenue models in the context of e-commerce. A key theoretical contribution is the proposed value-driven product-service framework that integrates e-commerce adoption, user value, and revenue models. Overall, this study provides insights into how e-commerce adoption is reshaping revenue models in the truck manufacturing industry, offering strategic guidance for companies like Volvo Trucks to navigate this evolving landscape and ensure sustained profitability in the digital era.

Keywords: Key Performance Indicators (KPIs), Real-Time Data Access, Cloud-Based Systems, Supply Chain Operations Reference (SCOR) model, Lean and Agile supply chain, Technology Acceptance Model (TAM), AI in E-Commerce

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Shima Shojaei Shahmirzadi
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1 Introduction

The turnkey-ready truck manufacturing sector is undergoing a significant transition as a result of e-commerce adoption, which is upsetting old revenue models and driving businesses to explore new income streams. This study seeks to examine how e-commerce adoption affects revenue models in the truck manufacturing business, as well as develop solutions for remaining profitable in the face of these changes.

Studying this topic is crucial because the shift to e-commerce presents both opportunities and challenges for truck manufacturers. On one hand, e-commerce enables the introduction of new revenue streams, such as mobility solutions and smart digital services, which can enhance customer value and operational efficiency. On the other hand, the e-commerce paradox complicates profitability by making it difficult to achieve high-profit margins solely from service offerings. Therefore, it is essential to explore how companies can navigate this evolving landscape to ensure sustained profitability.

The significance of this study lies in its potential to provide strategic guidance for truck manufacturers like Volvo Trucks. By examining the impact of e-commerce on revenue models through an interview-based approach at Volvo Trucks, this research aims to offer insights into strategic decision-making and the development of compelling business cases with robust profitability analysis. The findings will be presented through archetypes illustrating value capture across different revenue models, highlighting the transition from traditional to innovative sources of user value. Additionally, the study proposes a value-driven product-service framework that integrates theoretical concepts of e-commerce adoption, user value, and revenue models, contributing to the academic discourse on this topic.

The incorporation of e-commerce into the turnkey truck manufacturing sector creates a big practical challenge: how to preserve profitability while addressing the changing demands of a digital marketplace. There is a clear knowledge gap regarding the specific impacts of e-commerce adoption on revenue models in this sector. While previous studies have explored digital transformation in various industries, there is limited research focused on its implications for truck manufacturers.

This research project is motivated by the need to address this knowledge gap and provide strategic insights for companies like Volvo Trucks. By investigating the effects of e-commerce adoption on revenue models, this study aims to uncover practical solutions for maintaining profitability and competitiveness. Understanding these dynamics is crucial for developing effective business strategies and ensuring the long-term success of truck manufacturers in the digital era.

This research seeks to investigate the vital function of digital technology and e-commerce platforms in reforming the truck manufacturing business, with a special emphasis on facilitating online sales for turnkey trucks. It highlights the significance of strategic adaptation to retain profitability, offering concrete insights and theoretical ideas to help businesses navigate the digital era and leverage e-commerce for long-term success.

1. Investigate the impact of e-commerce adoption on revenue models in the truck manufacturing industry.
2. Identify the primary drivers behind the shift to online purchasing, including market demands, technological advancements, and changes in consumer behavior.
3. Examine the challenges faced by sellers and buyers in the transition to online sales, such as logistical issues, technological barriers, and concerns regarding customer trust and satisfaction.
4. Assess the potential benefits of transitioning to online sales for all stakeholders, including enhanced customer reach, streamlined processes, and improved profitability.
5. Develop strategic recommendations for truck manufacturers to successfully adapt to e-commerce, ensuring they leverage digital technologies to maintain competitiveness and profitability in the digital era.

Turnkey-ready trucks are fully built, road-ready automobiles intended to serve a variety of commercial and industrial uses. These vehicles have all the necessary parts and systems to carry out certain jobs, like moving goods, working with building supplies or acting as mobile workshops. The need for effective, adaptable, and dependable solutions across numerous industries, including logistics, construction, and agriculture, has resulted in a considerable increase in demand for turnkey-ready trucks in recent years.

Digitalization has had notable effects on the automotive sector, presenting both opportunities and challenges. Shifts in market dynamics resulting from digitalization have compelled companies to innovate and develop fresh revenue models to maintain profitability. Businesses must adapt and innovate to stay competitive as the world becomes more interconnected and digitally oriented (Teece & Linden, 2017). A remarkable illustration of how an ancient industry can embrace digital transformation to better serve its clients and prosper in the contemporary market is the shift towards online sales of turnkey-ready trucks. This essay seeks to present a thorough analysis of this transformation and its effects on the automobile industry as a whole.

Turnkey sales are a key concept that can enhance digitalization's performance and cost in a business. Today, turnkey has become a common term in many industries, including manufacturing, software development, and engineering. In the manufacturing industry, turnkey products are complete systems or assemblies that are ready for use in the customer's application without the need for further customization or integration (Xie et al., 2022). In the engineering industry, turnkey solutions are complete systems or facilities that are designed, constructed, and commissioned for the customer, ready to be used immediately upon completion. The turnkey notion contributes to shorter delivery times and lower finished truck costs. This could be accomplished by having a single point of accountability (Construction Accounting & Marketing, 2023).

1.1 Background

The turnkey truck manufacturing sector produces fully outfitted, ready-to-use vehicles that may be deployed immediately for a variety of commercial uses. This method provides considerable benefits to clients, such as shorter lead times and improved operational efficiency. However, the rise of e-commerce has created both possibilities and problems for this conventional business model, prompting a rethinking of how these vehicles are promoted and sold.

The concept of turnkey solutions is integral to the truck manufacturing industry. These solutions are characterized by products that are ready for immediate use with minimal configuration required by the end user. In this context, vehicles are delivered fully equipped with all necessary features and specifications, appealing particularly to fleet operators and logistics companies that seek to streamline operations and minimize downtime. However, the rise of digital platforms and e-commerce is beginning to disrupt this traditional model. New customer expectations and competitive pressures are emerging, prompting a shift in how these turnkey solutions are marketed and sold.

Digital truck sales involve leveraging internet platforms and e-commerce strategies to market and sell trucks. This approach offers numerous advantages, including an expanded market reach, enhanced customer engagement, and the ability to provide personalized solutions based on customer data. E-commerce has revolutionized many industries by offering customers convenient access to products and services, and the truck manufacturing sector is no exception. Nevertheless, this transition introduces new challenges. Companies must develop robust digital infrastructure, address cybersecurity concerns, and navigate the e-commerce paradox, which involves the difficulty of achieving high profit margins solely through digital service offerings.

Volvo Trucks exemplifies the integration of e-commerce into traditional business models. As a global leader in truck manufacturing, Volvo has been at the forefront of this digital shift. The company’s efforts to harness digital sales channels and explore new revenue streams are in line with a broader industry trend toward digital transformation. By adopting e-commerce, Volvo Trucks aims to enhance customer value through mobility solutions and smart digital services. This strategy highlights the necessity for traditional revenue models to evolve in order to stay competitive in a constantly changing market.

Trucking plays a crucial role in maintaining the continuous flow of products and services in the modern, digitally-driven world. It has evolved into the foundation of contemporary economies, tying up supply chains and facilitating quick product delivery to customers and enterprises alike. The industry's relevance is derived from both its ability to promote economic growth and its capacity to change with the times (Sugianto et al., 2023). The trucking industry can optimize routes, improve fuel efficiency, lower emissions, and give real-time tracking and delivery updates because of technological breakthroughs like telematics, the Internet of Things, and data analytics. In addition to enhancing operational efficiency, this digital transformation also promotes sustainability and improves customer satisfaction. Consequently, the trucking sector is playing an active role in shaping the future of logistics and transportation, highlighting its critical importance in our increasingly interconnected world. This industry is not merely keeping up with the digital age; it is propelling it forward.

The effect of turnkey on the sales of trucks would depend on the specific context and market conditions. Turnkey solutions for trucks could refer to fully assembled and ready-to-use trucks, or they could refer to custom-built trucks that are designed and manufactured to meet the specific needs of a customer (Stack Path, n.d.). Furthermore, for customers who are looking for a hassle-free and quick solution, turnkey solutions are attractive because they can be immediately deployed without any additional customization or integration. This could potentially increase the demand for turnkey trucks, as customers value the convenience and time savings that come with a fully assembled and ready-to-use product.

A digital service, as defined by Osterwalder & Pigneur (2010) and Lusch et al. (2010), encompasses any internet-delivered technological solution designed to enhance the user experience or streamline business operations. With the emergence of digitalization, online sales have become a crucial part of the trucking industry, and new challenges have also come along. One of the challenges in selling turnkey-ready trucks is the difference in regulations and requirements in different geographical locations. Selling commercial vehicles online requires compliance with various rules and regulations, and these rules vary from one region to another. Complying with them can also be time-consuming and costly.

By selling online, businesses must consider the roads, weather conditions, and customers' needs in different regions. Different locations and countries have specific legal requirements in order to fulfill the customer's needs. For instance, in Norway, the roads even in the spring are covered with snow, and this condition needs to be met with some specific features in the body and also the tires of the truck.

While online sales have become prevalent, face-to-face interactions have disappeared. As a result, having an online sale should be based on mutual trust and putting effort into fulfilling the customer's needs. In this article and during the thesis work, some key problems need to be elaborated on. One challenge is reliable logistics, which are the main part of truck shipping to deliver the order to its destination. Moreover, providing turnkey truck sales online in different regions based on different regulations and unique customers is another challenge.

