Master Thesis

Agile approach in supply chain management

Study programme: N0413A050030 International Management
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Master Thesis Assignment Form

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Anotace

Práce je zaměřena na dvě znalostní oblasti: Řízení dodavatelského řetězce a agilní řízení. Aby bylo možné lépe vysvětlit souvislost mezi těmito dvěma tématy je nejprve teorie rozdělena a nakonec jsou témata propojena závěrečnou teoretickou kapitolou. Praktická část práce je zaměřena na firmu. Za účelem prokázání účinnosti strategie řízení dodavatelského řetězce je vytvořena případová studie. Tato případová studie je provedena na logistickém oddělení, aby došlo k co nejlepšímu vhledu do fungování strategie dodavatelského řetězce. Navíc je vytvořena matice rizik a logistická kvalita je vysvětlena s důrazem na dodavatele a IT nástroje. Dále jsou v posledních dvou podkapitolách představeny nové a aktuálně používané dva procesy, jsou vysvětleny, upraveny a je na ně aplikována agilní metodika. Nakonec je uvedeno shrnutí práce spolu se shrnutím hlavních závěru.

Klíčová slova

Agilní management, agilní transformace, management, logistická kvalita, matice rizik, dodavatelský řetězec.

Agile approach in supply chain management

Annotation

The thesis is focused on two knowledge fields: Supply chain management and agile management. To better explain the connection among these two topics, theory introduce both of them firstly extra and on the end combined them together. The subsequent section of the thesis is focused on a company. In order to demonstrate the effectiveness of the supply chain management strategy, a case study is created. This case study is conducted on the logistic department in order to better demonstrate the supply chain strategy. In addition, a risk matrix and logistic quality with emphasis on suppliers and IT tools is created. Furthermore, in the last two sections of the chapter, new and currently used processes are introduced, explained, adjusted and agile methodology is applied on them. Finally, a summary of the thesis is provided, accompanied by a statement of the main outcomes

Key Words

Agile management, agile transformation, management, logistic quality, risk matrix, supply chain.

Contents

List of Figures

10

List of Tables

List of Abbreviations and Symbols

3TG	Tin, tungsten, tantalum and gold
8D	Eight disciplines
ABC	Activity based costing
AI	Artificial intelligence
ART	Agile release train
ASAP	As soon as possible
ASN	Advance shipping notice
B2B	Business to business
B2C	Business to costumer
C2C	Customer to customer
CO_2	Carbon dioxide
CSR	Corporate social responsibility
DOD	Definition of done
ERP	Enterprise resource planning
FMEA	Failure mode and effects analysis
I2D	Intralogistics to demand
IoT	Internet of things
ISO	International organization for standardization
JIT	Just in time
KPI	Key performance indicators
MTM	Methods time measurement
O2C	Order to cash
P2F	Plan to fulfil
P2P	Process to pay
PSS	Problem solving sheet

QR	Quick respond
SC	Supply chain
SCM	Supply chain management
SSL	Supplier service level
R&D	Research and development
RCA	Root causes analysis
TMC	Transport management center
TMU	Time measurement unit
TUL	Technical University of Liberec
VMI	Vendor managed inventory
WIP	Work in progress

Introduction

In today's business environment, the ability to adapt to changing circumstances is critical to the survival and success of a company. Management uses newest knowledge in order to overcome challenges and to improve company´s performance. At the beginning of the 21st century, lean management was and still is a highly popular tool. However, due to its inflexible practice, it is now considered insufficient and a new approach is required. Agile management offers new management principles, which are based on the agile methodology. The decision to use the agile methodology is mainly due to its innovative approach towards future challenges, whose occurrence is increasingly probable. The main advantages are that it enables better orientation in a rapidly changing environment, emphasises teamwork, and focuses on continuous improvement through learning.

The theoretical part focuses on explaining the knowledge of supply chain management and agile management. The task of the theory is to explain both fields, at the end of third part is going to bring them together and demonstrate a successful examples. The aim of the practical part is to study the company's supply chain and identify some space for the possible use of agile methodology. For this proposal, a case study will be created in the company. The case study methodology has been used due to its wide range of information used and its most common use for students. The case study will face two concrete problems and before that a company overview will be created. The investigation will examine the company's strategy in the context of the supply chain, with a particular focus on the purchasing and logistics departments and their activities in a more digitised business environment. The case study will provide a detailed description of the logistics specifications in the plant. The final section will present a new process and an updated version of the current process created using the agile methodology.

1 Theoretical part

For better understanding how to implement new knowledge of agile management in a SCM, it is important to get to know every part of supply chain. Essentials, strategies, and a new finding in a field of supply chain are crucial for keeping up with competitors. Second part of the theory will explain agile approach, what are the principles and tools. It is going to describe how it can be beneficial for a company. The theory is closed with an examples of a successful implementation of agile in SC.

1.1 Supply chain

Every organization is providing their product or services to their customers. To create firm's product, it is important to take all necessary inputs and to put them through operations to create outputs. Inputs include people, material, equipment, information, investment, and other resources. Operations are the sum of manufacturing, serving, transporting, selling, training and other important processes for creating the final product. Between the outputs belong goods, services, profit, wages, and waste (Waters 2003).

Supply chain can be defined as:

- Supply chain is the alignment of firms that bring products or services to market. (Lambert 1998)
- Consist of the series of activities and organization that materials move through on their journey from initial suppliers to final customers (Waters 2003).
- The material and information interchanges in the logistical process, stretching from acquisition of raw materials to delivery of finished products to the end user. All vendors, service providers and customers are linked in the supply chain (Vitasek 2013).

Next to the flow of material exist another three important flows. Information flow began with customer's order, then goes to manufacture through sales chain and distributors. From information flow firm creates demand forecast and after that, they plan their inventory levels. Value added flow starts with a supplier of raw material, they add to a value of the material the shipping costs. Material goes to manufacturer of semifinished parts or directly to manufacturer of final product. Before the product reaches the distributor, the production costs are added to the value of the product. Final customer pays at the end of the flow for distribution cost and profit of the sales chain. The fourth

flow is money flow, and it arises at customer and ends by supplier of raw material (Lochmannová 2022).
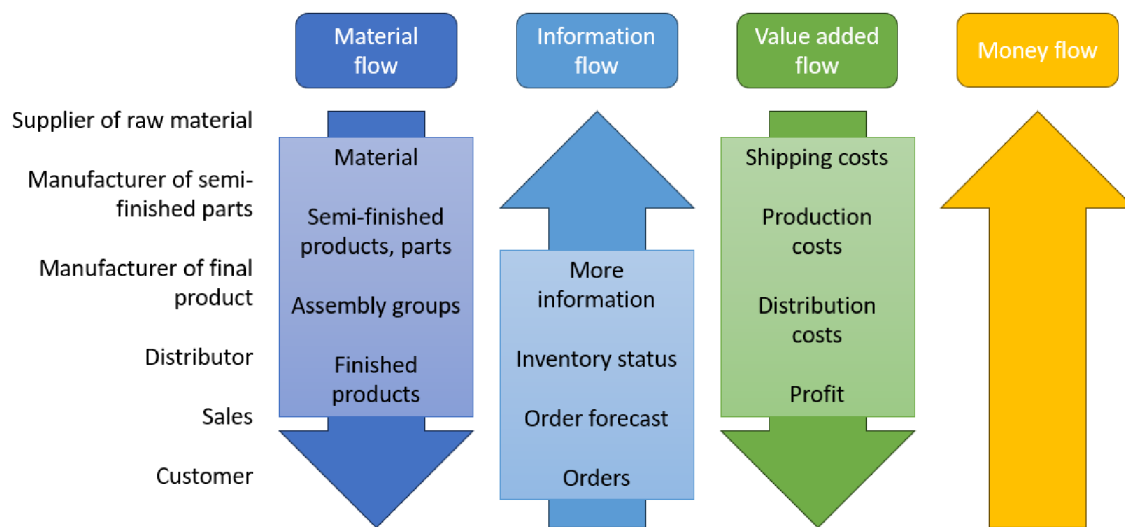
Figure 1: Flows
Resource: Own processing according to Lochmannová (2022)

