ŠKODA AUTO UNIVERSITY

Report

Group: 3

Topic: Technological and process innovation in sustainable automotive supply chain management

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Content

[2 Summary 2](#_Toc130372959)

[3 Introduction 3](#_Toc130372960)

[4 Systems thinking in Wholeness in Sustainable Supply Chain Management 4](#_Toc130372961)

[4.1 System Thinking in Wholeness 4](#_Toc130372962)

[4.2 VUCA Environment in automotive 7](#_Toc130372963)

[4.3 Sustainable triple bottom line wise balance examples outside automotive 14](#_Toc130372964)

[4.4 Automotive stakeholder description 18](#_Toc130372965)

[5 Technological innovations 23](#_Toc130372966)

[5.1 3D printing 23](#_Toc130372967)

[5.2 Benefits 25](#_Toc130372968)

[5.3 Disadvantge 26](#_Toc130372969)

[5.4 Area of application 27](#_Toc130372970)

[5.5 3D metal printing 27](#_Toc130372971)

[6 Process Innovations 30](#_Toc130372972)

[6.1 Lean Management 30](#_Toc130372973)

[6.2 System thinking and collaboration planning 31](#_Toc130372974)

[6.3 Agility 33](#_Toc130372975)

[6.4 Closed loop supply chain 34](#_Toc130372976)

[6.5 Risk management 35](#_Toc130372977)

[6.6 Digitalization 36](#_Toc130372978)

[7 Conclusion 42](#_Toc130372979)

[8 Refernces 43](#_Toc130372980)

[9 List of figures and tables 46](#_Toc130372981)

# Summary

The automotive industry has been facing increasing pressure to adopt sustainable practices in their supply chain management. Technological and process innovation has been identified as a key solution to address this challenge.

In order to understand the topic of sustainable automotive supply chain management and its background more precisely, the topic was divided into four sub-headings within the groupmembers as a first step. First: “Systems Thinking in Wholeness”, second: “VUCA Environment in Automotive”, third: “Sustainable tripple bottom line wise balance examples outside automotive” and lastly: “Automotive stakeholders desriptions”. Through external research of each topic, these were elaborated in a comprehensible and structured way and then presented to the whole group. In the following, the actual subject and aim of this work was divided into 2 groups. One group was dedicated to technology innovations in the automotive supply chain, the other team investigated process innovations. Through this work it was found that technological and process innovations are essential for the automotive supply chain to remain competitive and efficient. The automotive industry is highly complex and constantly evolving, with changing consumer preferences, government regulations, and technological advancements.

# Introduction

In today's world, the business environment is increasingly characterized by volatility, uncertainty, complexity, and ambiguity (VUCA). This reality poses significant challenges for companies that operate in the automotive industry, which relies on complex and interconnected supply chains that span the globe. To navigate this VUCA world successfully, it is crucial for companies to embrace sustainable technological and process innovations in automotive supply chain management. This requires engaging with stakeholders who represent the external environment, such as customers, suppliers, regulators, and civil society organizations, to understand their needs and expectations, and to develop sustainable solutions that balance conflicting demands. Instead of focusing solely on maximizing performance of individual parts of the supply chain, companies should adopt a wholeness systems thinking approach that identifies the purpose of the supply chain and integrates the requirements of all stakeholders. This approach can help companies achieve a balance of the three sustainable dimensions of the supply chain (economic, environmental, and social) and create shared value for all stakeholders. Within this thesis, the questions “Why we need process and technological innovations in automotive sustainable supply chain management and in which sequence ideally?” and “Why we need to consider sustainability or shared value as crucial aspecct of 21st centry business?” are to be examined and answered. In order to show the importance of sustainable technological and process innovations in automotive supply chain management, and the role of stakeholders and wholeness systems thinking in achieving sustainable solutions.

We as a group have explicitly chosen this theme, as sustainability is becoming increasingly important in every aspect of life, especially in today's age. As companies and organisations have one of the biggest impacts on global sustainability/ environment, we as a team find it even more important to work out new advances, insights and proposals to ensure sustainability.

# Systems thinking in Wholeness in Sustainable Supply Chain Management

## System Thinking in Wholeness

Systems thinking is a way of making something complicated, understandable. We are going to look at the whole and the goals instead of looking at everything separately. The goal of systems thinking is to formulate and reason about physical, biological, or sociological principles that apply to general systems. The main basis of systems thinking is mutual interactions between the parts that create the whole system, influenced by the environment (Holman et al., 2018).

Typical example of systems thinking in the automotive industry in the company of Toyota Production System. Systems thinking at Toyota starts with a clear vision of the goal. Their visions clearly state that the company wants to provide the best cars to the customers. Toyota bases its management decisions on long-term systems thinking, even at the expense of short-term financial goals.

It is of course important for a company to make money, but growing, working and aligning between the departments towards doing common things has a higher importance and purpose. This philosophy provides a basis for guidelines, principles and processes. The vision of the Toyota Way is that the entire organization adds value to customers and society through continuous adaptation, improvement and learning (Liker, 2021)

How does it work?

The pyramid is crucial for further comparison of current and proposed systems thinking approaches. A system consists of at least 2 interacting parts. Every part of the system directly or indirectly affects the system goal, and system goal affects every part or interaction of the system. The relationship between system elements are important to the performance of the system as a whole (Lenort, 2018).

Diagram

Description automatically generated

Systems thinking consists of?

* Components
* Interactions
* Purpose

WHS consists of wholeness analysis (WA) and wholesomeness synthesis (WS) WS consists of 3 parts:

* Identification of the higher system
* Understanding the higher system
* Identifying the target of the system under investigation in the higher system

WA consists of 3 parts:

* Decompose the system into independent parts and communicate according to the stated purpose *Fig 1. WST pyramid*
* An understanding of each separate part and their interactions
* Understanding of each part and interactions, is an understanding of the whole system.

This systematically makes it possible to prevent overperformance of the system.

Purpose = Here the goal is not to have maximum profit or minimum costs, but to obtain optimal costs (Wicher, 2018). The optimal cost results from consideration of external environment, which means application of Wholeness Synthesis. Customer satisfaction, identified in within external environment is the Purpose, delivering optimal results from Wholeness perspective.

Benefit

We want to have customers' full satisfaction in the next stage. The big advantage of this system is that there is no overproduction.Diagram

Description automatically generated with medium confidence

*Fig 2. Optimal performence*

As a result, the costs of the studied systems have increased. Each individual department within the company ultimately all have the same goal, so we no longer have conflicting sub-goals. However, the supply costs are higher as a result. Satisfaction of customer requirements is pursued. Toyota and Zara have lower total costs because they use Wholeness-systems thinking. (Giurgiu, 2018)

Disadventages

Satisfaction of customer requirements is pursued. Toyota and Zara have lower total costs because they use Wholeness systems thinking. The application requiers mindset change of the companies employee, which is one of the most difficult obstacles for successful implementation.

Demand chain management

To optimally organize your supply chain, you must try to estimate the customer's demand properly. That way we don't waste resources. Food production is an example of this. 50% of the food produced is wasted.

supply chain managers are under pressure to be both lean and agile; be both customer-friendly and inexpensive; and to provide great service levels and fast execution, while also reducing inventory and support costs.

Demand chain management consists of Teachers and researchers from the specialisms (even silos) Marketing and Sales, and Logistics and Supply Chain Management come together to form and proposed an integrated unit (Christopher, 2018).

Diagram, table

Description automatically generated

*Fig 3. value dilivery system*

Phase 1: Pick the Value: That is, use customer insight to

identify opportunities to create value and

build a value proposition around that opportunity.

Phase 2: Provide the value: product/service development,

procurement, manufacturing, delivery and lifetime support.