The pivotal characteristic of turnkey projects is the innovative combination of services and products to fulfill the unique needs of the customer. Turnkey projects implicate the complete delivery system, and turnkey deliveries make a great shift of responsibility from customer to supplier, which may involve the customer’s responsibility for innovative development among practices, not only for a successful delivery process but also for creating value for the customer (Mimoso, 2020).

The turnkey concept can provide a competitive advantage for the business by reducing time-to-market, costs, quality development, and ongoing support (Gönnheimer et al., 2019). Turnkey projects can reduce the time-to-market for new products or services, which can be a critical factor in gaining a competitive advantage. By engaging with a single supplier who is responsible for the entire project, businesses can save time and resources and bring their products or services to market more quickly. Cost reduction is another prominent factor for businesses. Turnkey projects can help businesses by streamlining the procurement process and reducing the risks associated with managing multiple vendors. By engaging with a single supplier, businesses can negotiate better pricing and reduce the costs associated with project management.

Quality improvements can be gained by using turnkey solutions that provide a single point of responsibility for the entire project. This can help ensure that the solution meets the customer's needs and expectations and is of high quality. Aftermarket services are an important aspect of the turnkey concept and can help businesses maintain a competitive advantage by providing ongoing support and maintenance services to their customers. This can help ensure that the solution continues to meet the customer's needs and expectations over time.

Volvo Trucks, a division of the renowned Swedish automotive manufacturer Volvo Group, has gained immense popularity and established a solid reputation in various countries around the world. With a rich history dating back to 1928, Volvo Trucks has consistently delivered high-quality, innovative, and reliable commercial vehicles, making it a trusted brand in the global trucking industry (History, n.d.). One of the key factors contributing to Volvo Trucks' popularity is its unwavering commitment to safety. The company has consistently prioritized safety innovations, implementing advanced technologies and features to ensure the well-being of drivers, passengers, and other road users. Volvo Trucks' dedication to safety has earned it widespread acclaim, with many countries recognizing its trucks as some of the safest on the road. This reputation for safety has led to increased demand for Volvo trucks across different markets.

Moreover, Volvo Trucks' commitment to environmental sustainability has also played a significant role in its popularity. The company has been at the forefront of developing and promoting eco-friendly technologies, such as hybrid and electric powertrains, alternative fuels, and energy-efficient designs. This proactive approach toward sustainability has resonated with countries that prioritize environmental consciousness, leading to Volvo Trucks' widespread adoption and positive reputation as an environmentally responsible brand.

Another aspect that contributes to Volvo Trucks' popularity is their focus on durability and performance. The brand is renowned for producing trucks that can withstand the harshest conditions and deliver exceptional performance. Whether it's long-haul transportation, construction, or other demanding applications, Volvo Trucks' robustness and reliability have made it a preferred choice for many countries' trucking needs. Additionally, Volvo Trucks has established a strong global presence through its extensive network of dealerships, service centers, and aftermarket support.

This widespread availability of parts and services ensures that customers can rely on timely assistance and maintenance, regardless of their location. This level of customer support has fostered trust and loyalty, contributing to Volvo Trucks' positive reputation and continued success. Volvo Trucks has earned a strong reputation and achieved remarkable sales success across various countries. Volvo Trucks has established a robust reputation and achieved impressive sales success across multiple countries, reflecting its commitment to quality, safety, innovation, and sustainability. This dedication has significantly contributed to the brand's widespread popularity. Notable markets where Volvo Trucks enjoys strong sales and high recognition include Sweden, the United States, Germany, France, the United Kingdom, and Australia. These countries highlight the geographically diversified market and solid reputation that Volvo Trucks maintains worldwide (Figure 1).

This success is detailed in the company's annual reports for 2023, showcasing Volvo Trucks' ability to meet diverse customer needs across different regions effectively. The brand's commitment to quality, safety, innovation, and sustainability has been key to its popularity. Notable markets where Volvo Trucks enjoys strong sales and recognition include Sweden, the United States, Germany, France, the United Kingdom, and Australia (Figure 1). Volvo Trucks' reliability, advanced technology, and emphasis on driver comfort have contributed to its success in these markets. The brand's focus on safety and environmental consciousness aligns with customer priorities in many countries. With a global reach and a comprehensive range of commercial vehicles, Volvo Trucks continues to be a trusted and preferred choice for businesses and truck operators worldwide.

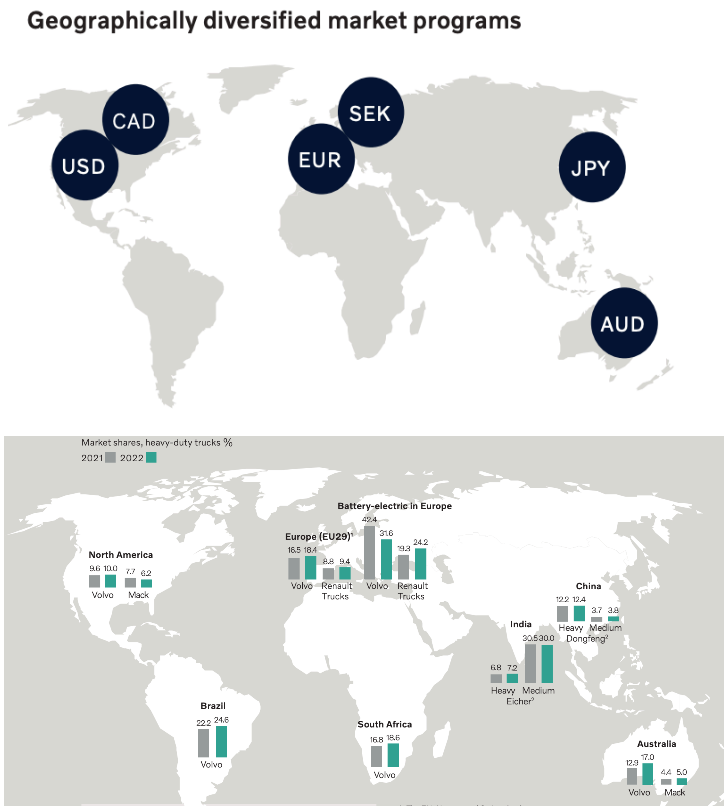

Figure 1. Volvo Trucks has a geographically diversified market and reputation among different countries around the globe (Annual Reports, 2023)

Furthermore, Volvo Trucks' emphasis on driver comfort, productivity, and innovative features has further propelled its popularity. The brand's trucks are designed with ergonomic cabins, advanced connectivity, and driver-assistance systems, enabling drivers to operate with ease, efficiency, and enhanced safety. This focus on driver satisfaction has garnered praise and loyalty from truck drivers worldwide.

Volvo Trucks aims to launch an online platform to assist in the sale of turnkey-ready trucks. It is predicted that this will reduce the cost of the final truck. This will give them a competitive advantage while also providing the consumer with a high-quality, value-for-money product in a relatively short period of time. Volvo Trucks has established a robust reputation and achieved impressive sales success across multiple countries, reflecting its commitment to quality, safety, innovation, and sustainability. This dedication has significantly contributed to the brand's widespread popularity. Notable markets where Volvo Trucks enjoys strong sales and high recognition include Sweden, the United States, Germany, France, the United Kingdom, and Australia. These countries highlight the geographically diversified market and solid reputation that Volvo Trucks maintains worldwide (Figure 1). This success is detailed in the company's annual reports for 2023, showcasing Volvo Trucks' ability to meet diverse customer needs across different regions effectively.

This motivates research into Volvo Trucks' strategy, specifically examining the company's initiative to launch an online platform for the sale of turnkey-ready trucks. The academic motivation for this study lies in filling a critical gap in the existing literature on digital transformation in the truck manufacturing industry. By exploring Volvo Trucks' digital initiative, the research aims to provide insights into how e-commerce can be leveraged to reduce costs, enhance competitiveness, and deliver high-quality, value-for-money products efficiently. Understanding these impacts will contribute to the broader academic discourse on digital commerce and its implications for traditional manufacturing industries, offering valuable theoretical and practical insights. This study also seeks to inform future strategies for other companies in similar sectors looking to adopt e-commerce solutions.

1.2 Problematization

In the dynamic landscape of automotive sales, the shift towards digitalization has reshaped traditional modes of commerce, presenting both opportunities and challenges for industry players. At the forefront of this transformation lies the endeavor to establish online portals tailored for the sale of turnkey-ready trucks. While the prospect of virtual platforms promises heightened accessibility and streamlined transactions, the journey towards their realization is fraught with complexities.

For turnkey-ready truck manufacturers, the imperative to adapt to evolving consumer behaviors and technological advancements necessitates a robust online presence. However, the process of developing an online portal specifically catered to the sale of turnkey-ready trucks poses multifaceted challenges that extend beyond conventional e-commerce ventures.

Primarily, technical hurdles loom large, encompassing the intricacies of integrating complex customization options, ensuring seamless compatibility with diverse truck configurations, and providing robust security measures to safeguard sensitive transactional data. These challenges, if left unaddressed, can undermine the efficacy and reliability of the online portal, eroding consumer trust and hindering adoption.