On the first look it can appear that participants of SC can be easily divided into companies and customers. But companies moreover are suppliers, service provides (they supply services like logistic, finance, marketing, and information technology), producers, distributors, wholesalers, retailer, and at the same time they are costumer of someone else. A final consumer of a product is an end customer (Hugos 2018). The members of SC can be split into:

- Producer= can be an organisation which produce a raw material (like an oil, minerals or cut timber) or finished goods. Product can also be intangible items such as film, software, or designs. Among services belong surgery, teaching, hair styling and much more.
- Distributor= is a link between the producers and the customers. They are usually the answer on when and where customer receive the products. They often sell to other businesses in larger quantities. For distributors is typical to take an ownership of significant inventories of products that they purchase from manufactures and sell it to consumers. An additional activity includes product promotion, sales, inventory management, warehouse operations, product transportation. Furthermore, it involves customer service and post-sales service. Some wholesales can negotiate trade and never took an ownership of that product.
- Retailer= have stock inventory and sell the product in small quantities to the general public. They deeply inspect the preferences and demands of the final customer. To motive the customer to purchase, they use a mix of price, product selection, service, and convenience.

- Customer= is a person or an organization that buy and uses the product.

- Service provider= is a set of companies, that provides a special expertise and skills focus on a particular activity needed by a SC. Part of those organizations focus on providing transportation and warehousing services; some focuses on financial services like providing loans, doing credit analysis or collecting on past due invoices; other organization deliver market research or advertising while others offers product design, engineering services, legal services, management advices, information technology and data collection services (Hugos 2018).

Parts of SC needs to cooperate in the best feasible way to satisfy a customer demand. Every company in the supply chain must make decisions individually but also collectively regarding their steps in following areas.

- Production= What product customer wants? How much of which product and in what quantity should be produced? What are the costs? How does the quality control look?

- Inventory= How high or low should the inventory levels be? How much inventory of raw, semifinished, or finished goods should be held? What are the optimal inventory levels?

- Location= Where should facilities for production and inventory storage be located? Where is the most cost-efficient location for production and for storage? What are the best ways to deliver product to the final customer?

- Transportation= How should inventory be moved? What is the cost-efficient way? What is the fastest way to transport the goods? What are the transit times and how to compass them? Which transport mode is the best for the company?

- Information= How much data should be collected and what amount should be shared? How to storage the data (Hugos 2018)?
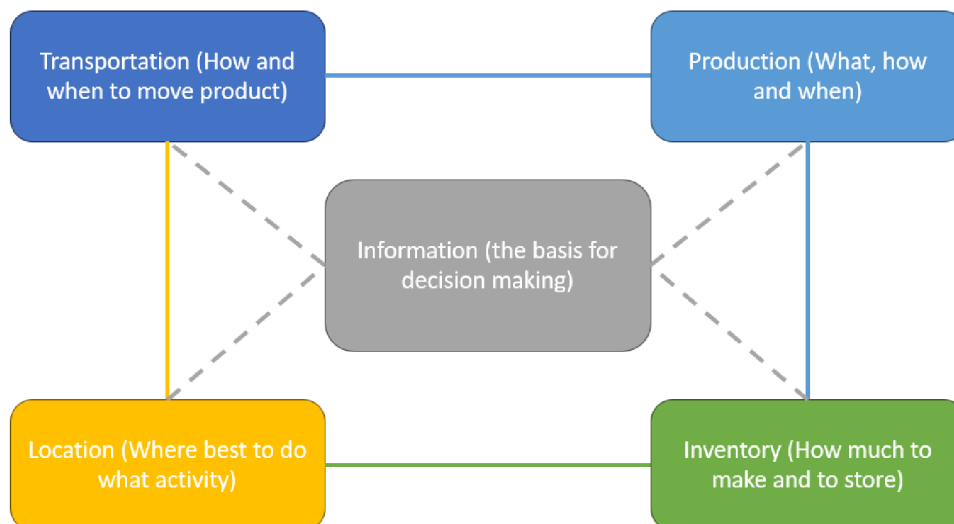
Figure 2: The five major supply chain drivers
Source: Own processing according to Hugos (2018)

The sum of decision in those areas affect the capabilities and effectiveness of the company´s performance on the market. Based on the firm's market, firms are choosing their strategies. The goal of supply chain management can be described as increasing throughput while simultaneously reducing inventory and operating expense (Hugos 2018). Strategies are linked with the structure of the companies SC. Strategy is closely described in next chapter. Structure of a SC can be divided into two types according to the enterprise's field of influence. Company chooses to move on or against the material flow. Then we talk about the vertical integration. On the other hand, when company took steps in the same industry, then it is described as a horizontal integration in SC (Lochmannová 2022).
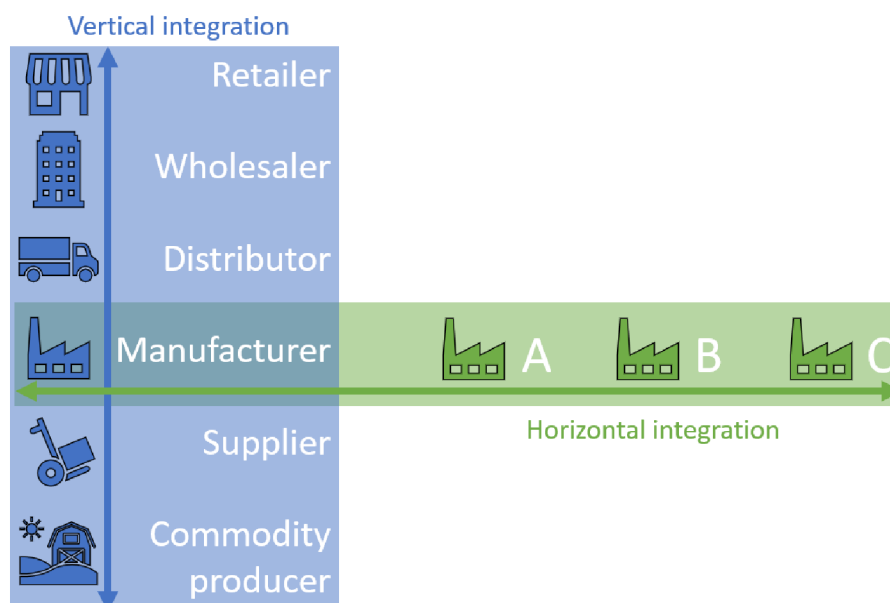
Figure 3: Vertical and horizontal integration
Source: Own processing according to (Lochmannová, 2022)

1.1.1 Supply chain management

After definition of SC, it is important to get to know how to manage it, what aspects and trends in this research field are existing. Definition of Supply Chain Management is following:

- Supply Chain Management (SCM) refers to the activities needed to provide a final product or service, which involves the coordination of activities starting with the raw materials and ending with the delivery of the final product service to the end customer. At the end of the products or asset's usable life, supply chains are also responsible for coordinating the recycling, remanufacturing (i.e., the rebuilding of a product to its original specifications using reused parts), or disposal of the final product (The World Bank 2023).

In today´s rapid changing business world, grows the importance of SC management. In present moment SCs are largely intercontinental with various value-creation stages and with several risk levels that are company-, network- and environment-related. Regardless of all mention above the customer awaits that material, products or services will be available at desired time and place, at a reasonable price when they call for it. Therefore, a close and effective cooperation between each part of a SC is a crucial for the fulfilment of the consumer´s demand. All these circumstances exert pressure on companies, thereby necessitating them to establish distinct logistical, IT, and risk management departments (Haug 2022). For better and more efficient managing is needed to have some tools and techniques, which are described in next selection.