Phase 3: Communicate the value: that is, use appropriate

media to explain and promote the value proposition to target markets

## VUCA Environment in automotive

Introduction in the VUCA World

The world we live in continues to change rapidly. Not a day goes by without a groundbreaking invention or other important discovery in the field of science and technology. Additionally, individuals find it difficult to keep up with the pace of change and discovery. Change is everywhere, and in the 21st century, successfully managing change has become one of the most important issues for organizations. Its speed and complexity are rapidly increasing. The future success of an organization depends on how successfully it manages this change. As environments become more complex, organizational crises are expected to become more frequent and cumulative.

Most companies and their leaders find it difficult to understand or struggle with how to manage or best lead in this new world. In addition, company boundaries are changing and global networks are forming. The old rules no longer apply, and leaders must come up with new ideas and strategies to create and sustain company success. The pace of change today is characterized by a radically different speed and breadth than in the past. Meanwhile, the occurrence of this flattening process is at war speed which is directly or indirectly affecting a lot of people in this world at once. Furthermore, the organization now faces these inevitable changes that are even foreseeable but lack leadership, imagination and flexibility to adapt. This is not because organizations are unaware or ignorant, but because of the speed of change, which is simply enormous. Moreover, this rapid flattening is creating a new environment which is known as a ‘VUCA’ environment by the business leaders.

The new environment is characterized by networking and increased complexity. The global economy is interconnected, and companies cannot just focus on the local economy. Instead, companies are forced to adapt their tactics and strategies to events in different parts of the world.

Organizations that respond quickly and efficiently to changing circumstances will survive. Environmental change is due to various factors such as technological innovation, increasing global competition and competitors, economic and social restructuring, shifting customer and stakeholder expectations, ecological dilemmas and new governmental and international regulations.

  
Figure 4: Unpredictable events

In a rapidly evolving world, change has become the norm for businesses to survive and thrive. As a result, it is becoming increasingly difficult for businesses to make decisions due to the highly uncertain and volatile business environment.

(Bennett and Lemoine, 2014), (Jacobides, 2017)

Definition of the VUCA Environment in Automotive

VUCA stands for volatility, uncertainty, complexity and ambiguity. A VUCA environment is a term used to describe a business or organizational environment characterized by a high degree of unpredictability and rapid change.

Volatility refers to the instability of the environment, where conditions change frequently and often rapidly. Uncertainty refers to the unpredictability of events so that it is difficult to predict future outcomes. Complexity describes the intricate relationships and interconnections of various factors in an environment, making it difficult to understand cause and effect. Finally, ambiguity refers to a lack of clarity or understanding of a situation that may have multiple interpretations. (Harappa, 2021)

![Ein Bild, das Text enthält.

Automatisch generierte Beschreibung](data:image/jpeg;base64,/9j/4AAQSkZJRgABAQEAkACQAAD/4REGRXhpZgAATU0AKgAAAAgABAE7AAIAAAAUAAAISodpAAQAAAABAAAIXpydAAEAAAAoAAAQ1uocAAcAAAgMAAAAPgAAAAAc6gAAAAgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAEdlbmVzdCwgSmVyZW1pYWggQi4AAAWQAwACAAAAFAAAEKyQBAACAAAAFAAAEMCSkQACAAAAAzU3AACSkgACAAAAAzU3AADqHAAHAAAIDAAACKAAAAAAHOoAAAAIAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA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 
Figure 5: Definition of VUCA  
 (Genest, 2020)

Taken together, these four factors make it difficult for companies and organizations to plan and implement strategies and make effective decisions in the face of constant change and uncertainty.

The automotive industry is particularly vulnerable to the VUCA environment due to high levels of technological innovation, a changing regulatory environment and intense competition. For example, the shift to electric vehicles, the rise of autonomous driving technology, and the growing emphasis on sustainability have all contributed to the VUCA environment in the automotive industry. (Wright, 2022)

Actual and most resent real-life examples of VUCA Environment

Generally formulated current examples can be given for each sub-item of the VUCA environment:

1.Volatility: The rapid changes in the technology sector, such as the development of new software, social media platforms, and artificial intelligence.

2.Uncertainty: The unpredictability of the global economy, such as the fluctuations in the stock market, changes in government policies, and economic sanctions.

3.Complexity: The interdependence and interconnectedness of different systems, such as supply chain networks, environmental ecosystems, and social networks.

4.Ambiguity: The lack of clear information or understanding of a situation, such as the multiple interpretations of legal regulations, the changing social norms, and cultural differences.

These examples demonstrate how the VUCA environment can impact different sectors and industries, and how organizations must adapt to these challenges to remain competitive and thrive.

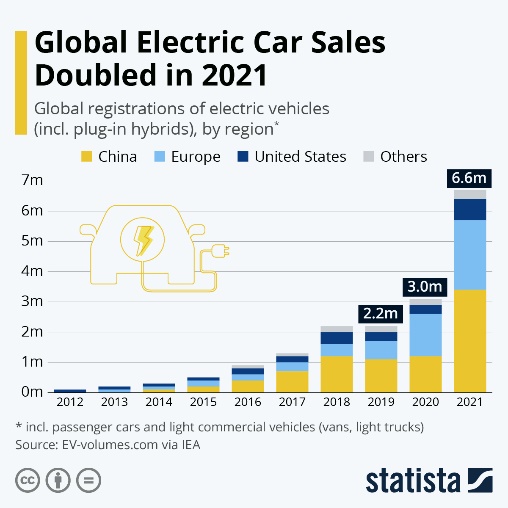
Probably one of the most recent real-life examples of the VUCA environment is the global pandemic caused by the Covid 19 virus in 2020. When the pandemic broke out, both individuals and organizations had to adapt as quickly as possible to the new, unprecedented situation. For example, students would have to attend classes online, all possible purchases would have to be made online, and contact with other people would have to be stopped. In the economic world, too, unexpected changes and adjustments had to be made quickly. For example, the majority of all employees worldwide could no longer come to work and switch to the home office, transport chains increasingly came to a standstill and the production of many products could not continue as before. As this situation came unpredictably, unexpectedly and very quickly, it is a prime example of the VUCA environment today.

Ein Bild, das Diagramm enthält.

Automatisch generierte Beschreibung  
Figure 6: Home Office trend due Covid 19  
(Cho, 2022)

However, as already mentioned, not only global events but also new technologies and social norms are evolving rapidly, and these also play a major role in the VUCA environment. Especially with regard to the automotive industry, it can be observed that more and more consumers prefer electric vehicles/these are becoming more and more popular. (Richter, 2022)

This tendency is additionally supported by legal regulations. In more and more cities, so-called environmental zones are being introduced to reduce diesel emissions. It is assumed that one day a diesel driving ban could also be introduced in the inner areas of cities. A current example of this is the expansion of the low emission zone in Munich, where only cars with a so-called "green" permit or special permit are allowed to drive. (Green-Zones.eu, 2023)

  
Figure 7: Increasing popularity of electric cars   
(Richter, 2022)

These examples, which are only a few of many more, raise the question for the various organisations of how they can best prevent such events in the future or, if not possible, how they can gain an advantage over their competitors.

VUCA Understanding Approach

**Ein Bild, das Diagramm enthält.

Automatisch generierte Beschreibung**

Figure 8: VUCA Understanding Approach

(MicroTool)

The understanding approach involves developing a deep understanding of the VUCA environment in which the organization operates. This involves gathering information about the internal and external factors that are contributing to the volatility, uncertainty, complexity, and ambiguity of the situation. (Bennett and Lemoine, 2014)

Volatility can be addressed with vision and is even more important in volatile situations. Vision gives leaders a clear idea of ​​what they want and where they want the organization to take them. Leaders with a clear vision can navigate volatile environmental changes, such as new competition in the market or an economic downturn.

Uncertainty can be dealt with understanding. Leaders must be able to stop, look and listen. Additionally, leaders must start with vision and learn to look and listen outside their functional domain to understand volatility. Therefore, leaders need to communicate with employees at different levels in the organization to develop and demonstrate their collaboration and teamwork skills.