Furthermore, logistical obstacles present formidable barriers to implementation. From the efficient management of inventory spanning a spectrum of truck models and specifications to the optimization of logistics networks for timely and cost-effective delivery, turnkey-ready truck manufacturers grapple with the intricacies of adapting their supply chain mechanisms to the demands of online commerce.

Moreover, the transition to e-commerce channels reverberates across the entire supply chain ecosystem, impacting not only manufacturers but also suppliers, distributors, and service providers. The ripple effects of this transformation necessitate a comprehensive understanding of its implications on supply chain management practices, particularly concerning inventory management, logistics, and order fulfillment.

Beyond the realm of operations, customer-oriented challenges loom large as manufacturers endeavor to align their online offerings with evolving consumer preferences and purchasing behaviors. Understanding the nuances of customer expectations in the digital realm, from intuitive user interfaces to personalized purchasing experiences, emerges as a critical endeavor in fostering consumer engagement and loyalty.

The prominent reason behind this topic is Volvo's insights and intention to have a convenient way of ordering for its customers, and this goal can be reached with the help of an online portal. Online sales can provide an opportunity not only for Volvo as a supplier but also to fulfill customers' needs and expectations, which leads to a win-win solution. For preparing a whole-end, turnkey-ready product, different categories of units are unified, which are sales, marketing, R&D, finance, logistics, delivery, etc. Alignment of all different parts with the list of articles that are selected by the buyers is an essential prerequisite that needs to be considered. An online portal is a software platform that has a list of articles that are provided by the supplier for the buyers to choose their product based on their requirements, and then they will finish their order with an online payment method. This platform enables the company to have a short delivery time and cost, which can be a great achievement.

Clearly, selling a simple product like a screw on an online portal is less challenging than selling a truck, which is assumed to be a heavy-duty vehicle and consists of a great volume of articles in a package. This is a problem, as the parts forming a truck could be available in one factory or acquired from different parts of the world. The expected purpose of the company would not be achieved until the finished truck met the customer's needs. In the heavy machinery industry, requirements and needs based on different geographical locations are different. The second problem is the location where the order has been placed; if the location is different from the main factory, it needs a new document and regulations. This is the exact problem that Volvo Trucks of Norway is faced with. In Norway, the trucks that are sold need to be prepared in the factory in Gothenburg, then transferred to Norway.

The next step is their body's preparation, which is done by a local body builder around there. The next problem is that the factory in Sweden works in collaboration with the body builders and does not identify them as a separate entity. The documentation and governmental regulations that are provided by Norway do not meet Sweden's requirements. Different problems create a bunch of challenges for the Norway factory and force them to burden a huge volume of time and cost. Due to this problem, it is essential for the Norway group to mount the body on the chassis of the truck in Norway and put the documentary requirement process in place themselves for the order registration.

The chassis is prepared in Gothenburg, and then it is driven to Norway, where the body of the truck is prepared. When manufacturing takes place in two different countries, it is time-consuming and, at the same time, challenging to be cost-effective. Also, different countries have different legal formalities and procedures corresponding to the registration of a truck. This situation could be faced by any automobile or truck manufacturer in any part of the world.

The issue at place is more than just technology implementation; it involves a comprehensive reinvention of the sales and distribution paradigm inside the turnkey-ready vehicle manufacturing business. Navigating these hurdles is critical for stakeholders interested in the success of online sales portals, as it allows them to benefit on the tremendous potential of digital commerce while limiting the dangers associated with its implementation.

1. The impact of this issue goes beyond the bounds of any single organization. The effects are far-reaching, affecting several truck manufacturers worldwide. Digitization opens up new options for optimizing operations, eliminating human interference, and speeding procedures. The attractiveness of an online portal, such as the one used by Volvo, is its promise of enhanced competitiveness, customer involvement, and market penetration.
2. In the Swedish market, the presence of formidable competitors such as Scania and Thule Group AB underlines the urgency for truck manufacturers to leverage digital innovations. The competitive landscape necessitates constant adaptation and innovation to maintain market share and relevance. As one company adopts digitization strategies, others may seek to emulate or surpass these advancements to gain a competitive edge.
3. However, the journey towards digitization is not devoid of challenges. Whenever an organization endeavors to implement transformative changes, a myriad of obstacles invariably surface. These challenges could encompass technological complexities, resistance to change among employees, security concerns in handling digital data, or the need for substantial financial investments.
4. The implementation of an online portal by Volvo exemplifies the proactive approach taken by some companies to embrace digitization. Yet, the path to realizing the benefits of such technological advancements is fraught with uncertainties. It becomes imperative to critically examine and understand the nuanced intricacies of this digital transformation journey.
5. Recognizing the inevitability of challenges in the wake of change is paramount. While the advantages of digitization are evident, understanding and preemptively addressing the obstacles that may arise in the course of implementation is crucial. This necessitates a comprehensive analysis and a strategic approach to navigate the complexities associated with such transformative endeavors.

Thus, the problem at hand extends beyond mere technological implementation; it encompasses a holistic reimagining of the sales and distribution paradigm within the turnkey-ready truck manufacturing industry. For stakeholders vested in the success of online sales portals, navigating these challenges is imperative to capitalize on the vast potential offered by digital commerce while mitigating the risks inherent in its adoption.

- Significance of the Problem: The relevance of the documentation and homologation challenge extends well beyond the confines of any single corporation, impacting the entire truck manufacturing industry on a global scale. The advent of digitization offers an array of possibilities for streamlining operations, reducing human intervention, and expediting processes. However, the lack of proper documentation can hinder these advancements. An online portal, like the one implemented by Volvo, promises increased competitiveness, enhanced customer engagement, and greater market penetration. However, these benefits cannot be fully realized without addressing the foundational issue of inadequate documentation.

- Industry Dynamics and Competition: In the competitive landscape of the Swedish market, formidable competitors such as Scania and Thule Group AB highlight the urgency for truck manufacturers to adopt digital innovations. The dynamics of this competitive environment necessitate constant adaptation and innovation. As one company implements digitization strategies, others are compelled to follow suit or risk losing their market share. Digital innovations, such as streamlined documentation processes and online sales platforms, are critical for maintaining relevance and achieving a competitive edge. For Volvo Trucks, staying ahead means not only implementing these technologies but also ensuring that the foundational processes, like documentation, are robust and efficient.

- Challenges Amidst Change: The journey towards digitization is fraught with challenges. Organizations undertaking transformative changes face a myriad of obstacles, including technological complexities, resistance to change among employees, and security concerns related to digital data handling. Moreover, substantial financial investments are often required to implement and sustain these changes. For Volvo Trucks, the lack of proper documentation exacerbates these challenges, making the digitization process even more daunting. Without a solid documentation foundation, the risk of errors, compliance issues, and operational inefficiencies increases, potentially derailing the entire digitization effort.

- Contextualizing the Change Process: Volvo's implementation of an online portal exemplifies a proactive approach to embracing digitization. This initiative aims to streamline sales processes, enhance the customer experience, and improve market reach. However, the path to realizing these benefits is laden with uncertainties and requires a critical examination of the digital transformation journey. The lack of proper documentation and homologation procedures can create significant roadblocks. Understanding the nuanced intricacies of this journey, including the interplay between technological advancements and foundational processes, is imperative for Volvo and other manufacturers to navigate the complexities of digital transformation effectively.

- Addressing the Inevitability of Challenges: Recognizing and addressing the inevitability of challenges in the wake of digitization is crucial. While the advantages of digitization are clear, preemptively identifying and mitigating the obstacles that may arise during implementation is essential. For Volvo Trucks, this means establishing comprehensive documentation and homologation procedures as a prerequisite for successful digital transformation. A strategic approach that includes thorough analysis, stakeholder engagement, and continuous improvement can help navigate the complexities associated with such transformative endeavors. By doing so, Volvo can leverage the full potential of digitization, ensuring enhanced competitiveness, operational efficiency, and customer satisfaction.

1.3 Purpose and in depth research questions

The research question is focused on investigating the challenges encountered when developing an online portal for enabling the online sales of turnkey-ready trucks. By exploring these challenges, the study aims to provide valuable insights into the complexities and obstacles involved in implementing such a platform. The research seeks to identify and analyze technical, logistical, and customer-oriented challenges that may arise during the conceptualization and implementation of the online portal. The findings of this research will contribute to a deeper understanding of the practical considerations and potential solutions needed to overcome these challenges, ultimately facilitating the successful establishment of an online platform for turnkey-ready truck sales.

With the previous objectives, the following research question is:

RQ1: What are the key challenges that could be encountered when coming up with an online portal to enable the online sales of the turnkey-ready trucks?

RQ2: How does e-commerce adoption impact the supply chain management practices of turnkey-ready truck manufacturers, particularly in terms of inventory management, logistics, and order fulfillment?

1.4 Delimitations

The Volvo Group has a presence across the world. Presence across the world is an indication that an organization is inclusive, agile, and incorporates a global approach when coming up with newer products or services. It comes with its own set of challenges. Being a global organization means that when coming up with a product or service, the cultural aspects, the geographical location of the country, and the general attitude of the public regarding the acceptance of the product are to be considered.

Since this research spans, taking into consideration the entire geography of Volvo's operations would be challenging and time-consuming. Hence, only the Norwegian market will be taken into consideration for this study. Coming up with an online portal involves the consolidation of many verticals and a lot of preparation. Addressing the measures to ensure a smooth transition to an online portal could also be time-consuming, and then getting into the task of incorporating an online portal will take additional time. This additional time could exceed the time frame of this study.