	Cost dimension	Risk dimension
Strategic	Supply chain strategy	
	Global supply chain strategy	
	Material supply strategy	
	Make or buy analysis from outsourcing decisions	
Operational	Risk matrix	
	Actvity based costing	
	Value stream mapping	
	Method times measurement	
	A3-report	

Figure 4: Toolbox of SCM
Source: Own processing according to (Haug, 2022)

This toolbox matrix describes a need of balancing company's cost and risk dimension. For better understanding, is useful to investigate how they depend on each other. To achieve greater company performance, the company must continuously improve in the field of efficiency and effectiveness in order to positively influence their profits. Enterprise steps must be carefully considered in compliance with company's revenues, costs, assets, and environment. The expenses have a direct influence on the profit, they can come in a different form. One of the types can be described on a following example: The costs associated with personnel, equipment, material, operations, and depreciation arise from the superfluous physical manipulation, movement, and extra storage of various material types. This described example is a logistic cost. Shortage and delays are creating also additional cost, lack of „the right time at the right place" must be usually replaced with more expensive method, like an air freight. To avoid this and to reach a required service level, company invest more into logistic and that increase a service level cost. Besides the company is put before a decision, which goal is more important. Typically, conflict can appear between price and order quantity. The company purchased bigger quantity to receive quantity discount despite the fact, that they do not need that much of the material. That led to increasing storage costs and tied up capital. This example is one of many, from which the company needs to find balance between cost, risk, and performance trade-offs to secure a dependable, responsive, flexible, and resilient SC. Risk dimension gain increasingly on its importance on company´s performance. Risk areas are widely linked through whole SC, including personnel, technical, interface, political, legal, economic, and

ecologic related sectors (Haug 2022). Risk is more in details describe in chapter 1.1.2 risk management.
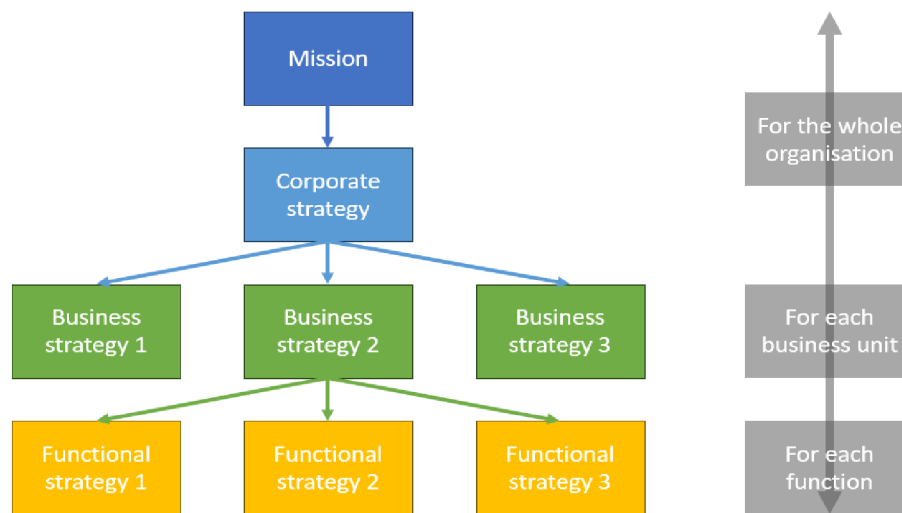
Figure 5: Types of strategic decision
Source: Own processing according to Waters (2003)

Strategic tools are deeply connected with enterprise mission, corporate, business, and functional strategy (Waters 2003). In a business world is more common to have a production and sales strategy, a **supply chain strategy** supports them in the way that the customer perceives the real value of the company. Goals of the SC strategy are short lead times, delivery reliability, flexibility, responsiveness, and high quality. Those are few of many criteria, which needs to be fulfilled to achieve a customer´s satisfaction. Way for success should be predefined in SC strategy. Strategy encompasses plans or patterns of actions connected to material flow, intending to strengthen existing order-qualifies and order-winners. This approach is designed to encourage competitiveness in alignment with a defined business strategy, ultimately facilitating the realization of long-term goals related to growth and yield (Jonsson 2008). Path of developing the strategy can be draw with Plan-Do-Check-Act method.

First step is to plan a framework and it is important to investigate business environment. Tool for that is SWOT analysis. It researches company's insides to identify the strength and weaknesses, as well as the external opportunities and threats. This helps to recognize firms performance and furthermore an area in which is action needed (Faust 2015). This analysis brings up the question like if it better to have more centralized/ decentralized production landscape, if is more useful to go with pull or push production approach, or if the purchase strategy is sufficient enough to satisfy the customer (Haug 2022). For gaining the answers is obligatory to execute four steps target-actual comparison.
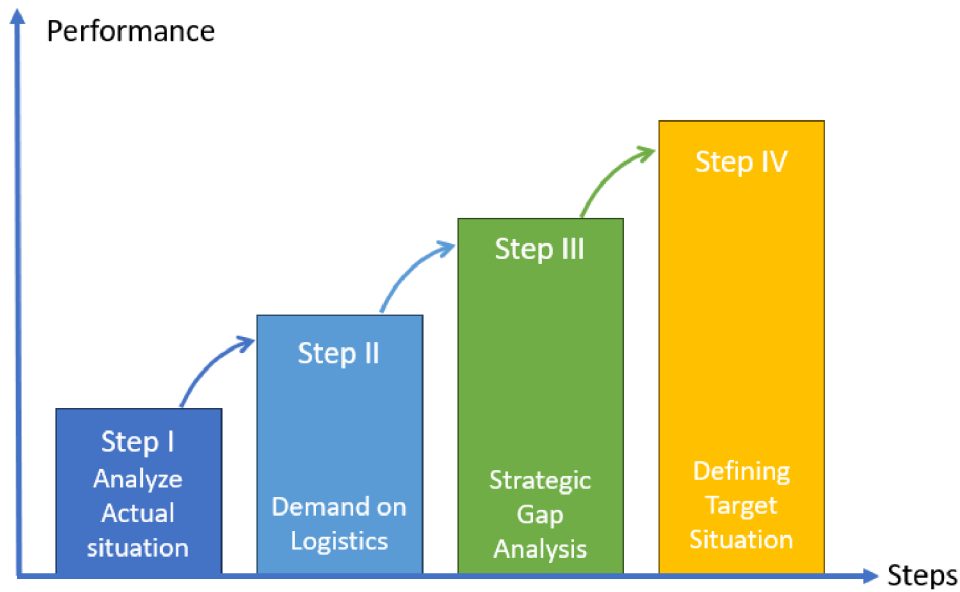
Figure 6: Step approach of target-actual comparison
Source: Own processing according to Haug (2022)

1. First phase is about comparison of the logistic department and its overall performance in the firm, its cooperation with all departments. Deep analysis of resources and skills of logistic department is conducted. KPIs from past 3-5 years about storage capacities, inventory range, lead time, throughput time, utilization of capacity, batch size in production, delivery times, conveyor technology or industrial truck fleet are used (Haug 2022).

2. Step II investigates logistic performance on the market and creates competitive analysis. Scanning is based on current data. From this analysis obtain the company information about market volume, market share and market growth per segment or possible entry barriers (Schulte 2017).

3. Strategic gap analysis results out of the comparison of the logistic performance and the company's current status of its logistic capabilities. If the comparison shows gap, then it is advised to took steps to minimized or close the gap to improve the enterprise performance (Schulte 2017).