Complexity can be met with clarity, which is the deliberate process of understanding chaos. In the VUCA world, chaos comes quickly and rarely. As a result, leaders must be quick and able to adapt to the messy minutiae to make smarter, more informed business decisions.

Agile resolves ambiguity. Leaders must be able to communicate and quickly apply solutions across the organization. In VUCA Prime, vision, understanding, clarity, and agility are not mutually exclusive, but intertwined elements that help leaders become strong VUCA leaders.

(Thebe, 2017), (Pardo, 2022), (Schoemaker, 2012)

Some ways to gain a better understanding of the VUCA environment include:

1.Analyzing data: Organizations can use data analytics tools to analyze large amounts of data and identify patterns and trends that may be contributing to the VUCA environment.

2.Conducting surveys and interviews: Organizations can survey their employees, customers, and stakeholders to gather information about their experiences and perspectives on the VUCA environment.

3.Engaging in scenario planning: Organizations can develop scenarios that explore different possible futures and help them to better understand the potential impacts of different factors on the VUCA environment.

(Wright, 2022), (Pardo, 2022)

In summary, to deal with VUCA environments, organizations can take a sensitive approach that includes a deep understanding of the factors that contribute to the volatility, uncertainty, complexity, and ambiguity of the situation. They can then tailor solutions to their specific circumstances which will be discussed in more detail in the later part of the text.

## Sustainable triple bottom line wise balance examples outside automotive

Shared Value Concept by Michael Porter

Businesses are expected to do more than just make a profit in today's world. They are expected to make a contribution to society and to address environmental issues. This is where Michael Porter's concept of shared value comes into play. In this article, we will look at the concept of shared value and its significance in business.

Michael Porter, a Harvard Business School professor, developed the shared value concept as a business strategy. Create economic value while also addressing societal and environmental issues is what shared value is all about. In other words, it is a method for businesses to generate value for both themselves and society.

The traditional model of corporate social responsibility (CSR), according to Porter, is flawed. CSR is frequently viewed as a distinct function from core business, with a focus on mitigating negative impacts rather than creating positive social and environmental outcomes. Shared value, on the other hand, is integrated into business strategy and focuses on creating social and environmental benefits that benefit the company as well.

Creating shared value is about more than just philanthropy and sustainability. It is all about identifying opportunities where societal needs and business objectives intersect. A company that provides clean energy solutions, for example, can create shared value by lowering carbon emissions while also generating revenue.

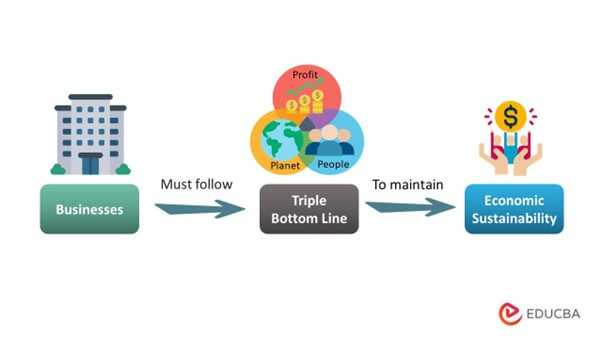
Companies that embrace the concept of shared value can benefit in a variety of ways. First, by demonstrating their commitment to social and environmental issues, they can improve their reputation and brand image. Customers who are increasingly concerned about these issues can be attracted and retained. Companies can also cut costs by improving efficiency and reducing waste.

The concept of shared value is not limited to large corporations. Creating shared value can also benefit small and medium-sized businesses (SMEs). Working with local communities and suppliers can help SMEs create social and environmental value.

To summarize, the concept of shared value is a powerful tool for businesses to create economic value while also addressing social and environmental issues. Companies can improve their reputation, attract customers, and reduce costs by incorporating shared value into their business strategy. It is not only about doing good, but also about doing well while doing good. (Porter, Kramer, 2011)

Triple bottom line

The Triple Bottom Line (TBL) is a transformative framework that assists businesses and organizations in transitioning to a more healthy and sustainable future. This framework broadens traditional business metrics to include the organization's benefits to social and economic well-being, as well as the environment. TBL provides tools to assist organizations in moving toward a regenerative and sustainable future by measuring the organization's impact and success beyond financial accounting. These three categories are known as the three "P's": people, planet, and prosperity. To fully account for the costs of doing business, organizations must go beyond mere compliance and take into account all stakeholders. CSR initiatives benefit both stakeholders and companies that incorporate CSR into their business strategy.



Figurure 9: 3“P`s“ & TBL

Stakeholders are becoming more aware of the impact of business on the environment, community, economy, and global issues such as climate change and social justice. Some large corporations go even further, aiming to have a positive or regenerative impact on the environment and society. (Gillis, 2021)

People & Supply chain management

The TBL approach begins with a consideration of all stakeholders within the "People" concept. Customers, employees, managers, shareholders, communities, and society are all involved in a typical supply chain. To provide value to people, the organization should now define SMART (specific, measurable, achievable, realistic, and timely) goals. For example, through recognition and fair working conditions, an organization can ensure the satisfaction of its employees and managers. Customer satisfaction can be measured by the quality of goods and services, which reflects on the overall satisfaction of the community and society. (RetailWorld, 2021)

Planet & Supply chain management

All resources on Earth are in short supply, which is why the TBL approach focuses on the planet and its protection. All supply chain operations have an impact on our planet. There is resource consumption from inbound logistics to outbound logistics, and as a result, companies should develop environmental strategies.

Purchasing and storage are two logistics processes that can be very resource-intensive. As a result, businesses use the JIT method. JIT is a critical component of a sustainable purchasing process that was first implemented in Toyota's manufacturing system. This method allows for the purchase of only the goods required to meet customer demand. This reduces inventory while also lowering storage and insurance costs. JIT is a fundamental approach in the FMCG sector and is especially important for products with limited shelf life, such as food. Waste reduction and cost reduction can provide a competitive advantage in the market. Excess inventory is avoided to reduce waste, but safety stock is included to prevent unexpected situations.

Optimizing routes is critical in outbound logistics to promote supply chain sustainability and reduce environmental impact. The optimization process can aid in lowering transportation fuel consumption, resulting in a lower carbon footprint for the supply chain. The supply chain can effectively manage costs while minimizing its environmental impact with a well-planned routing strategy. (All things Supply Chain, 2020)

Profit & Supply chain management

Businesses are constantly looking for ways to cut costs in the logistics industry due to the high cost of transportation. Artificial intelligence and computer programs have recently been developed to assist in the efficient planning of truck loading and routing. Companies take various approaches to this issue, with each having its own strategy for reducing costs in the transportation of goods and materials. (All things Supply Chain, 2020)

Examples of balanced companies

In this section, will be presented companies that are actively seeking solutions to improve logistics processes while taking responsibility for their environmental impact.

Obsah obrázku diagram

Popis byl vytvořen automatickyEFITRANSA is a logistics company that specializes in environmentally friendly solutions. One of its flagship products is the CARGO and POLYVALENT trailers, which are excellent examples of how to effectively increase trailer capacity. These trailers are cleverly designed so that they are never empty. Because of their universal design, these trailers can transport a variety of items such as cars and can be filled with other goods such as car parts on the return trip. This novel solution has successfully reduced CO2 emissions by up to 25% on an annual basis. (Efitransa, 2023)

Figure 10: The Polyvalent truck combines the loading of cargo and vehicles in the same truck. (Efitransa, 2023)

DHL uses virtual material loading in its operations, a program that optimizes truck loading to ensure 100% space utilization in accordance with efficiency requirements, such as unloading locations. This approach offers a significant advantage in terms of space savings, allowing trucks to make a single trip instead of two, resulting in lower fuel consumption. The virtual loading program is also beneficial to warehouse employees and drivers. (DHL, 2023)

Wise balance approach

The application of Sustainable Development in logistics management poses significant challenges. When the concept of sustainability is divided into three pillars, there is a reduction that emphasizes competing interests rather than the link between the pillars. As a result, it is critical to identify the goals of three distinct sustainable dimensions and thus improve the performance of sustainable logistics management in order to reduce basic resource consumption. Despite the fact that there are numerous ways to implement balance in businesses, it can be concluded that businesses are still looking for new and improved solutions, and this topic is supported for them.