Hence, this study will only realize and analyze the challenges that are prevalent in the Norwegian market when delivering a truck. Addressing these challenges is indispensable. However, it will be ensured that the conclusion obtained from the analysis performed is suitable for not just the Norwegian market but for different geographies across the world. It will be ensured that the conclusion derived should benefit other organizations in the business as well, not just Volvo. Since only the Norwegian market is taken into consideration, the size of the audience supplemented with the information and data required for this study will be restricted to employees working in or for the Norwegian or Swedish markets. Since the study is critical and would be the foundation stone for the online portal, the focus will be on the quality of the data rather than the quantity.

2 Theoretical Framework

2.1 Introduction

The development of an online portal for the sale of turnkey-ready trucks is a multifaceted challenge that intersects various theoretical domains within e-commerce, supply chain management, and consumer behavior. This chapter provides a comprehensive theoretical framework to underpin the investigation of the technical, logistical, and customer-oriented challenges of implementing such a platform. By situating the research within established theories and models, this framework aims to elucidate the complexities and barriers encountered and identify potential solutions to these challenges.

2.2 E-commerce Adoption and Technological Integration

E-commerce adoption theory provides a foundational perspective for understanding the technical challenges associated with developing an online portal for turnkey-ready trucks. According to the Technology Acceptance Model (TAM), perceived ease of use and perceived usefulness are critical factors influencing the adoption of new technologies (Fedorko et al., 2018). In the context of an online sales portal, ensuring that the platform is user-friendly and meets the practical needs of both sellers and buyers is paramount. The platform must be intuitive, allowing users to navigate effortlessly through the process of selecting, customizing, and purchasing trucks. Features such as detailed product information, real-time inventory updates, and seamless payment options can enhance the perceived usefulness of the platform, thereby encouraging adoption.

Additionally, the Unified Theory of Acceptance and Use of Technology (UTAUT) posits that performance expectancy, effort expectancy, social influence, and facilitating conditions determine user acceptance and usage behavior (Al-Saedi et al., 2020). Performance expectancy relates to the degree to which users believe the platform will help them achieve their goals efficiently. In this context, the online portal must demonstrate clear advantages over traditional sales methods, such as faster processing times, personalized recommendations, and the ability to track orders and deliveries in real-time. Effort expectancy, on the other hand, focuses on the ease of use of the platform. A well-designed interface, comprehensive user guides, and responsive customer support can significantly reduce the effort required to use the platform.

Social influence involves the impact of others’ opinions on an individual's decision to adopt the technology. Positive testimonials, endorsements from industry leaders, and case studies of successful implementations can bolster confidence in the platform. Facilitating conditions encompass the availability of resources and support to use the technology effectively. This includes robust technological infrastructure, integration with existing enterprise systems, and continuous technical support. Ensuring compatibility with various devices and browsers, providing training programs, and offering a reliable help desk can further support users in adopting and utilizing the platform effectively.

Applying TAM and UTAUT to the development of an online portal for turnkey-ready trucks highlights the need for a holistic approach that addresses user experience, perceived benefits, social factors, and technical support. By focusing on these critical aspects, companies can create a platform that not only attracts users but also encourages long-term engagement and satisfaction, thereby driving the successful adoption of e-commerce in the truck manufacturing industry.

2.3 Logistical Challenges in Supply Chain Management

The implementation of an online sales portal has a substantial influence on supply chain management procedures, specifically inventory management, transportation, and order fulfillment. The Supply Chain Council established the Supply Chain Operations Reference (SCOR) model, which offers a complete framework for analyzing and improving supply chain performance. This approach emphasizes the important processes of planning, sourcing, manufacturing, delivery, and return, all of which must be optimized for efficient operation. In the context of turnkey trucks, including e-commerce, it needs a rethinking of these procedures to accommodate digital transactions, real-time inventory changes, and improved logistical coordination.

For inventory management, the online sales portal enables real-time tracking and dynamic inventory management, which is crucial for maintaining optimal stock levels and reducing overstock or stock outs. This real-time visibility allows for more accurate demand forecasting and inventory planning, ensuring that the right trucks are available at the right time. Additionally, automated inventory updates and alerts can help manage supply levels efficiently, reducing the need for manual intervention and minimizing errors.

In terms of logistics, the online sales portal introduces new requirements for distribution and delivery operations. E-commerce platforms can facilitate better route planning and load optimization, improving the efficiency of delivery processes. The integration of advanced tracking technologies ensures that customers are informed about the status of their orders, enhancing transparency and customer satisfaction. Furthermore, the portal can streamline logistics by integrating with various third-party logistics providers, offering flexible and scalable delivery options.

Order fulfillment processes are also transformed by the adoption of an online sales portal. The automation of order processing reduces lead times and enhances accuracy, allowing for quicker response times to customer orders. This is particularly important for turnkey-ready trucks, where customization and specific configurations are often required. The portal can manage these complex orders by providing a seamless interface for customers to select and customize their trucks, with the backend systems ensuring that these customizations are accurately captured and communicated to the production and logistics teams.

Lean and Agile supply chain theories further illuminate the need for flexibility and responsiveness in managing the complexities introduced by e-commerce. Lean supply chain principles advocate for the elimination of waste and continuous improvement (Womack & Jones, 1997), which can be achieved through the use of streamlined processes and the elimination of redundant steps in the supply chain. This approach ensures that resources are utilized efficiently and that the supply chain operates smoothly without unnecessary delays.

On the other hand, Agile Supply Chain Theory emphasizes the importance of adaptability and speed in responding to market demands (Christopher, 2000). In the e-commerce context, this means being able to quickly adjust to changes in customer preferences, market conditions, and supply chain disruptions. The online sales portal supports this agility by providing real-time data and analytics, enabling swift decision-making and adjustments. The challenge lies in balancing these approaches to maintain efficiency while meeting the heightened expectations of e-commerce customers.

The implementation of an online sales portal in the turnkey-ready truck manufacturing industry necessitates a comprehensive reevaluation and optimization of supply chain management practices. By leveraging the SCOR model and integrating Lean and Agile Supply Chain principles, companies can enhance their inventory management, logistics, and order fulfillment processes to support the demands of the digital marketplace. This strategic alignment not only improves operational efficiency but also ensures that the company can meet the evolving needs of its customers in a competitive and dynamic environment.

2.4 Customer Behavior and E-commerce

The Theory of Planned Behavior (TPB), proposed by Ajzen (1991), offers valuable insights into how attitudes, subjective norms, and perceived behavioral control influence purchasing decisions. In the context of e-commerce, these factors play a significant role in shaping the online shopping experience. For instance, customers are more likely to make a purchase if they perceive online shopping as convenient, if their peers recommend a particular product or platform, and if they feel confident in their ability to navigate the website and complete transactions.

Furthermore, the Consumer Decision-Making Process model, as outlined by Erasmus et al. (2010), breaks down the stages consumers go through when making purchasing decisions. This includes problem recognition, information search, evaluation of alternatives, purchase decisions, and post-purchase behavior. Each stage presents opportunities for the online sales portal to influence customer decisions and enhance the overall shopping experience.

For example, to address the information search stage, the online portal should provide comprehensive product descriptions, high-quality images, and user reviews to help customers make informed choices. During the purchase decision stage, features like comparison tools and personalized recommendations can assist customers in selecting the most suitable product. Additionally, robust customer support services can help address any post-purchase concerns, building trust and loyalty among customers. By understanding these models and stages of consumer behavior, businesses can tailor their online sales portal to meet the needs and preferences of their target audience, ultimately driving conversion rates and customer satisfaction.

2.5 Barriers to Enabling Online Sales of Turnkey-Ready Trucks

Several barriers can hinder the successful implementation of an online sales portal for turnkey-ready trucks. These barriers can be categorized into technical, logistical, and customer-related challenges.

2.5.1 Technical Barriers

Technical barriers encompass issues related to the design, development, and maintenance of the online portal. Key challenges include:

- System Integration: Ensuring seamless integration with existing enterprise resource planning (ERP) systems, customer relationship management (CRM) systems, and supply chain management software is critical. Disparate systems can lead to data silos, inefficiencies, and errors in order processing and inventory management (Siau & Tian, 2004).
- Security and Privacy: Protecting sensitive customer and transactional data is paramount. The portal must comply with stringent cybersecurity standards to prevent data breaches and build customer trust. This involves implementing robust encryption, secure payment gateways, and adherence to data protection regulations such as GDPR (General Data Protection Regulation) (Basin et al., 2018).
- Scalability and Performance: The portal must be designed to handle varying levels of traffic and transaction volumes without compromising performance. Scalability issues can lead to slow load times, transaction errors, and poor user experience, which can deter potential buyers (Sheng et al., 2008).

2.5.2 Logistical Barriers

Logistical barriers pertain to the complexities of managing the supply chain and delivering products efficiently. Major challenges include:

- Inventory Management: Real-time inventory tracking is essential for accurately reflecting stock levels on the portal. This requires sophisticated inventory management systems capable of synchronizing with the online platform to prevent overselling or stockouts (Chopra & Meindl, 2013).
- Logistics and Distribution: The physical delivery of turnkey-ready trucks involves coordination with transportation and logistics providers. Ensuring timely and cost-effective delivery while managing the logistics of large, complex products poses significant challenges. Additionally, reverse logistics for returns or exchanges must be efficiently managed (Christopher, 2011).
- Supply Chain Coordination: Effective collaboration with suppliers and distributors is crucial to maintaining the flow of goods. E-commerce adoption can disrupt traditional supply chain processes, necessitating new strategies for coordination and communication across the supply chain network (Simchi-Levi, Kaminsky, & Simchi-Levi, 2008).