4. Last step is to define the target situation.

Framework phase of creating the strategy is closed and on that is build the Do-phase focused on measurements and targets. To know how the plan is standing, it is necessary to create a definition of success measurements. Success factors are performance features that supports gaining an advantage over competitors (Schulte 2017). For each strategic segment, which was spot in the first phase, needs to be created its own measures and strategies, because one strategic attitude will not be suitable for every section. One of the targets is question of the cost. The finance demands must

be contemplated regarding the enterprises bottom line. It is crucial that the SC targets aligns with diverse customer requirements for specific logistic performance. Occasionally strategy must be accompanied with the further segment´s level tactics (Haug 2022). Important aspect which needs to be considered is the product life cycle. The strategy must be adjust according to the stage of product life, strategy will be different for new product in introduction phase and different for product in maturity or declining phase (Lochmannová 2022). Check phase is fill with monitoring activities like strategy roadmap, KPI cockpit, reporting system and many more. The strategy roadmap is assembled from finance, customer, process, and employee. Every part has their own predefined measurements with concrete targets and clearly explained accountabilities. Each measurement has its key role in SC strategy. On the roadmap is build up performance management system, with only few KPI, but with great expressiveness. All KPI can be put under a KPI-Cockpit, which provides clear summary about SC strategy development and its milestones. Monitoring phase is accompanied with a sophisticated risk management (Haug 2022). Last part of creating the SC strategy is act-phase. For securing the successful implementation of a newly developed strategy is key to arrange employee's commitment. That can already begin with the strategy roadmap through use of communication tools, like company information emails or newspapers (Faust 2015). Actively involved employees should be professionally trained and prepared. Also, firm's suppliers need to be informed about the strategy, so they could harmonized or adjust their current strategies, in order to fulfil end customer demand. In some point in the future, it is preferable to create a review towards strategy progress, whether it required some modification or not (Haug 2022).

Global supply chain design is another strategic tool. A global market is offering many opportunities how to reduces cost (especially in value added flow), waiting times and how to fulfil consumers demands as soon as possible. Continuous improvement and adaptation of the global SC design is crucial skill against firm's competitors. The higher numbers of markets, production sites and supplier are, the higher degree of complexity occurs. For this reason, a more advanced SC design is required (Faust 2015). To select the most suitable network is difficult and complex decision. Wide spectrum of criteria needs to be considered for example: specific market criteria, customs, local content diversity, decoupling points, economies of scale, knowledge intensity of production, material availability, equipment investment, etc. Closer example is in the figure 7 (Faust 2015). Managing global SC as a centralized system is incredibly challenging. With increasing number of locations is advised to consider question between centralised and decentralised competencies. Clear structure, definite responsibilities and network rules must be set up. According to Faust

(2015) it is important to allow decentralized freedom during realizing the completed potential of standardization at the same time.
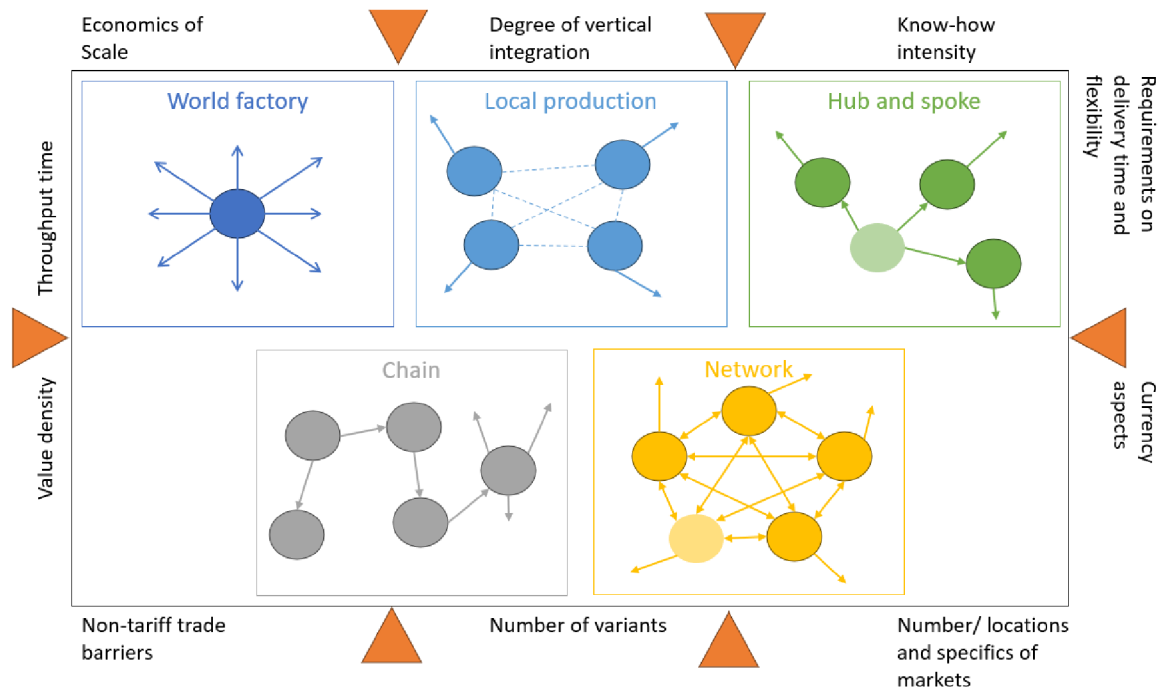
Figure 7: Network types with selected factors
Source: Own processing according to Haug (2022)

For global SC design are defined five design principles. Those principles are advised to be use by the logistics departments. But this cannot be used for every chain. For example: company focused on cost leadership will not offer short delivery times for their consumers and will prefer to have a longer response time. Principles are:

- Bundling in inventory management= The principle addresses a question about collection of future customer needs. Aggregation level can be calculated on a daily, weekly, or monthly basis. Consider that a broader scope of anticipated aggregation levels increases the risk of misallocation for example capital. Firm must decide if it advantageous to buy larger batch size and to utilize it or rather let it go. Another obstacle relates to a number of warehouses. Enterprise calculates if one warehouse pays off, rather than more and how will the additional transportation costs reflect into the final expenses. From the mention above, logistic department must find balance among inventory costs and transportation costs.
- Bundling in transport management= Condition for application of this principles is that company has regional warehouses in theirs SC network. This arrangement enables the utilization of utilized trucks with a minimally required fleet, while simultaneously delivering a superior logistics performance. Decentralized SC network with regional warehousing facilities can

benefit from this principle. This structure reduces transportation cost, but increase level of inventory levels, because of the fact of an unpredictable sales fluctuations. The abovementioned reveals that the logistics department must strike again balance between transportation and inventory expenses.

- Planning vs. Reaction (push- vs. pull-principle)= The goal of most SC's is to shorten delivery times to satisfy customer demands as soon as possible. Therefore, the pull principle is gaining more popularity. Condition for applying the pull principle is that the product/service is close to the end customer. In proximity, it is possible to apply Just-in-Time (JIT). The JIT philosophy assumes less inventory, while producing what is required only when it is required. The push principle is applied to parts of production where there is low uncertainty, a focus on economies of scale, and long lead times. Because of this, the goal is to achieve the lowest possible costs with effective resource utilization. In conclusion, the necessity for a sophisticated combination of plan-based and order-driven activities, which ought to be integrated in a target-oriented SC design, is of great significance.

- Smoothing= Securing the smooth flow of material and goods through SC without any disturbance or blocking, smoothing is one of the most important task of logistics. Aggregated planning consists of calculating the optimal capacity of goods receipt, warehouses, and capacity of utilization of truck fleet. One of the most common goals conflicts lies among shortening the lead time and maximizing the utilization rate. Firms are looking for balance between smoothing process through target-oriented demand management with tactical planning solution and considering advantages of various sales promotion and theirs following utilisation.