## Automotive stakeholder description

Stakeholders definition

Stakeholders are a group of people or organization that affects the decision making and actions of a company. One of the most important stakeholders are the customers. They are important because they are the people who use the product. Customer preferences can influence the development of the products and marketing strategies. Another important stakeholder group is the employees. They are important to the success of companies because they contribute to quality, innovation, and efficiency. Investors are also important stakeholders. They provide capital to companies and expect a profit for their investment. Companies need to build investor confidence by maintaining financial stability and managing risks. Also, suppliers, government, community, and media are important stakeholders.

To facilitate stakeholder dialogue, ŠKODA AUTO provides transparent and complete information about its activities. The company focuses on maintaining a continuous dialogue with its employees, suppliers, investors and shareholders, customers, media, and other stakeholders to clearly determine the opinions of all stakeholders. This is how they can have good knowledge for the demands of the stakeholders. (ŠKODA AUTO, 2018)

Kuva, joka sisältää kohteen diagrammi

Kuvaus luotu automaattisesti

Figure 11. Sustainable value chain

Stakeholder examples

Stakeholders are usually divided into two categories. Internal- and external stakeholders. Internal stakeholders are for example the employees, owners, and managers. External stakeholders are for example customers, suppliers, government, and communities. Some stakeholders like investors can be in both categories depending on the company.

Kuva, joka sisältää kohteen pöytä

Kuvaus luotu automaattisesti

Figure 12. Stakeholder examples

Internal stakeholders

Internal stakeholders have a direct stake in the company such as employees. (Investopedia, 2023) They work for the company to earn money support themselves and have safety. Employees are important stakeholders and companies need to communicate with them often to hear their opinion and to make them a positive work environment to support growth and development. Owners are also internal stakeholders and have most likely the biggest stake in the company.

External stakeholders

External stakeholders outside of the organization but are impacted by actions and decisions. External stakeholders want the company to perform well. Customer is typically the most important external stakeholder because it is affected the most. If a company provides the customer a good quality product, it creates a positive effect on the stakeholders. They also advertise the product to their friends and family and increase sales. Suppliers are important stakeholders in automotive industry. They provide parts, materials, and components to manufacturers and play a critical role in the quality of the end product.

Governments and competitors can be considered major stakeholders in a business. Specially in automotive industry. Governments collect tax money from the company and from all the people it employs. They also set regulations and standards for vehicle safety and polluting. Competitors compete for the same market. They influence the industry with their own innovations and marketing strategies. Customers might prefer companies whos cars consume less fuel or are electric. Also they care about if the car is made with recycled materials.

Competing stakeholders

Sometimes stakeholders have competing interests. The more stakeholders there are, the more chances there are that they have competing interests. For example, the owners will most likely try to maximize the companies profits. Also, the investors. One way to maximize the profits is to reduce employee’s salary. The employees won’t like reduced salary, and neither would the government, because they would get less tax money. The most successful companies are the ones that can balance all the stakeholders. (Investopedia, 2023)

Sustainable thinking with stakeholders

Stakeholders are a big part of sustainable thinking, because they can impact or be impacted by it. It can have positive impact on stakeholders. It might attract customers and investors who prioritize environmentally friendly businesses. It can also impact suppliers as they can be asked to start thinking about sustainability more by their customers. It can also have impact on local communities if for example company starts helping the community with the sustainability and reducing environmental polluting.

It can also have negative impact on stakeholders. Sustainability can sometimes rise the cost of parts and components. Company can then rise the cost of the end product or reduce their profits. This could scare away some customers who doesn’t care so much about sustainable products and only look at the price tag. Sustainable recources can also be harder to get.

Kuva, joka sisältää kohteen diagrammi

Kuvaus luotu automaattisesti

Figure 13. Sustainable development strategy

# Technological innovations

The automotive industry is one of the most important industries for the European economy. As regulations in sustainability are becoming stricter and will become even more strict and people are demanding for a change, companies are looking for new innovations in the automotive industry to help make the process more sustainable and greener. One example of an innovation that would make the industry more sustainable is 3D printing. Today 3D printing technology is so advanced you could print almost anything. (Ad Van Wijk & Iris Van Wijk, 3D printing technologies, page.20.)

## 3D printing

3D printing is a process of making a physical object from 3D model by melting material into thin layers. 3D printing is usually done with plastic but can also be done with other materials with bigger and more expensive equipment. Nowadays we have 3D printers that print with concrete and metal.

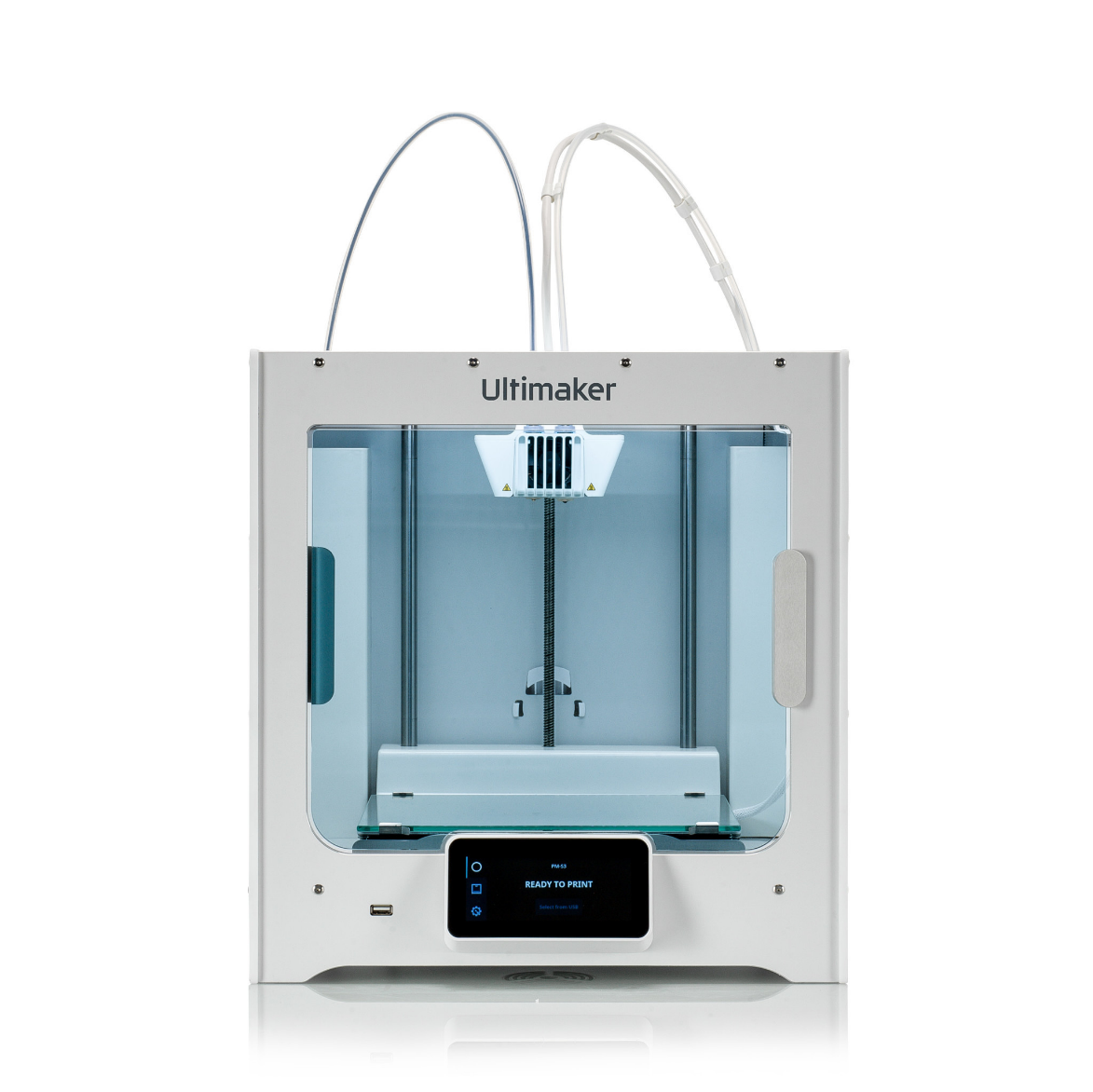
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Automatisch generierte Beschreibung