2.5.3 Customer-Oriented Barriers

Customer-oriented barriers focus on understanding and meeting the needs and expectations of the target market. Key challenges include:

- User Experience: The design and usability of the online portal must cater to diverse user needs, providing a seamless and intuitive experience. This includes easy navigation, comprehensive product information, customization options, and responsive customer support (Lewis & Sauro, 2021).
- Trust and Reliability: Building trust in an online environment is challenging, especially for high-value purchases like turnkey-ready trucks. Providing transparent information, reliable customer service, and strong after-sales support are essential to gaining customer confidence (Gefen, Karahanna, & Straub, 2003).
- Personalization and Customization: Customers often expect personalized experiences and options to customize their purchases. Implementing advanced personalization algorithms and customization features can enhance customer satisfaction but also add to the complexity of the portal's development (Shen, 2014).

2.6 Conceptual Model

To address these barriers, the study proposes a conceptual model that integrates the aforementioned theoretical frameworks. This model serves as a guide for identifying specific challenges and formulating strategies to overcome them.

- Technical Integration: Leveraging TAM and UTAUT to ensure user acceptance by focusing on ease of use and perceived usefulness.
- Logistical Efficiency: Applying the SCOR model and Lean/Agile supply chain principles to optimize supply chain processes and enhance responsiveness.
- Customer Engagement: Utilizing TPB and the Consumer Decision-Making Process model to design user-centric features and build trust.

This theoretical framework provides a structured approach to exploring the challenges of developing an online portal for the sale of turnkey-ready trucks. By integrating insights from e-commerce adoption, supply chain management, and customer behavior theories, the framework offers a comprehensive lens through which to examine and address the multifaceted barriers involved. The subsequent chapters will empirically investigate these challenges and propose practical solutions to facilitate the successful establishment of the online platform.

Through this research, a deeper understanding of the interplay between technical, logistical, and customer-oriented factors will be achieved, contributing to both academic knowledge and practical applications in the fields of e-commerce and project management.

3 Methodology

The study's research methodology entails an interview-based investigation employing an inductive approach, incorporating two distinct methods of data collection: qualitative interviews and document analysis. Additionally, the chosen research methodologies will be elaborated upon, accompanied by a table delineating the participating respondents. The data analysis process will be detailed, comprising two levels aimed at addressing various research inquiries. Finally, considerations regarding quality assurance and ethical considerations will be discussed.

3.1 Research approach

In pursuit of the study's objectives, an inductive methodology has been adopted. The selected research design involves conducting interviews as the primary method of data collection, employing qualitative research techniques. This inductive approach enables the study to formulate novel theories and hypotheses grounded in observed and interpreted data (Bell et al., 2019). To comprehend broader issues or overarching phenomena, a sense-making case study approach has been embraced (Bell et al., 2019; Gioia & Chittipeddi, 1991). Given the dynamic nature of the automotive industry, there are aspects not fully covered by existing theory, necessitating exploration within an industry context. By eliciting individuals' sense making of their own experiences within an organization, this study leverages their perspectives to address practical challenges (Gioia & Chittipeddi, 1991). As the objective is to contribute to theoretical knowledge through theory-building, employing a company operating within the industry setting is deemed appropriate (Eisenhardt, 1989; Goffin et al., 2019). A corporation that is a part of the new industrial environment and provides chances for novel study access and data collection is Volvo Trucks. The choice of Volvo Trucks as a case study company can be described as theoretical sampling since it helps to discover patterns from data collection and connect them to theoretical concepts (Bell et al., 2019). Based on these arguments, theoretical sampling, and Volvo Trucks as a case are supported (Eisenhardt & Graebner, 2007; Yin, 1994).

A case study equips a researcher with the clarity to approach a problem by narrowing down on one aspect of the problem, analyzing it, drawing a conclusion from it, and then proceeding to another. "What a case study can do that a survey normally cannot is study things in detail" (Denscombe, 2010, p. 53). Case study equips a researcher with an opportunity to dig deeper and explore the interconnectedness of relationships and processes (Denscombe, 2010). Since coming up with an online portal involves the consolidation of various verticals into one unit and ensuring that they work in tandem with each other, A case study could prove beneficial in identifying the role and functioning of each vertical.

This research design aims to investigate and identify key factors that can enable the sale of turnkey-ready trucks on the market. By employing this research methodology, we seek to understand the perspectives, experiences, and perceptions of individuals involved in the turnkey-ready truck industry. The findings will contribute to a comprehensive understanding of the critical elements that drive successful sales and inform strategic decision-making for truck manufacturers.

3.2 Data collection

Ensuring the quality of the study necessitates the attainment of triangulation, thorough review, and validation of data, as well as transparency in data collection processes (Goffin et al., 2019). Triangulation has been achieved through the collection of data from three distinct sources: qualitative interviews and document reviews. These sources collectively form the foundation for addressing all research questions. To provide deeper transparency regarding data collection methodologies, the forthcoming subsection will define the data sources.

3.2.1 Interview data

Two forms of interviews were undertaken: semi-structured and unstructured qualitative interviews. The initial phase involved piloting five unstructured interviews aimed at delineating the study's scope, refining its research questions, and establishing a foundation for both the interview guide and the sample for subsequent semi-structured interviews. The interview guide was structured around topics pertinent to the research questions at hand. Subsequently, 10 semi-structured interviews were conducted to gather empirical data and allow respondents to articulate their experiences in relation to the research questions. This approach, as advocated by Bell et al. (2019), enables interviewers to steer conversations towards specific topics while affording respondents the freedom to respond openly, fostering interpretations and associations. While the interview guide served as a template, questions were not always presented in the same sequence, and new inquiries were introduced as interesting tangents emerged during the interviews. Given the diverse competencies and knowledge contributions of the respondents, variations in the guide's questions were expected. Data from unstructured interviews was solely documented through notes, whereas data from semi-structured interviews was recorded and subsequently transcribed (table 3.1).

Table (3.1)
List of respondents

Respondent	Role	Duration	Where
R1	Senior, Sales Manager	1h	Telephone
R2	Senior, Regional Sales Manager	1h 15 min	Teams
R3	Senior, Order Manager	45 min	Teams
R4	Senior, Homologation Specialist	30 min	Teams
R5	Product Definition	1h	Teams
R6	Senior, Digital Delivery Manager	30 min	Face-to-face
R7	Senior, Business Development	45 min	Face-to-face
R8	Business Development Controller, Finance	30 min	Face-to-face
R9	Senior, Product Definition	30 min	Teams
R10	Senior, Customer Offer & Experience	1h	Teams

3.2.2 Data from documents

Documents were utilized as supplementary sources to augment the data obtained from interviews, aiming to enhance comprehension of the discourse and bridge any knowledge disparities. The themes explored in the interviews served as a framework for selecting relevant documents for review. This approach facilitated a comprehensive and visual grasp of the discussions with respondents, thereby enriching the analysis of the gathered data.

3.2.3 Research Objectives

- Identify the key features and specifications that the company needs to consider when placing an order for turnkey-ready trucks.
- Explore the role of after-sales services and support in influencing customer purchasing decisions.
- Investigate the impact of pricing strategies on the sales of turnkey-ready trucks.
- Examine the importance of customization options and their influence on customer preferences.
- Understand the perceptions of the regulatory documentation process for the product ordering process.
- Identify potential challenges and barriers faced by customers and truck manufacturers in the sales process.

3.3 Data Analysis

Bell et al. (2018) highlight various methods for qualitative data analysis, with grounded theory standing out as one of the most widely adopted techniques, particularly in the context of an inductive approach. This method involves four key steps: theoretical sampling, data coding, theoretical saturation, and constant comparison. Theoretical sampling was employed during the data collection process.

The data analysis process followed a thematic analysis approach. Initially, the audio recordings were transcribed verbatim, ensuring the accuracy of participants' responses while preserving their language and expressions. The transcriptions were then read and coded by the researcher to identify initial themes and patterns related to each challenge area. Open coding was employed to allow for the emergence of new themes from the data rather than imposing preconceived categories.

The codes were organized into meaningful clusters, which were further refined and grouped into overarching themes and sub-themes corresponding to each challenge area. The themes were continuously compared and refined to ensure consistency and coherence across the dataset. The analysis process involved an iterative interplay between the data and the emerging themes, with regular reflection and discussion among the research team to enhance the validity and reliability of the findings.

Also, further investigation could facilitate identifying their dependence and interconnectedness with other verticals. Identifying this relationship could facilitate identifying the measures that could be adopted to ensure the smooth consolidation of them into an online portal. The biggest advantage of going ahead with a case study is that the case being investigated pre-exists. Hence, this eliminates the biased opinions of the employees or any individual who is being surveyed. There are no assumptions or preconceived notions. This study is a qualitative study, and data is at the heart of a qualitative study. The outcome of research is dependent upon the quality of the data that has been collected.