- Structural flexibility, versatility, and robustness= SC designs is created on this principle, can better react towards changing environment. Making the production line suitable for more than one product is called mixed-model line and is evidence of a flexible system. Flexible companies can amend their basic structure for a reasonable price and within a reasonable amount of time. The moment when versatility is needed occurs when a company's decentralized distribution cannot effectively manage a wide range of its production. That is why they making the distribution system more centralized (Haug 2022).

The third strategic tool with closer focus on risk is called **material supply strategy**. Strategy for wide variety of production must be adjusted due to their customers' demands. A company cannot treat every product the same because of its specific features. For better logistic management, it is advised to use ABC-, XYZ- and LMS-analysis (Haug 2022). ABC-analysis is based on Pareto-principle

so called 80/20-rule. It investigates connection of the dependency between the value and quantity of the products. In following list describes characteristic of each type.

- A= approx. 20% of the quantities representing approx. 80% of total turnover, that's why A-product needs intensive treatment.
- B= approx. 30% represents approx. 15% of total turnover, B-product requires differential treatment.
- C= approx. 50% of the quantities represents 5% of turnover, for C-product is advised to reduce effort and rational treatment is required.

Based on this analysis can the company arrange different strategy for products (Lochmannová 2022). XYZ-analysis is additional to the ABC-analysis and describes product to their utilization level and assumed products forecast.

- X= Represents continuous demand with high prediction accuracy.
- Y= Products have regular or fluctuation demand with medium prediction accuracy.
- Z= Are products with discontinuous demand and low prediction accuracy. (Water 2003)

Combining the two methods produces a matrix that reveals which supply concept or strategy is most appropriate for which material class. Table 1 provides the respective allocation alternatives (Haug 2022).

Table 1: ABC- and XYZ-analysis with corresponding strategy

	X	Y	Z
A	High value, continuous demand JIT, JIS, Warehouse on wheels (WOW)	High value, regular/fluctuating demand Depending on company situation WOW, JIT, JIS, conventional	High value Discontinuous demand Conscious stockpiling-conventional
B	Medium value, continuous demand Depending on company situation WOW, JIS, JIT, conventional	Medium value, regular/fluctuating demand Depending on company situation WOW, JIT, JIS, conventional	Medium value Discontinuous demand Conscious stockpiling-conventional
C	Low value, continuous demand Conscious stockpiling-conventional C-parts-management WOW	Low value Regular or fluctuating demand Conscious stockpiling-conventional C-parts-management	Low value Discontinuous demand Conscious stockpiling-conventional C-parts-management

Source: Own processing according to Haug (2022)

Next tool for logistic is LMS-analysis. Describes the geometrical and the bulkiness of the products, which are considered. Products are divided into three groups large (L), medium (M) and small (S) (Lochmannová 2022). Combining those three analysis is possible to identified twenty-seven product

groups and for them must be various strategy developed, which is focused on procurement, storage, transport, and supply chain. This integrated analysis creates better transparency, helps with reducing of the inventory level and lowers tied-up capital. The overall outcome is optimisation of supply logistic. Example of product group can be AXL. This product group has constant demand, high value, and large-volume characteristic, that why is most suitable for JIT delivery. A CZS-group is quite an opposite, shows poor suitability for JIT, better use has here conventional storage and efficient C-parts-management (Haug 2022).

The last strategic tool is **make or buy analysis for outsourcing decision**. This tool clarifies the question about insourcing and outsourcing. Finance plays key role in acquiring material or services. Purchasing department decides if it is cheaper to produce the product or rather buy it somewhere else. Consequently, a logistics department needs to bring the outsourced product to company. Another important aspect is level of technology, which can compensate a lack of knowledge and helps to be ahead of the competitors. When considering the outsourcing, two field needs to be deeply investigated. In figure 8 is portrayed relationship among level of competitiveness relative to supplier and strategic importance of this competence (Haug 2022). The outsourcing is bringing up two major opportunities for logistic cost- and performance-inducted opportunities. Cost-induced opportunities concentrate on reducing of tied-up capital with help of focusing on core competencies and prevention of investment. Performance-induced opportunities includes improvement of quality through specific know-how and technology, as well as infrastructure of logistics service providers (Haug 2022).

Figure 8: The outsourcing matrix
Source: Own processing according to Haug (2022)

28

Operation tools support firm decision on lower management level. Usually are operation tools focused on cost dimension. Intercontinental SC's were hardly challenged in past few years, especially during the COVID-19 pandemic. That created bigger emphasis on risk management. An appropriate tool for identifying feasible risk factors is **risk matrix**. Matrix is conducted from two criteria, investigation of budgetary impact and likelihood of occurrence in the future. Logistic management makes decision based on the matrix in order to avoid risk factors (Lochmannová 2022). Closer look on this topic is going to be in chapter 1.1.2.

Trend in managing the expenses is to outsources or to use a profit centre concepts. It is hard to use a direct costing method, because overhead costs are dependent on a variety of variants and the products' complexity itself (Horvát 2015). For effective calculation of the costs is advised to use **activity-based costing** (ABC). Central principle is that the overhead costs from material, production, R&D, distribution, and marketing ought to be located more in detail to cost-units and corporate procedures as a replacement of a simple mark-up-pricing with direct costs as the basis for calculation of overhead costs to cost-units. The ABC approach have better cost transparency and contribute to an identification of improvement potential. This costing method is more suitable for repetitive and standardized processes. On the other hand, this method is complex, time consuming and needs a lot of effort in order to use as a standard accounting tool (Haug 2022).

The SC is interconnected with four types of flows, which are mentioned in the first chapter of SC. Next operation tool from SC toolbox is **value stream mapping**. This method investigates material and information flow in the whole production process, it is also well-known method for a lean management. The outcome of this method requires four steps. Firstly, it is important to identify the product value stream, which is going to be described. Next is description of development of a current state map of material, processes, and information flow. Third step is to recognized issues, opportunities for improvement and to interpret a future state. Last part of mapping is to apply an improvement idea. On figure 9 is repressed an example of value stream mapping. For logistic purposes must be included information liked to stocks, transport, logistic processes like consolidation, portioning, sorting, picking, labelling, packing and administrative activities. Through its emphasis on customer and value orientation, the pursuit of synchronization, enhancement of transparency, and dedication to perfection, value stream mapping facilitates the establishment of a continuous improvement process driven by facts (Faust 2015).
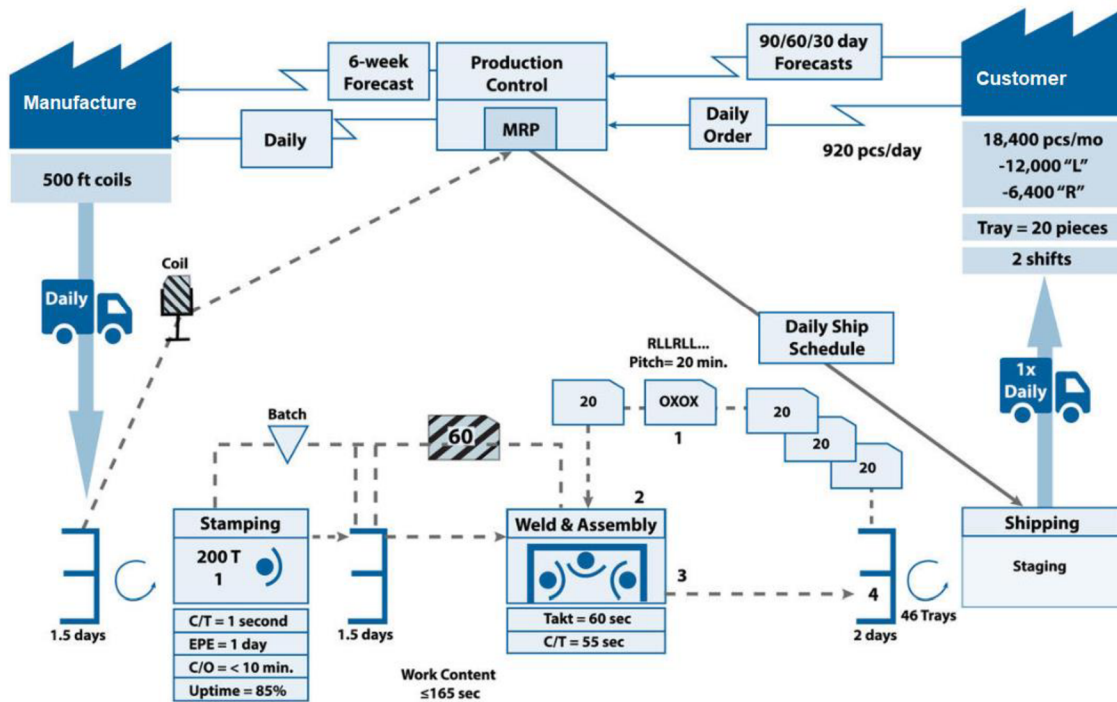
Figure 9: Value stream mapping
Source: National Institute of standards and Technology (2022)