*Figure 14. 3D printing technologies. Source: (Ad Van Wijk & Iris Van Wijk)*

To print out a product, the 3D model of the piece needs to be converted in a software to a form the printer understands which is most likely G-code. The 3D model can be designed in CAD or it can be scanned from an existing piece with a3D scanner. In the software you can also change the precision of the print and structure of the filling for example honeycomb.

First when 3D printing became possible it was used in automotive industry to create prototypes for vehicles and see how they fit. But as times has progressed and 3D printing technology has evolved and more technologies have started benefiting automotive companies. Now 3D printing can print so quality products they can be used in the final product rather than just print out prototypes. (Tom Horton, 2020)



*Figure 15. Regular 3D printer*

Benefits

Supply chain

3D printing would make the automotive industry more sustainable. Now parts are produced at factories around the country or even around the world. Then they are shipped or transported to a factory to be made into products. With 3D printing we could print out some required parts at the spot skipping the transportation part of the supply chain resulting in significant greenhouse gas emissions. Or maybe the supplier could 3D print the parts with recycled materials. (Clean future, 2023)

3DP also reduces waste. Normal manufacturing methods like machining generate a significant amount of waste. Mills or lathes remove material from blocks to create the product but 3D printing doesn’t remove material, it adds it layer by layer until the piece is done so minimal amount of material is used.

With 3D printing companies can also produce parts more quickly and easily. It can reduce lead times and improve the efficiency of the supply chain. This can help reduce the need for large storages and lower the risk of stock running out.

Overall 3D printing has a large impact on the automotive industry in terms of improved efficiency and flexibility in the manufacturing process and also in terms of sustainability in the supply chain and as the 3D printing technology continues to improve. We will most likely see even more applications of 3D printing in the industry, further improving environmental impact and overall sustainability.

Custom parts

The benefits would also include easily modified custom parts. Rather than CNC machining a prototype or custom part it would take much less time to get the 3D printed product to test.

Environmental

3DP has the potential to significantly reduce a feedstock's lifecycle energy needs and CO2 emissions. Production-related energy needs and CO2 emissions are reduced through shortened processes and simpler production, and indirect material-related energy needs are reduced through more efficient use of resources. Reeves case studies of aircraft structural components have shown that production-related energy needs and CO2 emissions can be reduced by up to 75%. 3DP-induced lightweight design further increases usage savings, totaling 63% savings in energy and CO2 emissions over the entire product lifecycle. 3D printing plants could run with solar or wind power and take less space than regular factories. This shows that 3DP has great environmental potential.

Disadvantge

3D technology in the automotive industry still poses some challenges. Because it is not yet used very much, the 3D technology materials will have high acquisition costs and technological limitations in production equipment. Due to innovation, there will be regular changes in 3D software programs, sometimes necessitating the purchase of new printing technology.

Area of application

At the moment, vents and dashboards have already been made with 3DP in someé vehicles. Due to the continuous improvements in 3DP and material technology, it will be possible to use 3DP parts in cars on a large scale in the future. Certain future applications may include engine components and suspension springs. 3DP is used as primary production technology for electric cars. Engineers have been able to implement 50 3DP components in the URBEE-2.

Components such as body panels produced using 3DP still need to be joined together using traditional methods such as mechanical joining. Low-cost additive manufacturing processes that can produce large metal parts have been explored and significant progress has been made.

## 3D metal printing

3D metal printing uses lasers to melt metal powder to desired shape. metal printing is also possible in making car parts, but not to produce the complete car yet. Mostly this is used to create prototypes before production. Through 3D metal printing, it is possible for engineers to create a functional prototype from their digital design without any manufacturing steps. It can also be used to make rapid prototypes of tools and spare parts. This saves time and money.

Benefits

3D metal printing can extend the lifespan of older vehicles. Car manufacturers stop making spare parts for discontinued vehicles making it hard to repair their vehicles. 3D metal printing would allow easy manufacturing of car parts for old and rare vehicles, and they are also customizeable. It would also allow making of more complex parts with cooling channels that would be impossible with regular CNC machining.

Future possibilities

Czinger vehicles have introduced their new 21C Hypercar which has a large section of its chassis 3D printed. It also has a world-first topology optimized and 3D printed gearbox. Its chassis has a lot of topology optimized parts (Figure 16.) which would be hard and expensive to machine but with 3D printing and their patented alloy materials it is possible. (Czinger, 2021) This proves that maybe in the near future factories will use more and more 3D printing technology.

Ein Bild, das Motorrad, draußen, halten, Motor enthält.

Automatisch generierte Beschreibung

Figure 16. Czinger 21C Suspension control arm (Source: Czinger)

## Automatic guided vehicles

Automatic guided vehicles (AGV) are load carriers that travel on the floor of the factory by itself. It doesn’t need a driver. Its movement is based on a combination of software and sensor-based movement. Because they move on the path they are programmed and have sensors that make the movement safe for others, they provide safe movement of loads.

Area of application

Usually, AGVs are used to transport material consistently to place where its needed. For example, when we were visiting Skoda auto we saw multiple AGVs transporting battery casings safely from warehouse to working station. Normally they would have to have many employees to transport the materials but now the AGVs do that automatically and safe.



Figure 17. AGVs (Source: marineinsight)

Benefits

Starting the use of AGVs can replace employees which is what the company wants but not necessarily good for all stakeholders. On the other hand the replaced employees can be used to monitor and repair or maintain the AGVs. The use of AGVs brings balance to the automation in the line. They are flexible, meaning that their routes or work processes can be easily changed or fixed. They cost less to operate and don’t need coffee breaks. They simply drive themselves to charging area when the battery is low or they are not needed. The AGVs also improve safety. They always follow the guided path and stop if they encounter a person or a block. Also if for example the company expands, they can easily add more AGVs that are quickly possible to learn the job by programming them.

# Process Innovations

Process innovation in supply chain management refers to the implementation of new or improved processes or methods within the supply chain to enhance efficiency, reduce costs, and improve overall performance. This type of innovation can involve changes to any aspect of the supply chain, from procurement and production to distribution and delivery. Process innovation in supply chain management is aimed at improving the overall performance of the supply chain by enhancing its speed, accuracy, responsiveness, and cost-effectiveness, ultimately leading to increased customer satisfaction and competitive advantage.

## Lean Management

Lean management is a process innovation that has been widely adopted in automotive supply chain management. It is a philosophy that focuses on eliminating waste and optimizing processes to increase efficiency and reduce costs.