3.3.1 Quality of data

Goffin et al. (2019) identify three major elements that influence the quality of data analysis in case studies: inter-coder agreement, presentation, and interpretation. Inter-coder agreement occurs when different researchers independently code the data, which promotes triangulation and boosts confidence in study results. It is critical to determine the desired level of agreement when working with many researchers; in this study, with two researchers, an acceptance level of 85% was established, requiring the percentage of agreements between researchers to exceed this threshold for data usage. The second aspect, case presentation, involves visualizing data to help researchers reach their conclusions. Throughout the study, data gathering was meticulously structured to allow for the presentation of findings via tables and figures. Finally, case interpretation entails data theory, which involves comparing the gathered data to existing literature in order to develop substantive insights (Eisenhardt, 1989).

3.4 Reflection of ethics

Throughout the research process, the utmost care was taken to uphold integrity and safeguard personal data prior to any information being made public. Prior to conducting interviews, respondents were provided with comprehensive details about the interview content, affording them the opportunity to decline participation if they chose. Furthermore, in adherence to principles of integrity, respondents provided explicit consent for the recording of interviews, with assurance that their anonymity would be maintained in the final report. To ensure the reliability and validity of the data, post-interview conversations and feedback sessions were conducted in the form of feedback involving both respondents and representatives from the case company, thereby reaffirming triangulation. In compliance with GDPR regulations, information pertaining to respondents was securely stored and promptly deleted after use.

4 Findings

4.1 Integrating Interview Data

To maintain clarity and distinguish interviewee statements from my analysis, incorporate quotes directly into the text and clearly attribute them.

Communication Challenges:

- Interviewee R1: “The problem now is that nobody takes responsibility.”
- Interviewee R3: “The factory should actually realize that they are a bodybuilder.”
- Interviewee R6: “The first time we talked about it was five years ago [...] but we have still not been able to see this or are willing to change it.”

These quotes highlight the critical need for improved communication and accountability within the manufacturing process. Clear communication is essential to address misalignment and facilitate the implementation of digitization, which can enhance the sales process.

Value Analytics:

- Interviewee R2: “Online sales is just a platform where we can put those trucks in and make them available for the customer.”
- Interviewee R10: “It's quite complex to buy [...] very big difference. Buying a truck, uh? Comparing to buying a personal car.”

The complexity of purchasing trucks compared to personal cars necessitates specific parameters to gauge the efficacy of digitization. Establishing these parameters can help align business goals with digital sales strategies, potentially reducing delivery time and costs.

IT Governance:

- Interviewee R3: “Whatever the customers need on their trucks is something you can select in the same system. You have to make a free text. And then there's manual work from the salesman; there's manual work at the factory site to decode this free text into something that the factory can understand.”

Digitization should aim to maintain logs of free-text requirements to enhance traceability and speed up delivery times. This log can also serve as a valuable resource for analyzing customer requirements.

Partnering and Dynamic IT Scope:

- Interviewee R4: “When it comes to whole vehicle type approval, unfortunately, we are light years away from getting the correct process to handle that.”
- Interviewee R5: “And we have those pre-studies from CI global customer protection global inside, but they have never reached their goal when it comes to creating processes.”

Effective partnership between business and IT is crucial. Before implementing digitization, it is necessary to streamline vehicle registration processes, which can be further enhanced by aligning these processes with business goals.

Business and IT Skills Development:

- Interviewee R7: "The tool could work quite well. You build up your truck; you would choose colors and some different packages, and so on. But for a truck, it is very much more complex."

Although creating a digital solution for truck delivery is complex, it can significantly increase customer satisfaction and competitiveness if 50–60% of customers' needs can be met with standardized options.

- Interviewee R8: "We are missing some organizations within our factory, so to speak. The guys that are working with the homologation and certification on the headquarters side, it's not. They are more looking into the rules and what different rules we need to comply with."

The challenges in homologation can be mitigated by upskilling teams to ensure they are well-equipped to generate adequate registration documents for the Norwegian market. Empowering these teams with greater authority and expertise can streamline this process.

This comment points directly to the challenges faced by the homologation department, which is responsible for ensuring that all regulatory requirements are met for vehicle certification. Upskilling teams within this department can address these challenges by equipping employees with the knowledge and tools required to generate adequate registration documents for the Norwegian market.

R8's insights reveal a critical issue that needs to be addressed to improve overall operational efficiency and regulatory compliance. By investing in the development of both business and IT skills, particularly within the homologation team, the company can enhance its ability to navigate complex regulatory landscapes. This, in turn, will facilitate smoother certification processes and reduce delays in getting trucks to market.

Moreover, the integration of advanced training programs and continuous professional development can ensure that employees stay updated with the latest regulatory changes and technological advancements. This approach not only rectifies current inefficiencies but also prepares the workforce for future challenges, thereby supporting the company's long-term strategic goals.

The feedback from Interviewee R8 underscores the necessity of upskilling within the organization, particularly in critical departments like homologation. Addressing this need can significantly improve the company's ability to meet regulatory requirements and enhance overall business performance.

- Interviewee R1: "The lack of a local factory means we have to rely on international logistics, which complicates things."

To overcome this challenge, companies can explore partnerships with existing manufacturing facilities in Norway. This approach leverages established infrastructure and resources while minimizing upfront investments.

4.2 Challenges and Insights from Digital Transformation: Interview Findings

The non-availability of an in-house factory in Norway presents a significant challenge for companies aiming to establish a robust supply chain for turnkey-ready trucks. Without a local production facility, companies face increased complexities and costs associated with manufacturing and logistics. Establishing an in-house factory requires substantial investment in infrastructure, equipment, and human resources, which may not be feasible for all companies, especially those entering new markets or operating with limited capital. To overcome the challenge of not having an in-house factory, companies can explore partnerships or subcontracting arrangements with existing manufacturing facilities in Norway. This approach allows companies to leverage established infrastructure and resources while minimizing the need for significant upfront investments. By partnering with local manufacturers, companies can benefit from their production capabilities, expertise, and existing supply chain networks. This can lead to more efficient production processes and faster turnaround times for fulfilling customer orders. Additionally, companies must carefully evaluate market demand and conduct a thorough cost-benefit analysis before committing to partnerships or subcontracting arrangements. Understanding the local market dynamics, customer preferences, and regulatory requirements is crucial for making informed decisions. By aligning production strategies with market demand, companies can optimize their supply chain operations and ensure they meet customer expectations effectively.

Effective coordination among different stakeholders is essential for the successful implementation of turnkey sales, especially in the absence of an in-house factory. Collaboration between designers, engineers, manufacturers, suppliers, and customers is crucial to ensuring smooth communication and efficient workflow. Differences in expectations, priorities, or geographical distances can pose significant challenges. Therefore, establishing effective communication channels and fostering strong partnerships can help mitigate these challenges. For instance, using digital collaboration tools and platforms can facilitate real-time communication and coordination among stakeholders, regardless of their geographical locations. Regular meetings, updates, and feedback loops can ensure that all parties are aligned and working towards common goals. Additionally, developing strong relationships with key suppliers and logistics providers can help ensure the timely delivery of materials and components, further enhancing the efficiency of the supply chain.

In summary, the non-availability of an in-house factory in Norway requires companies to adopt innovative solutions to maintain an efficient supply chain for turnkey-ready trucks. By exploring partnerships with local manufacturers, conducting market evaluations, and fostering effective stakeholder collaboration, companies can overcome these challenges and ensure successful turnkey sales operations (Figure 3).

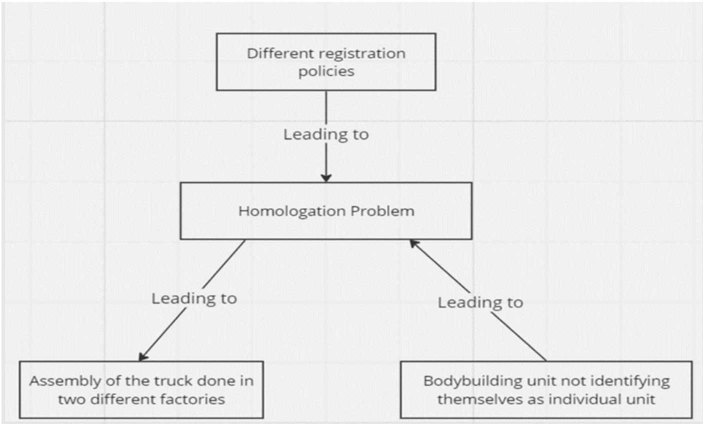

Figure 3. Process design and problem analysis based on data (own made)

The customer-centric approach is crucial for achieving customer loyalty and better financial outcomes (Fornell et al., 1996). Customer orientation forms the foundation of order processes and is key to sustainable competitive advantage (Kumar et al., 2011). However, the lack of documented data and a proper homologation routine can present significant challenges. Here are the key issues faced by Volvo Trucks in Norway due to these deficiencies:

Lack of Documented Data

The absence of thorough documentation and homologation procedures can cause numerous problems for businesses. Proper documentation is essential for maintaining customer satisfaction, ensuring compliance, and streamlining operations. Without it, Volvo Trucks has encountered several challenges that hinder their efficiency and effectiveness.

Compliance Issues

Proper documentation and homologation procedures are vital for ensuring adherence to laws, regulations, and standards. The absence of these can make it difficult for businesses to demonstrate compliance, leading to potential legal and regulatory complications. Non-compliance can result in severe consequences, including penalties, fines, legal disputes, and even the suspension of business operations. Volvo Trucks has experienced challenges in proving compliance, which pose significant risks to their operational stability.