Methods-time measurement (MTM) helps company to standardize assessment framework and to managed various areas linked with SC. Into those belong production, warehouse, distribution, after-sales, maintenance, and disposal logistic, all of them have their specifics tasks and processes. A goal of MTM is to support logistic to became more effective and efficient. Method is combining standardization and predetermined motion time to reduce excessive costs, which are labour, and motion related. MTM operates with coding system based on hierarchy of the process complexity. The higher the hierarchical level, the higher the aggregation level of several motions. For each level is a motion time calculated into a time measurement unit (TMU). An example is that 1TMU is 0.035 seconds and the code for a forklift is described according to MTM is 5LTSAAAFM, that is resulting into 833 TMU which is 29,155 seconds. Necessary condition for the full utilization of MTM at the logistics department is to have standardized and defined processes. If this condition is fulfilled and the processes are calculated and planned, then can MTM effectively supports the material flow. The output is to smoothen the material flow from an end-to-end point of view (Haug 2022).
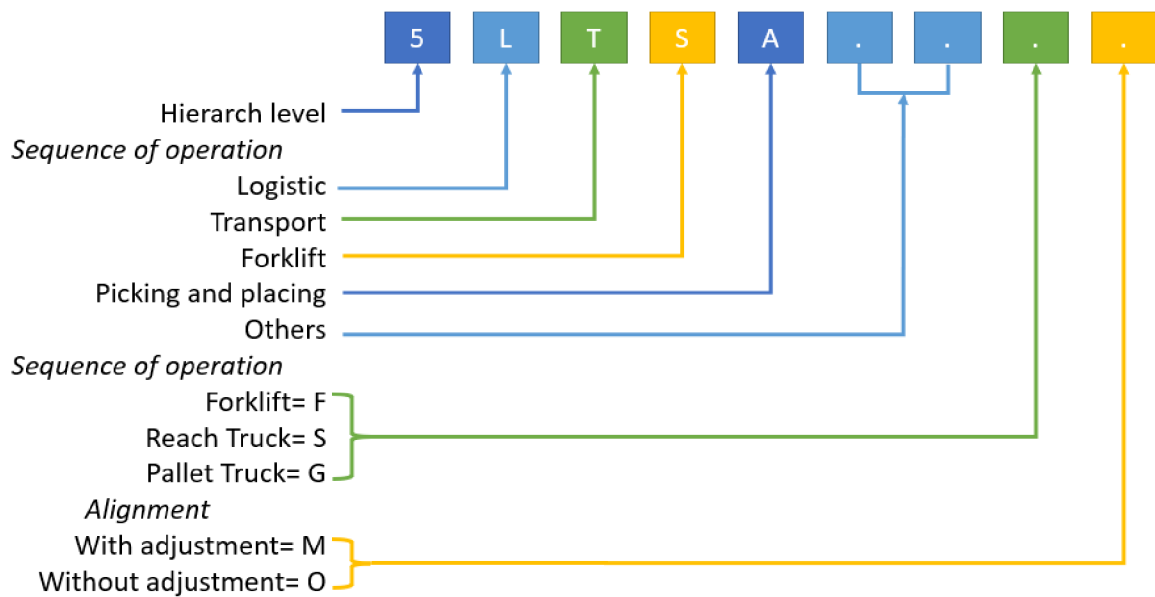
Figure 10: Coding in MTM system
Source: Own processing according to Haug (2022)

Another tool from lean management is a **A3 report**. This method is fully focused on expensive part of the firm. This tool refers to Toyota saying: „every issue the organization faces, can and should be captured on a single sheet of paper" (Lochmannová 2022), A3 includes following:

- Title= clear description of an issue

- Owner and date of the lates version

- Issue background= issue needs to address with respect towards company importance

- Current conditions= the gap between the targeted state and the actual

- Goal= wished state

- Analysis= differences between a current- and target-state, defined measurements

- Recommendation= how to achieve the target, advised actions

- Plan= way of an implementation of a recommendation

- Follow up= Controlling of the implementation with correction advice

The above-mentioned advice structure is merely a guideline, there is not just one ideal report template. Project based A3 reports usually have more than one report. The meaning of this tool is to help the firm to operationalize its strategy and to provided easier overview of the issue (Haug 2022).

1.1.2 Risk management

A company's environment is filled with threads and opportunities. Threads are risks for a company's success, follow up to it companies SCs can be influenced by several risks. Therefore, the need of managing this uncertainty arise. Three main goals of risk management are:

- Identify, evaluate, and control risk that can be influenced.

- Initiate measures for risks that cannot be influenced.

- Create flexible structures to consciously deal with unpredictable risks.

Every firm's activity is naturally connected with some potential risk. Risk can be viewed as an acceptance of danger that occur in entrepreneurial activity (Hartel 2010).

Figure 11: A supply chain risk management process
Source: Own processing according to Hartel (2010)

Analysis of risks can be implemented into praxis at any time, but for efficient managing, it is advised to implement it at the begging of projects. Process of managing the risks is divided into four steps. First step is to investigate all relevant internal and external threats linked to SC. Tools for identification are risk catalogues, questionnaires, monitoring early warning indicators, interviews, IT tools, evaluation of claims databases and others. After that, it is necessary to decide if the concrete risk is really endangering the firm. Despite the extensive research conducted by the company, there will always be a gap with unknown threats. External risks can be characterized as geopolitical, macroeconomic, natural disasters or technological influence, which is changing company performance on the market (Lochmannová 2022). The following table 2 describe how does the perception of external risks changed in past year.

Table 2: TOP 10 risks according to Allianz

Place	2019	2021	2023
1	Business interruption	Business interruption	Cyber incidents
2	Cyber incidents	Pandemic outbreak	Business interruption
3	Natural catastrophes	Cyber incidents	Macroeconomic developments
4	Changes in legislation	Market developments	Energy crisis
5	Market developments	Changes in legislation	Changes in legislation
6	Fire, explosion	Natural catastrophes	Natural catastrophes
7	New technologies	Fire, explosion	Climate change
8	Climate change	Macroeconomic developments	Fire, explosion
9	Loss of reputation or brand value	Climate change	Shortage of skilled workforce
10	Shortage of skilled workforce	Political risks and violence	Political risks and violence

Source: Own processing according to Allianz (2023)

On the other hand, internal risks are linked with people (employees, suppliers), technology use (safety, cybersecurity), operation and physical aspects (damage from accidents, theft). After collection of the risk list, department can use tool called risk inventory to gain an overview of current situation. For every risk is written designation, class (resources, policy, …), possible cause, probability of occurrence, potential lost and at the end is calculated a risk value by multiplying probability and potential lost. The risk inventory consists of sum of all risk values, and it should be compared with potential monetary project benefits. If risk value is higher, the company ought to consider if the projects should continue or end (Hartel 2022). An alternative tool for risk evaluation is Failure mode effects analysis (FMEA), this method has a fixed structure, which is displayed on table 3. It offers standardization in communication and transparency in documentation.