Area of application

One of the core principles of lean management is the concept of value stream mapping, which involves identifying all the steps involved in delivering a product or service to the customer, and then analysing each step to determine if it adds value. Any step that does not add value is considered waste and should be eliminated or improved. (TXM, 2023)



Figure 17: The 7 Types of Waste

(Igus, 2019)

Another key principle of lean management is continuous improvement, which also involves constantly seeking out ways to improve processes and eliminate waste. This can be achieved through the use of tools such as kaizen, which is a Japanese term that means "continuous improvement." (Teran, 2019)

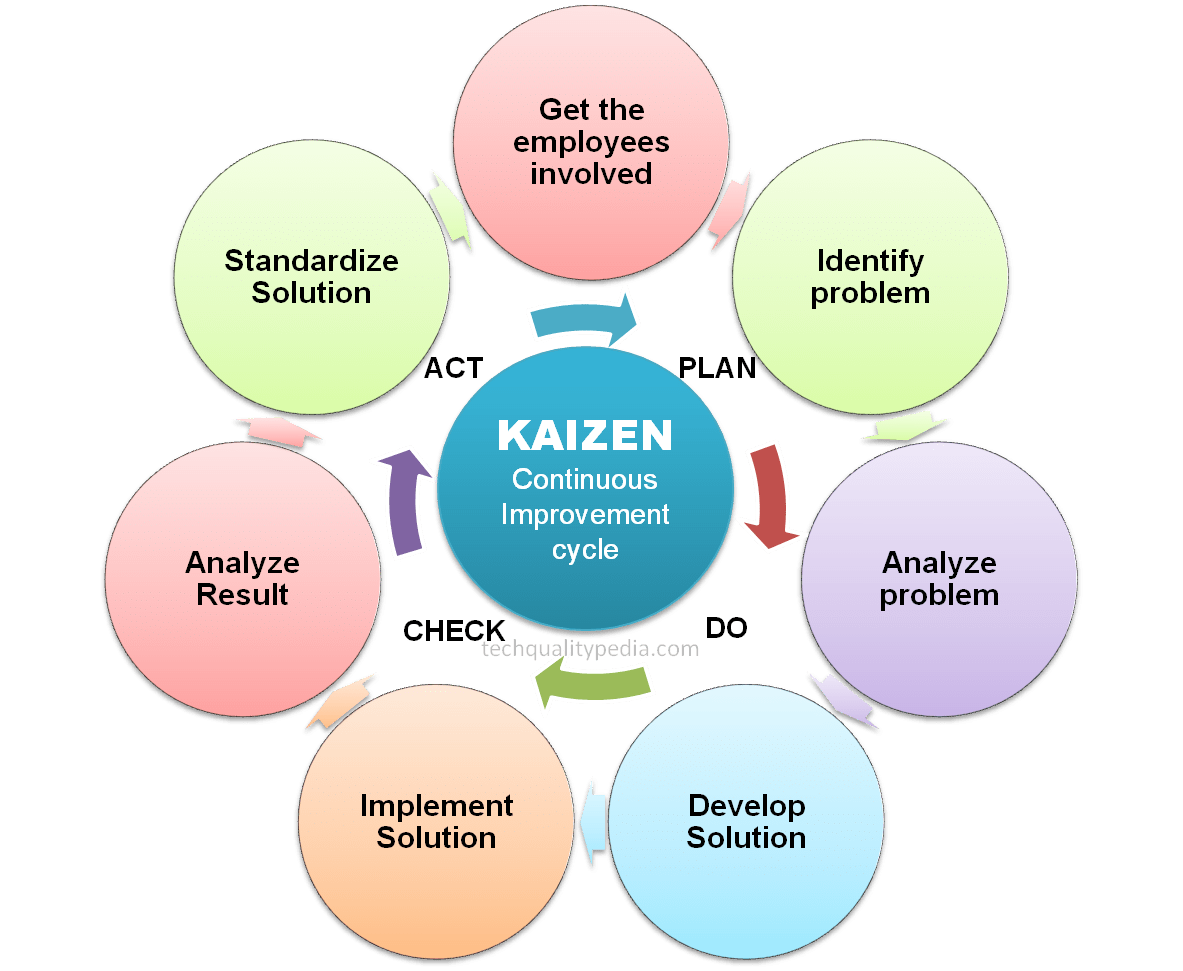


Figure 18: Kaizen

(Techquality, 2021)

Benefits

To summon up, lean management is an effective process innovation in automotive supply chain management, as it enables companies to achieve greater efficiency, reduce costs and waste and improve quality, while also fostering a culture of continuous improvement. By adopting lean principles, automotive companies can better meet the demands of customers and remain competitive in the industry. (TXM, 2023)

## System thinking and collaboration planning

Systems thinking and collaborative planning in automotive supply chain management refer to the practice of sharing information and collaborating within one's own organization and among all parties involved in the supply chain (from suppliers to manufacturers to dealers) to achieve Optimal planning and performance.

Area of application

Especially the systems thinking within the organisation is still outdated in many places. This means that the different departments in a company work independently and do not all function together as a big whole. (1) Especially nowadays, internal collaboration that responds to the challenges of the environment and the expectations of stakeholders is becoming more and more important to ensure the survival of the organisation. Thus, a company should always start with an analysis of consumer expectations and demands before deciding which technologies and processes to use. “You have got to start with customer experience and work back toward the technology – not the other way around.“ – Steve Jobs. Customer experience means the systematic consideration of external environment described within Wholeness Systems Thinking. (2) (Supplytech, 2020) (Goehring, 2017)

(1)

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Automatisch generierte Beschreibung

Figure 19: Current Status Management of disconnected systems

(2)

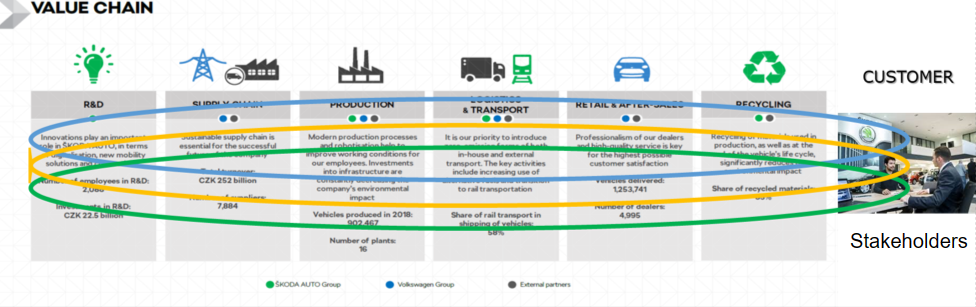


Figure 20: management of interconnected systems based on External environment

One example of collaborative planning in automotive supply chain management is the use of demand forecasting. By sharing data and collaborating with suppliers, manufacturers can get a better understanding of the demand for their products, allowing them to adjust production schedules accordingly and avoid excess inventory or stockouts. In the automotive industry, collaborative planning is essential due to the complexity of the supply chain and the high level of interdependence between suppliers and manufacturers. By collaborating, all parties can gain visibility into the entire supply chain, identify potential issues early on, and work together to develop solutions.

Benefits

In conclusion, systems thinking and collaborative planning in automotive supply chain management can improve efficiency, reduce costs, and increase customer satisfaction by ensuring that all parties work together to achieve common goals. (Supplytech, 2020) (Goehring, 2017)

## Agility

Agility is a process innovation in automotive supply chain management, which apply to the ability of companies to quickly adapt to changes in market and customer needs. In today's rapidly changing business environment, agility is becoming increasingly important for automotive companies to remain competitive.

Area of application

In the automotive industry, agility can be achieved through a variety of methods, such as flexible manufacturing systems, cross-functional teams, and advanced planning and scheduling software. By implementing these tools and practices, companies can quickly respond to changes in demand, shift production to meet changing customer needs, and reduce lead times.

Ein Bild, das Text, Mobiltelefon, Screenshot enthält.