Supplier and Partner Relationships

Strong relationships with suppliers and partners are crucial for a smooth supply chain. However, the lack of proper documentation and homologation procedures can strain these relationships. Suppliers may be reluctant to engage with businesses that lack clear processes or cannot provide the necessary documentation. This reluctance can lead to delays, disputes, and difficulties in maintaining reliable and trustworthy supply chains. Volvo Trucks has faced such challenges, affecting their ability to ensure timely and efficient supply chain operations.

Operational Inefficiencies

Documentation and homologation procedures are essential for streamlining and standardizing business operations. Without these, businesses may encounter various inefficiencies, such as delays in product launches, difficulties in tracking inventory, and challenges in managing quality control processes. These operational inefficiencies can increase costs, hinder productivity, and negatively impact overall business performance. Volvo Trucks has faced significant operational challenges due to the lack of proper documentation, affecting their ability to maintain high standards and efficient operations.

By addressing these issues, Volvo Trucks can enhance their operational efficiency, ensure compliance, strengthen supplier and partner relationships, and ultimately provide better customer satisfaction. Proper documentation and homologation procedures are critical components for overcoming these challenges and achieving long-term success in the digital era.

Another significant challenges identified in the development and implementation of an online portal for the sale of turnkey-ready trucks is the lack of documented data. This deficiency has profound implications for various aspects of the business, particularly in auditing, future sales planning, and customer satisfaction.

Firstly, the absence of documented data with a long history in Norway's order processing severely hampers the auditing process. Effective auditing relies on accurate, comprehensive records of transactions, customer interactions, inventory levels, and regulatory compliance. Without these records, it becomes exceedingly difficult to conduct thorough audits, identify discrepancies, and ensure compliance with industry standards and regulations. This lack of data can lead to financial inaccuracies, unrecognized liabilities, and potential legal challenges. Companies are unable to verify their financial integrity, which can erode stakeholder trust and negatively impact their reputation.

Furthermore, the deficiency in documented data poses significant obstacles for future sales planning. Accurate data is essential for forecasting demand, managing inventory, and developing sales strategies. Without historical sales data, companies struggle to identify trends, understand customer preferences, and anticipate future demand. This can result in either overproduction or underproduction, both of which have detrimental financial implications. Overproduction ties up capital in unsold inventory, while underproduction can lead to missed sales opportunities and dissatisfied customers.

Moreover, the lack of documented data affects customer satisfaction adversely. Detailed records of customer interactions, preferences, and feedback are crucial for personalizing the customer experience and resolving issues effectively. Without such data, companies are unable to track customer satisfaction levels accurately, identify recurring problems, or implement targeted improvements. This can lead to a generic, less responsive customer service experience, ultimately diminishing customer loyalty and satisfaction.

The findings underscore the critical impact of the lack of documented data on auditing, future sales planning, and customer satisfaction in the turnkey-ready truck sales industry. Addressing this issue is essential for enhancing operational efficiency, ensuring regulatory compliance, and improving customer experiences. By prioritizing data documentation and leveraging modern data management technologies, companies can overcome these challenges and position themselves for long-term success in a competitive market.

5 Recommended Solutions

5.1 Introduction

Building on the findings from Chapter 4, this chapter presents recommended solutions to address the challenges associated with enabling the sale of turnkey trucks. These recommendations are designed to improve communication, streamline processes, enhance IT governance, and foster effective partnerships, ultimately facilitating the successful implementation of turnkey sales strategies in the truck industry.

5.2 Communication Improvements

Effective communication is the cornerstone of any successful manufacturing process, particularly in complex operations such as the production and sale of turnkey trucks. A clear responsibility assignment is essential to ensure that every team member understands their role and is accountable for their tasks. Designating specific roles for each stage of the production and sales process reduces ambiguity, enhances accountability, and improves coordination. When roles are clearly defined, each team member knows exactly what is expected of them, which minimizes confusion and overlap of duties. This clarity prevents tasks from falling through the cracks, ensuring comprehensive coverage of all necessary activities. Assigning specific responsibilities ensures that each task has an accountable owner, driving individuals to complete their tasks diligently and promptly.

It also facilitates easier tracking of progress and identification of bottlenecks or issues. Moreover, clear roles make it easier to coordinate efforts between different departments and teams, as everyone knows who to contact for specific information or decisions, fostering better collaboration and smoother transitions between different stages of the production and sales process. To implement role designation, it is crucial to conduct a thorough analysis of the entire process to identify all necessary roles, followed by creating detailed maps outlining each role, its responsibilities, and how it fits into the overall process. Developing comprehensive job descriptions that specify duties, required skills, and reporting lines is also essential. These descriptions should be communicated to all team members and stakeholders. Providing training sessions to help employees fully understand their roles and responsibilities and including role-specific training during the onboarding process for new hires are vital steps in ensuring everyone is well-prepared to fulfill their roles.

Regular communication channels are equally important for maintaining alignment and ensuring timely resolution of issues. Establishing a regular schedule for interdepartmental meetings to discuss progress, address issues, and plan upcoming tasks is crucial. Depending on the complexity and pace of the project, these meetings can be weekly, biweekly, or monthly. Daily stand-up meetings can be highly effective for teams working closely together, allowing team members to share their work, report blockers, and align on priorities. Stand-ups promote transparency and quick problem-solving, keeping the team agile and responsive. Implementing a system for regular status updates where each team provides brief reports on their progress, achievements, and challenges is also beneficial. These updates can be shared through emails, internal communication platforms, or during scheduled meetings.

Utilizing collaborative platforms like Slack, Microsoft Teams, or project management tools can facilitate ongoing communication. These platforms enable real-time messaging, file sharing, and task tracking, ensuring everyone stays informed and connected. Establishing feedback loops where team members can provide input on processes, share suggestions, and raise concerns is also important. Regular feedback sessions help identify communication gaps and areas for improvement, fostering a culture of continuous improvement.

To implement regular communication channels effectively, it is essential to develop a communication plan outlining the frequency, format, and purpose of each type of meeting or update. This plan should be communicated to all team members and integrated into their workflows. Appointing facilitators or coordinators for meetings ensures they are structured, focused, and productive. Facilitators help keep discussions on track, summarize key points, and follow up on action items. Leveraging technology to automate and streamline communication, such as using automated email reminders, calendar invites, and integrated communication platforms, enhances efficiency. Ensuring all team members are trained in using these tools effectively is crucial. Maintaining detailed minutes of meetings and records of decisions made and sharing these documents with all relevant stakeholders ensures transparency and accountability. Documenting outcomes helps track progress and provides a reference for future discussions. By clearly defining roles and responsibilities and establishing regular communication channels, companies can significantly improve communication within the turnkey truck production and sales process. This not only enhances operational efficiency but also ensures that issues are promptly addressed, leading to better outcomes and higher customer satisfaction. Ensure all communication tools are integrated with the company's ERP (Enterprise Resource Planning) system to maintain a unified workflow.

5.3 Value Analytics Implementation

The definition of specific parameters to gauge the efficacy of digitization is essential. Key Performance Indicators (KPIs) play a crucial role in this regard, providing measurable benchmarks for success. One recommended KPI is delivery time reduction, which involves monitoring the time taken from order to delivery. By tracking this metric, companies can ensure that their digitization efforts are indeed improving efficiency. Another vital KPI is cost savings, which involves analyzing the reductions achieved through streamlined processes and minimized manual interventions. By focusing on these KPIs, companies can systematically assess the impact of their digital transformations and make informed decisions to enhance performance.

5.4 Customer Feedback Mechanism

Implementing a robust customer feedback mechanism is critical for continuously improving the digital sales platform. Regularly collecting feedback through surveys and reviews enables companies to gather valuable insights directly from customers. This feedback can highlight areas of success and identify opportunities for improvement. Additionally, employing analytics tools to analyze customer behavior and preferences further refines the sales process. These tools provide a deeper understanding of customer interactions with the platform, allowing for more targeted enhancements that align with customer needs and expectations.

5.5 IT Governance Enhancements

To address issues with free-text requirements, implementing automated text analysis tools is recommended. These tools can automate the parsing and categorizing of free-text inputs, significantly streamlining the decoding process. By enhancing traceability, these tools maintain logs of all free-text requirements, ensuring a clear record that facilitates future analysis and decision-making. Automated text analysis not only improves efficiency but also enhances accuracy, leading to more reliable and actionable insights. Ensuring all IT systems are integrated to provide a seamless flow of information across departments is vital. Implementing unified databases is a key step in this direction. Unified databases store all relevant information in an accessible format for all stakeholders, promoting transparency and collaboration. Additionally, providing real-time data access to all relevant parties enhances decision-making processes. With immediate access to current information, teams can respond more swiftly and effectively to changing conditions and requirements.

5.6 Enhanced Collaboration with Local Manufacturers

Forming strategic partnerships with local manufacturers leverages their infrastructure and expertise. Exploring joint ventures or subcontracting arrangements with established local manufacturers can be mutually beneficial. Such collaborations utilize shared resources to minimize costs and enhance production capabilities, fostering a more robust and efficient production process.