Table 3: FMEA template

Process step		Potential risk	Poss. Error sequence	Risk assessment				Potential reason	Recomm. measure	Rest risk			
				S	O	D	RNP			S	O	D	RPN
1.	Material collection	Lost material	Delay	1	8	8	64			1	3	5	15
2.	Kommissio-nierung												
X.													

Source: Own processing according to Hartel (2022)

The procedure of FMEA begin with description of the project phase or activity, then follows potential enumeration of risk and its causes. For every risk is fill risk assessment, which is evaluated with risk priority numbers (RPN), parts of assessment are severity, occurrence, and detection. By multiplying them the RNP value is calculated. If the value is below 100, then there is no activity required. The RPN is between 100-200 team decides if it is necessary to creates any measures. Every RPN above 200 request action. But borderline for every company can be adjusted, due to the

company willingness to take the risk (Hartel 2022). Second step in SC risk management is to analyse and assessment the founded risks. Tools from the first step can be used in the second step as well. Specific tool is risk map. This method is based on visualization, it is graph, where on x-axis is potential effects of the risk and on y-axis is likelihood of occurrence of the risks. From very low probability through moderate to very high.
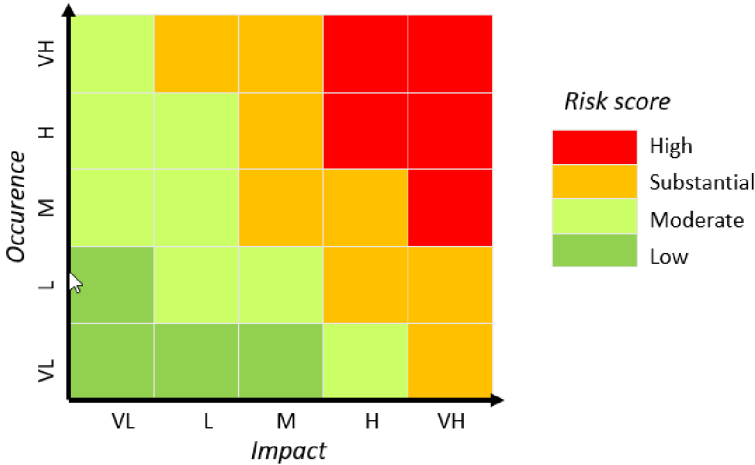
Figure 12: Risk map structure
Source: Own processing according to The world bank (2023)

Risk located in green area mostly do not require action, only when it is necessary, and action is based on risk management strategy. Usually, those risks are accepted. Second group is between moderate and substantial risk score, on this field the decisions are managed according to risk handling strategy and activities are continuously or periodically controlled. Last categories have the highest risk score, action needs to be immediately applied (The world bank 2023). After identifying and analysing risks, the risk management take place. Exist five approaches towards risk.

- Risk retention= protect the production with safety stocks, creating buffers in term of time, budget, and objectives.
- Risk diversification= strategy is focused on dividing the risk into more parts, which are less risky, tendency is to find a decentralized solution.
- Risk transfer= moving the risk to a third party, mostly to insurance, consultants, coordination services providers or joint ventures.
- Risk reduction= lowering the level of risk by performing stress tests, learning more about similar problematic, conducting inspection on daily basis.

- Risk avoidance= strategic approach is to find external expert support, implementation of measures, creating new system and its parallel application with old system, establishment of redundant structures among resources.

The key is not to produce a specific plan, but rather to establish guidelines that encourage a flexible attitude towards expected and unforeseen events. The firm should be able to respond more quickly and maintain a steady performance (Hartel 2022). Last step is to control the risk. This part is to define risk action plan and its implementation, establish the measurement to monitor costs, time, and quality of objectives, which are planned, managed, and controlled. Outcome will be in monetary unit and should be compared with the begging and target values (Hartel 2022).

1.1.3   Trends in SCM

Supply chain management is changing according to its surroundings. First SC existed already in Antic time, first so called SCM relates to Alexander the Great and his campaign to India, he must deal with big army, long travel distance and lack of resources. Thanks to him and his general, he created one of the biggest realms in the world. Since then, the development of SCM made a huge step and is still in development (Hugos 2018). Nowadays trends are grounded on globalization. Thanks to shared knowledge and pressure on R&D, new findings and trends are sharply arising. In this chapter, the newest trends are going to be introduces.

Globalization started already in the first half of the last century and is still ongoing trend in terms of interconnection of businesses. Globalization enables markets from all over the world to penetrate each other. That have created pressure on price and cost through wider competitor environment. This liberation of markets brings opportunities for firms, but also creates a tension. The customer can choose between many products, among various quality and price levels. That results into question about effectiveness and expenses in SC. Costs in SCM are significantly connected with transportation. To fight competitors, a firm can choose to have fast delivery on behalf of the product price or to have lower price, but longer delivery time. To satisfy the consumer, the company is forced to create a better production planning, to avoid some inconvenience and when some appears then, to have prepared solution for them. Example can be, when a shipment is delayed, then they need to choose more cost demanding transport solution, like air freight. Globalization has had an impact on corporate decision-making procedures and duties, and who should take care of them. That leads firm to splitting the production into several locations and to

choose outsourcing. Globalization not only offers opportunities, but also threads, examples can be wars or pandemics. Negative outcomes of globalizations can poorly influence the company´s performance (Hartel 2022).

Next topic is deeply connected with ecological side of business. **Ecological trends** are in the field of climate change and corporate social responsibility. Those are creating many interesting opportunities for enhance the company performance. This trend areas are driven with the fact of the limitation of world resources and with increasing world pollution. CO2 emission is an unpleasant product of one of the main activities in SC, transportation. To have lower costs, the enterprise chooses to buy a cheaper, but from more distant supplier. That leads to increase of the level of transportation and subsequently increase the pollution. In order to lower the carbon footprint, governments are creating a new regulation to force the companies to lower their contribution. From this reason, green strategies or green logistic are implemented into companies' management (Hartel 2022). Sustainability have also increasing popularly, not only in management, but mainly in perception of the customers. To gain this sustainable advantage over competitors, it is possible to choose from three environmental strategies.

- Pollution prevention= effective planning in order to obtain the minimal environmental pollution and degradation such as CO2 emissions, waste from packaging, light pollution and more.
- Product stewardship= finding improvement in the product life cycle by product modification or redesign.
- Sustainable development= applying so called clean technologies to minimized the environmental occupation of the enterprise (Cousins 2019).