Automatisch generierte Beschreibung

Figure 21: Agility and resilience by type

(Heinrich and Li, 2022)

Benefits

One of the key benefits of agility in automotive supply chain management is the ability to reduce inventory levels. By being able to quickly adjust production schedules in response to changing demand, companies can reduce the need for large inventory stockpiles, which can be expensive and tie up valuable resources. Another benefit of agility is the ability to improve customer service. By being able to quickly respond to changing customer needs, companies can better meet the demands of their customers and provide a higher level of service, which can lead to increased customer loyalty and repeat business.

In summary, agility is an effective process innovation in automotive supply chain management, as it enables companies to better respond to changing market conditions, reduce costs, and improve customer service. By adopting agile practices, automotive companies can remain competitive in an industry that is constantly evolving. (Heinrich and Li, 2022)

## Closed loop supply chain

A closed loop supply chain is a process innovation that involves the integration of the forward and reverse flows of materials, information, and money in a supply chain. In the automotive industry, a closed loop supply chain refers to the process of managing the end-of-life products and the recovery of the parts and materials for reuse or recycling. Traditionally, the automotive supply chain has been a linear, one-way process, where products are manufactured, sold, and eventually discarded as waste. However, with the increasing focus on sustainability and environmental responsibility, automotive companies are adopting a closed loop supply chain to reduce waste and increase the recovery of materials.

Area of application

In a closed loop supply chain for the automotive industry, the process starts with the design of the products, which must be made with materials that can be recovered and reused or recycled at the end of their life. The products are then manufactured and sold to customers, who use them until they reach the end of their life. At this point, the products are recovered and sent back to the manufacturer, where they are disassembled, and the parts and materials are sorted for reuse or recycling. The recovered materials are then used to create new products, closing the loop and reducing waste.

Benefits

The closed loop supply chain process in the automotive industry offers several benefits, including reduced waste, improved sustainability, and increased cost savings. It also helps companies to comply with environmental regulations and meet the increasing demand for sustainable products. A closed loop supply chain is a valuable process innovation in the automotive industry that helps companies to improve their environmental performance, reduce waste, and create a more sustainable future. (Revolutionized, 2022) (Radiant, 2022)

## Risk management

Risk management, as a process innovation in automotive supply chain management, refers to the systematic identification, assessment and mitigation of risks that may affect the supply chain. This involves developing strategies to mitigate and manage risks that may arise at different stages of the supply chain, from raw material procurement to eventual vehicle delivery to customers. (Deloitte, 2022)

Area of application

An example of risk management as an automotive supply chain management process innovation is the implementation of a risk management framework that integrates risk management into the decision-making process. This includes identifying potential risks, assessing their potential impact on the supply chain, and developing mitigation strategies to minimize their impact. Risk management as process innovation also involves collaboration and communication with suppliers and other stakeholders in the supply chain to identify and address potential risks. This includes regular communication with suppliers to identify potential risks in the supply chain and develop contingency plans for potential disruptions. (Deloitte, 2022)

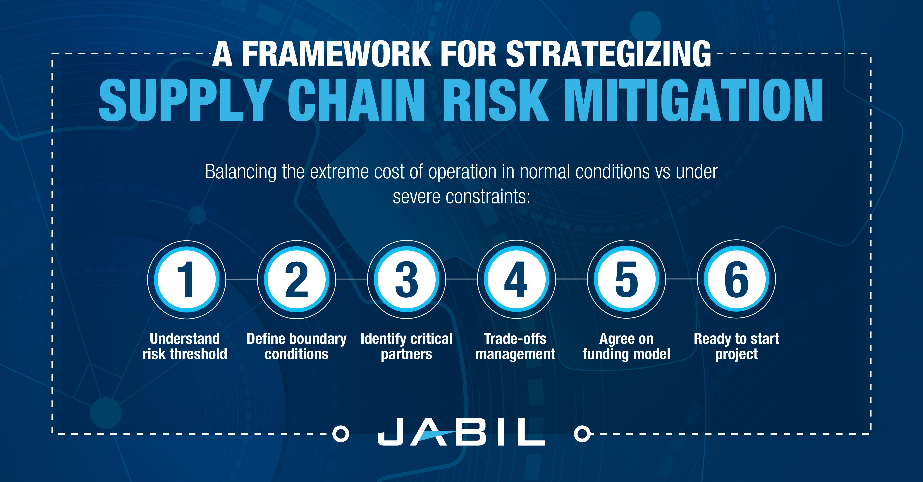


Figure 22: Supply chain risk mitigation

(Wee, 2023)

Benefits

To summon up, risk management in automotive supply chain management involves systematically identifying, assessing and mitigating risks throughout the supply chain. This helps minimize the impact of potential disruptions and increases supply chain resilience, ultimately increasing efficiency and reducing costs.

## Digitalization

Digitalization management as a process innovation in automotive supply chain management refers to the use of digital technologies to improve the efficiency and effectiveness of supply chain operations. (McKinsey, 2016)

Area of application

A prime example is the use of digital platforms to improve collaboration and communication between stakeholders in the supply chain. This includes the use of cloud-based platforms to share information and collaborate on projects, as well as the use of mobile devices and applications to facilitate communication and coordination between suppliers, manufacturers, and logistics providers. Digitalization management also involves the integration of digital technologies into manufacturing processes to improve efficiency and reduce waste. (Part: Technology innovations)

It can be said that digital management, as a process innovation for automotive supply chain management, involves integrating digital technologies and tools throughout the supply chain to increase efficiency, improve collaboration, and reduce waste. This helps to improve overall supply chain efficiency and competitiveness, thereby increasing customer satisfaction and profitability. (McKinsey, 2016) (Hermes, 2023)

# Implementation of knowledge in practice

The whole issue can be illustrated using simple logistic games. These interactive games simulate complex logistics processes, and for these reasons it is appropriate to include them in the teaching of logistics, to approach the problem.

## Beergame

Xander

## Paper planes factory

The airplane factory game simulates how important it is to make maximum use of all available capacities. The efficiency of the production line is simulated here, as well as the fact that it is important to have things planned and in order.

Push system – Round 1

Obsah obrázku bílá tabule

Popis byl vytvořen automatickyIn the first round, our factory had 7 employees, namely two warehouse workers and 5 aircraft builders. The production hall was chaotic, the workstations were scattered and did not connect to each other in any way. Each worker was to produce as many airplanes as possible in 3 minutes, with the factory's goal of producing 14 airplanes in 3 minutes. The result of this round was the failure to meet the production plan. The production line was able to produce 4 quality airplanes and 4 scraps.

Figure 23 - Push system (first round)

Push system – Round 2

In the second round, our factory still had 7 employees, namely two warehouse workers and 5 airplanes builders. Each builder specialized in one specific activity, but the production line still did not connect with each other, so warehouse workers could not efficiently transport semi-finished products between individual workers. At the same time, 9 airplanes were being developed at the sites. The result of this round was failure to meet the production plan (14 airplanes in 3 min.). Only 5 quality airplanes were produced.

Obsah obrázku bílá tabule

Popis byl vytvořen automaticky

Figure 24 - Push system (second round)

Push system – Round 3

Obsah obrázku bílá tabule

Popis byl vytvořen automatickyIn the third round, 2 employees were laid off, leaving only 5 aircraft builders in the factory. Each builder made up his part and the line was already organized, so the positions followed each other. At the same time, the warehouse with materials and finished products was included in the production line. This round the goal was to make 10 planes in 3 minutes and the goal was not met. 7 high-quality one-shot planes were produced and 5 planes were developed, which, as in previous rounds, was caused by the push system.

Figure 25 - Push system (third round)

Pull system

The pull system in manufacturing is a production strategy that focuses on producing goods only when there is a demand for them. In a pull system, production is driven by customer demand, rather than by a forecast or a pre-determined schedule.

The pull system is based on the idea of Just-In-Time production, where production is aligned with the customer demand. In a pull system, the customer's demand "pulls" the production of goods from the beginning of the supply chain to the end.