5.7 Dynamic IT Scope and E-Retail Integration

Developing e-retail platforms that offer customization options for customers is a key strategy. User-friendly interfaces that allow customers to easily customize their trucks make the buying process more engaging and satisfying. Additionally, providing pre-configured options that cater to common customer preferences simplifies the buying process, making it more accessible and appealing to a broader audience. Implementing scalable IT solutions that can grow with the business ensures long-term adaptability. Utilizing cloud-based systems offers scalability and flexibility, allowing businesses to expand their IT capabilities as needed without significant upfront investments. Developing a modular IT infrastructure further supports scalability, enabling easy expansion or modification in response to changing business needs.

5.8 Business Skills Development

Investing in comprehensive training programs is crucial for upskilling employees in both business and IT skills. Conducting regular workshops and training sessions on the latest technologies and industry best practices keeps employees updated and competent. Offering certification programs ensures employees have recognized qualifications, enhancing their professional development and confidence. Forming cross-functional teams facilitates knowledge sharing and collaboration across departments. Encouraging interdepartmental projects promotes a deeper understanding of different aspects of the business, fostering a more integrated and cohesive approach to problem-solving. Implementing mentorship programs, where experienced employees guide and support less experienced colleagues, further enhances skill development and organizational knowledge.

6 Conclusion

Innovations must keep pace with changing customer demands and technological advancements in order to succeed in rapidly changing environments (McDonough &

Barczak, 1991). These solutions will not only improve operational efficiency but also enhance customer satisfaction and ensure long-term business success. Adopting a holistic approach that integrates value analytics, customer feedback mechanisms, robust IT governance, strategic partnerships, dynamic IT solutions, and comprehensive skill development will position companies to thrive in an increasingly digital and competitive marketplace.

The analysis revealed several key challenges that can be encountered when developing an online portal for the sale of turnkey-ready trucks. One of the primary challenges is poor communication within the manufacturing process, which can lead to significant delays and errors. To address this, it is essential to establish clear responsibilities and accountability. This can be achieved by designating specific roles for each stage of the production and sales process and implementing regular communication channels such as meetings and updates to ensure all teams are aligned and issues are resolved promptly. Additionally, defining Key Performance Indicators (KPIs) such as delivery time reduction and cost savings is crucial to measure the success of digitization efforts. These metrics allow for continuous assessment and improvement of the online portal's efficiency.

Another challenge is the need for a robust customer feedback mechanism to continuously improve the digital sales platform. Implementing surveys and reviews to collect customer feedback, coupled with analytics tools to interpret customer behavior, helps refine the sales process and enhance user satisfaction. Moreover, managing free-text requirements and ensuring seamless information flow can be problematic. To mitigate this, automated text analysis tools can be implemented to streamline the processing of free-text inputs. Integrated IT systems can ensure that all relevant data is accessible and traceable, enhancing operational efficiency. Furthermore, developing a customizable e-retail platform with user-friendly interfaces and scalable IT solutions, such as cloud-based systems, ensures that the portal can grow with the business and meet diverse customer needs. Lastly, bottlenecks in registration and manufacturing processes can delay sales. Streamlining registration processes and forming strategic partnerships with local manufacturers can leverage existing infrastructure and expertise, reducing delays and enhancing production capabilities.

E-commerce adoption significantly impacts the supply chain management practices of turnkey-ready truck manufacturers, particularly in inventory management, logistics, and order fulfillment. In terms of inventory management, e-commerce requires more agile systems to keep up with online demand. Real-time data access and unified databases are critical to maintaining accurate inventory levels, reducing the risks of overstocking or stock outs, and ensuring that inventory aligns with customer demand. This agility ensures that manufacturers can respond promptly to changes in demand, maintaining efficiency and customer satisfaction.

Regarding logistics, the analysis highlighted that efficient logistics are crucial to meeting the faster delivery expectations of online customers. By monitoring KPIs such as delivery time reduction and leveraging integrated IT systems, manufacturers can optimize their logistics operations, ensuring timely and efficient delivery of trucks. This optimization includes everything from improving transportation routes to better managing warehouse operations, all aimed at reducing delivery times and enhancing customer satisfaction.

Order fulfillment also sees a significant impact from e-commerce adoption. The increased volume of orders necessitates streamlined processes to handle them efficiently. Automation of order processing and the implementation of scalable IT infrastructure, such as cloud-based systems, ensure that order fulfillment can adapt to increased demand without sacrificing efficiency or accuracy. This ensures that customers receive their orders promptly and accurately, further enhancing their experience.

Additionally, e-commerce platforms change how customers interact with the buying process, often leading to higher expectations for customization and convenience. Developing customizable e-retail platforms allows customers to personalize their purchases, which enhances satisfaction and loyalty. Using analytics tools to track and understand customer preferences helps manufacturers tailor their offerings and improve the overall buying experience. This customer-centric approach not only meets current demands but also anticipates future trends, ensuring long-term success in the digital marketplace.

By addressing research questions through thorough analysis and recommended solutions, the study highlights critical areas for improvement and strategies necessary to overcome the challenges associated with launching an online portal for turnkey-ready trucks. Improved communication, effective use of value analytics, robust customer feedback mechanisms, enhanced IT governance, strategic partnerships, and dynamic IT and e-retail integration collectively ensure that supply chain management practices are optimized for the digital age. This optimization leads to better operational efficiency and customer satisfaction, positioning manufacturers for sustained success in a competitive market.

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8 Appendix 1

Crucial parts of interviews' quotation:

- Interviewee R1, Senior Sales Manager: "The problem now is that nobody takes responsibility."

  "The lack of a local factory means we have to rely on international logistics, which complicates things."

- Interviewee R2, Senior Regional Sales Manager: "Online sales is just a platform where we can put those trucks in and make them available for the customer."

- Interviewee R3, Senior Order Manager: "The factory should actually realize that they are a bodybuilder."

  "Whatever the customers need on their trucks is something you can select in the same system. You have to make a free text. And then there's manual work from the salesman; there's manual work at the factory site to decode this free text into something that the factory can understand."

- Interviewee R4, Senior Homologation Specialist: "When it comes to whole vehicle type approval, unfortunately we are light years away from getting a correct process to handle that."

  We struggle with compliance because our documentation processes are not streamlined."

- Interviewee R5, Product Definition: "And we have those been some pre-studies from CI global customer protection global inside, but they have never reached their goal when it comes to creating processes."

- Interviewee R6, Senior Digital Delivery Manager: "The first time we talked about it was five years ago, but we have still not been able to see this or are willing to change it."

- Interviewee R7, Senior Business Development: “Tool could work quite well. You build up your truck; you would choose colors and some different packages, and so on. But for a truck, it is very much more complex.”

- Interviewee R8, Business Development Controller, Finance: “We are missing some organizations within our factory, so to speak. The guys that are working with the homologation and certification on the headquarters side, it's not. They are more looking into the rules on what different rules we need to comply with.”

- Interviewee R9, Senior Product Definition: “The product definitions we use are often outdated and don't align with current market needs. Updating these definitions can make a significant difference in how we meet customer expectations.”

- Interviewee R10, Senior Customer Offer & Experience: "It's quite complex to buy a truck from an online portal as it is not a screw, which is simple to buy; each truck has a great volume of configuration, which is customized based on each customer's need."

  “Without proper data, we cannot accurately forecast demand or personalize customer experiences.”

9 Appendix 2

Open-ended questions:

a) What are the most important factors you consider when purchasing a turnkey-ready truck?

b) How do after-sales services and support influence your decision to buy a turnkey-ready truck?

c) How do pricing strategies affect your decision-making process when considering turnkey-ready trucks?

d) What customization options do you find most appealing in turnkey-ready trucks?

e) What are your perceptions of the reliability and durability of turnkey-ready trucks?

f) Can you identify any challenges or barriers that customers and truck manufacturers face in the sales process?

Theme	Quote from the interview	Inference
Vehicle Type Approval	Unfortunately, light years away from getting a correct process to handle that	The fundamental requirement of a turnkey project of having everything in-house and eliminating third-party vendors is being fulfilled.
Customer Adaptation	We have some smaller solutions. We do something like we call swap body. But compared to hook lift or tipper body, that's a whole different story.	As the complexity of the body of the truck increases, it becomes difficult for the factory to provide type approval. The scope is limited to basic superstructure on frame, which allows to carrying containers on top of the truck.
Customisation in the configurations	We do not have that type of legal department within GTO to take care of certification.	Identification of the most sold customizations of the configurations and enabling the corresponding certifications by having the appropriate legal team.
Restricted role of homologation team	The guys working on the homologation and certification on the headquarters side are more looking into what different rules that we need to comply with	If the role of the role and responsibilities of the homologation team is extended to provide required documents as well, that can facilitate in speeding up of the delivery process as a ready truck can be rolled out of the factory to the customer.

Registration of the Chassis	Bodybuilders would do the registration at the airport when they receive it. But now we have added an extra process. We have hired a company that will do that for us because that ways we save a lot of claims. All the inspections are now done closer to the site.	This is different from what the turnkey concept stands for. Turnkey concepts emphasize in elimination of the external vendors and having everything in-house. This facilitates in lowering the costs of the finished product and reduces the delivery time.
Difference in type approvals	Sweden and Denmark have single type approval and Norway have tie ups with the body builders in Norway and they take care of the truck itself. We do not have any real turnkey concepts from our side with Norway today.	Different local markets have different documentation requirements. Region or country specific turnkey concept could be implemented where an entire team is established which takes care of the entire homologation aspect of that specific region.

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