To implement a pull system, a company needs to have a good understanding of its customer demand and have a flexible production process that can quickly adapt to changes in demand. In a pull system, each step of the manufacturing process is designed to pull only the necessary materials and resources needed for the next step, based on the demand of the customer.

The pull system in manufacturing has several benefits that make it an attractive approach for many companies. Here are some of the key benefits of the pull system:

* Reduced Waste: By producing goods only when there is a demand for them, the pull system reduces waste in the form of excess inventory, overproduction, and unused resources. This can help companies save costs and improve efficiency.
* Improved Flexibility: The pull system allows companies to quickly adjust production to changes in customer demand. This makes it easier for companies to respond to market changes and stay competitive.
* Better Quality: The pull system focuses on producing only what is needed, which can lead to better quality products as there is less chance of defects or errors occurring due to overproduction.
* Reduced Lead Times: By aligning production with customer demand, the pull system can help reduce lead times for delivering products to customers. This can improve customer satisfaction and help companies win more business.
* Cost Savings: By reducing waste, improving efficiency, and responding to changes in demand, the pull system can help companies save costs and improve their bottom line.

To introduce a pull system in production, a company needs to prepare and consider several key factors. These include:

* Understand the Customer Demand: The pull system is based on producing goods only when there is customer demand. Therefore, a company needs to have a good understanding of its customer demand patterns to plan its production accordingly.
* Create a Flexible Manufacturing Process: The pull system requires a flexible and lean manufacturing process that can quickly adapt to changes in demand. A company needs to have a process that is optimized for producing goods quickly and efficiently.
* Implement a Reliable Supply Chain: The pull system requires a reliable supply chain that can quickly deliver the required materials and components needed for production. Therefore, a company needs to have a supply chain that is optimized for speed, reliability, and flexibility.
* Train the Workforce: The pull system requires a workforce that understands the principles and methods of the pull system. Therefore, a company needs to provide training to its employees to ensure that they understand the new process and can operate efficiently in this new environment.
* Implement a System for Monitoring and Controlling Production: To ensure that the pull system is working efficiently, a company needs to implement a system for monitoring and controlling production. This system should track customer demand, inventory levels, production output, and other key performance indicators.
* Establish Communication Channels: Effective communication between different departments and teams is essential for the success of the pull system. Therefore, a company needs to establish communication channels to ensure that everyone is aligned with the production goals and can quickly respond to changes in demand.

Overall, the pull system is a customer-focused approach to manufacturing that can help companies improve their efficiency, reduce waste, and enhance their customer satisfaction.

# Conclusion

In conclusion, technological and process innovations in sustainable automotive supply chain management are increasingly important in today's world compared to the past. This is due to the growing awareness of the impact of the automotive industry on the environment, as well as the need to improve efficiency and reduce costs. Companies that fail to embrace these innovations may struggle to survive in the current business environment.

However, companies that use technological and process innovations in the right way can gain a competitive advantage over their rivals. By investing in sustainable supply chain practices, companies can reduce costs, improve efficiency, and enhance their reputation. Furthermore, by adopting technological and process innovations, the automotive supply chain can improve its agility, flexibility, and responsiveness to these changes. In addition, these practices can help companies meet the changing expectations of consumers and regulators.

Overall, the automotive industry needs to embrace technological and process innovations in sustainable supply chain management in order to thrive in the current environment. By doing so, companies can not only survive, but also gain a competitive edge in a rapidly changing market.

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**List of figures**

Figure 1: WST pyramid

Figure 2: Optimal performance

Figure 3: Value dilivery system

Figure 4: Unpredictable events

Figure 5: Definition of VUCA

Figure 6: Home Office trend due Covid 19

Figure 7: Increasing popularity of electric cars

Figure 8: VUCA Understanding Approach

Figure 9: 3 P’s & TBL

Figure 10: The Polyvalent truck combines the loading of cargo and vehicles in the same truck.

Figure 11: Sustainable value chain

Figure 12: Stakeholder examples

Figure 13: Sustainable development strategy

Figure 14: 3D printing technologies

Figure 15: Regular 3D printer

Figure 16: Czinger 21C suspension control arm

Figure 17: The 7 Ways of waste

Figure 18: Kaizen

Figure 19: Current Status Management of disconnected systems

Figure 20: management of interconnected systems based on External environment

Figure 21: Agility and resilience by type

Figure 22: Supply chain risk mitigation

Figure 23: Push system (first round)

Figure 24: Push system (second round)

Figure 25: Push system (third round)

**Attachment**

**Questions & Answers – Kahoot**

**Systems Thinking in Wholeness ​**

1. What system thinking ensures that you do not get overproduction?

* Reductionism system thinking
* Anti-waste system thinking
* Wholeness system thinking
* #nooverproduction system thinking

1. What is the goal of wholeness system thinking?

* Maximum profit
* Optimal cost
* Overproduction
* Underproduction

1. Is demand chain management important for wholeness system thinking?

* Yes
* No

1. The relationship between system elements are not important to the performance of the system as a whole.

* Yes
* No

1. What is the second phase of the value delivery system?

* provide the value
* choose the value
* communicate the value
* change the value

1. Wholesomeness synthesis consist of?

* identification of the higher system
* Understanding the higher system
* Identifying the target of the system under investigation in the higher system
* all of them

**VUCA Environment in Automotive ​**

1. VUCA is a acronym that stands for...

* - Violin, ukulele, clarinet and accordion
* - Volume, uncertainty, complex and agility
* - Volatility, uncertainty, complexity and ambiguity
* - Visibility, utility, completion and anonymity

1. Ambiguity refers to the instability of the environment, where conditions change frequently and often rapidly.

- True

- False

1. Covid 19 can be discribed as on of the most resent real-life examples of a VUCA World.

* True
* False

1. What impact does the VUCA environment have on the automotive industry?

* The VUCA environment has no impact.
* Processes and products must become more flexible.
* There should only be a focus on long-term planning.
* The car industry is not affected by the VUCA environment.

1. By understanding and actively acting in the VUCA world, not only can the associated risks be eliminated, but advantages over competitors can be created.

* True
* False

1. “Changes in government regulations” counts as…

* Volatility
* Uncertainty
* Complexity
* Ambiguity

**Sustainable tripple bottom line wise balance examples outside automotive ​**

1. The concept of triple bottom line mainstreams the idea of sustainability as including…………..

* People, Profit, Planet
* People, Profit, Cars
* People, Profit, Planes
* Planet, Technology, Comunication

1. Shared Value concept by Michel Porter is understood as a business strategy where social needs and business objectives intersect .

* Yes
* No

1. According to which goals we can achieve a sustainable balance in Supply chain management?

* SMART
* STUPID
* STAR
* SKODA

1. How we can increase profit and reduce cost in the supply chain?

* Efficient planning of truck loading and routing
* Drive with empty trucks.
* Using a lot of packing material
* Confucing trucks route

1. If companies want to be environmentally friendly and don't want to waste resources, what method should they adopt?

* JIT
* FIT
* HIT
* None of the above

1. Does the Shared Value Concept by Michael Porter support CSR?

* Yes
* No

**Automotive stakeholders descriptions**

1. A group or organization that affects the dicision making and actions of a company are called...

* Snakeholders
* Stakeholders
* Stealholders
* Snackholder

1. Which of the following is not an important stakeholder in the automotive industry?

* Customer
* Employee
* Supplier
* Benni

1. What are the divided categories of a stakeholder?

* Internal and external
* Hel and heaven
* Happy and sad
* Rich and poor

1. The negative impact on stakeholder is when they don’t care so much about sustainable products.

* Yes
* No

1. Investiors are important stakeholders.

* yes
* no

1. Which of these is best way to balance stakeholders

* Don’t tell them anything
* Prioritize open and transparent communication, and implement sustainable manufacturing prosecces
* Give them free t-shirts
* Host giveaways