According to Cousins (2019) the companies are adjusting the product life cycle with use of circular economic. From traditional cradle to grave, when product ends as a waste, trend is move to cradle to cradle (C2C). That means that after the use, the product or its parts are extracted, upcycled, and used again in manufacture. This method is slightly different for biological and for technical material. New adjusted life cycle is visualized in the following figure 13.
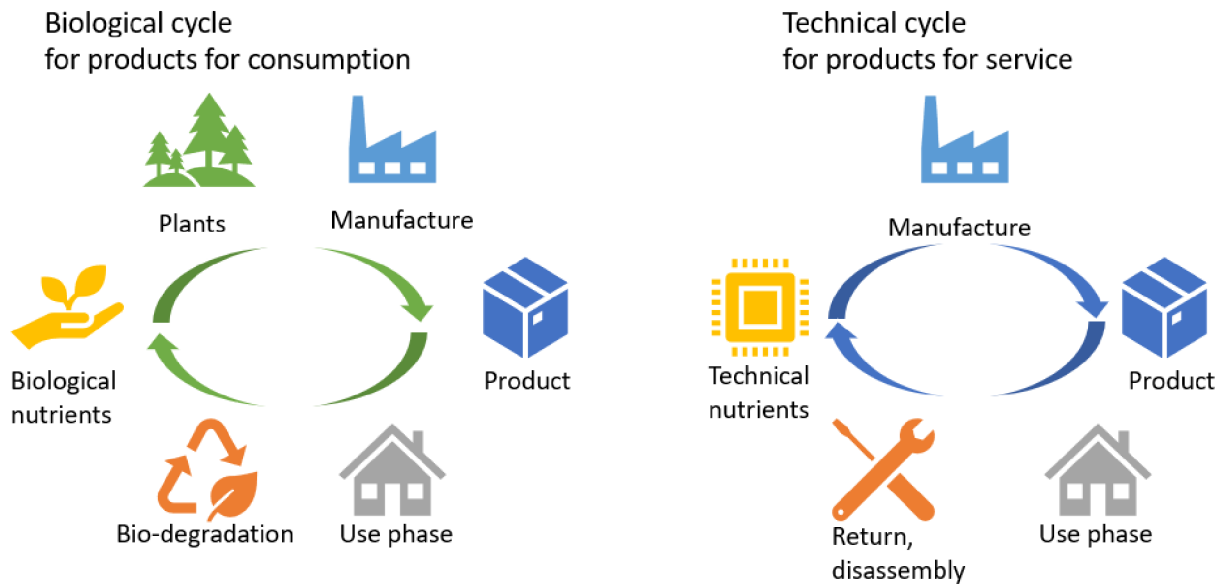
Figure 13: Cradle to cradle
Source: Own processing according to Hartel (2022)

Ecological themes are also deeply connected with social aspects of business. Companies are trying to improve their appearance with corporate social responsibility. The underlying concept behind responsible corporate citizenship is that the firm aids in enhancing public areas by addressing social, financial, and environmental issues (Hartel 2022).

Other trends are related to **new technologies** such as digitalization, industry 4.0, automatization in SC and much more. Nowadays every process in firm is connected with digitalization, because of emphasis on faster responses. Industry 4.0 closely leads the way of research in SC. Connection of information and communication technology is driving force behind the fourth industrial revolution as well as behind industry and logistic 4.0. All resources and processes in business are interconnected through technologies to achieve better efficient and flexible performance (Hartel 2022). Vision for logistic 4.0 is following. An online order initiates the production of a certain product. As a result, to previous demands a stock and warehouses have already a required material for the production. During producing the routing of the recipient is calculated. Finished product will themselves book loading carrier through RFID chips. After filling the load carrier, a transportation will be booked by fully automated conveyor technology (without manual handling) as well as transport from distribution place to final destination, where the goods can be picked up by the recipient with electronically send code.

This goal can be achieved with well-organized cross-company network along the whole supply chain (Helmke 2022). To secure the necessary data and to support the goal of logistic 4.0, the use of cloud

computing is crucial. Cloud computing is a technology model that enables all-over access to a shared pool of computing resources over the internet connection. As an alternative of owning and maintaining physical servers or computing infrastructure, users can access and use computing resources, such as servers, storage, databases, networking, software, and analytics, on a pay-as-you-go basis. The trend of digitalization in the workplace has been going on for a long time. Enterprises are using software's on daily basis such as enterprise resource planning system (ERP), warehouse management system (WMS), transport management system (TMS) and much more (Hugos 2018).

Important trend way is connected with internet. Among youngest generation grows popularity of **social media**. Hence, this trend the use of Facebook, platform X (previously Twitter) or WhatsApp as a communication channel arise. It is used to attract or influence potential consumer or employee (Hartel 2022). Another trend link to the internet is an online marketplaces, which are a new distribution channels in SC. They provide services to the shippers, carriers and also freight forwards with utilization of the trucks, planes, trains, barges, and ships cargos, but also help with the handling of warehouses. They also provide valuable data, which can be useful for business analysis and for automating of operational processes (Lehmacher 2021). In today's world the firm is not only existing in a physical world, but also in virtual. Therefore, the SC perform on online platforms. E-commerce refers to the buying and selling of goods and services over the internet. It involves online transactions between B2B, B2C, and even C2C. E-commerce encompasses a wide range of activities, including online retail, electronic payments, online marketplaces, and digital supply chains. It enables businesses to reach a global audience, provides consumers with convenient shopping experiences, and relies on technologies such as websites, mobile apps, and secure online payment systems (Plehn 2021).

1.2 Agile management

In SCM is nowadays used project management and agile is a new philosophy for projects. Enterprises projects living according to agile is flexible, good responding towards in or out changes, threats, and opportunities. For example, company can use agile in project management to adapt to challenges quickly and to manage the projects with better emphasis on people in order to improve the quality of the project performance. The agile project management is increasing on its popularity in solving SCM issues, especially in SC project management. Key to successful implementation of agile is to use it as a way of doing and understanding things. Many firms have failed with the

implementation because they have used it as a tool, not as a way of thinking. This untraditional project approach is based on a philosophy focused on people (Doležal 2022). Basic principles for agile are described in following chapter, main tools with an updated knowledge are introduced in chapter 1.2.2.

1.2.1 Principles of agile

History of agile management starts already in 20th century, in Japan with Hirotaka Takechi and Ikujiro Nonaka. They published an article named „The New New Product Development Game," there was represented a new rapid, flexible development strategy to fulfil a fast-paced product demands (Layton 2022). Origin of agile management can be assigned to a year 2001. Experts in a field of software and project management assemble a „Manifesto for Agile Software Development." They created a four basic principle for successful software development, which grounded also an agile basic principle.

- Individuals and interactions over processes and tools
    - A successful project relays on a significant extent of people involved. Without actively involved people any particularly good, planed project can fail.
- Working software over comprehensive documentation
    - The evaluation should be future-oriented through a current software rather than past-oriented, which is executed through project documentation.
- Customer collaboration over contract negotiation
    - People involved in the project should cooperated and understand, that the project is about „us" and is not divided into „us" and „them."
- Responding to change over following a plan
    - Is more use full to respond flexible towards changes in the project, rather than have rigid attitude (Hartel 2022).

Principles mention above, ware meant for software development, due to IT-people who has created it. But despite that, these principles started to intervened into other part of business (Layton 2022). On those four principles are build up another twelve guidelines advice, which helps the company or project team to adopt the agile approach.

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.

2. Welcome changing requirements, even late in development. Agile processes harness change for the customers competitive advantage.

3. Deliver working software frequently, from a couple of weeks to couple of months, with a preference to the shorter timescale.

4. Businesspeople and developers must work together daily throughout the project.

5. Build projects around motivated individuals. Give them the environment and support they need ad trust them to get the job done.

6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.

7. Working software is the primary measure of process.

8. Agile processes promote sustainable development. The sponsors, developers and users should be able to maintain a constant pace indefinitely.

9. Continuous attention to technical excellence and good design enhances agility.

10. Simplicity- the art of maximizing the amount of work not done is essential.

11. The best architectures, requirements and designs emerge from self-organizing teams.

12. At regular intervals, the team reflects on how to become more effective, then tunes and adjust its behaviour accordingly (Agile Manifesto 2018).

Overall, agile is focused on the customer demand. The twelve principles can be divided into four parts according to their focus. Principle 1, 2, 3 and 4 concentrate on customer satisfaction. The customer can be a person or a group that is financing the project, customer can be from outside the company, stakeholder. Easily can be named as a user. The second group cares about a quality side of the project. Into them belongs 1, 3, 4, 6, 7, 8, 9 and 12. Third interest area is about teamwork, concretely 4, 5, 6, 8, 11 and 12. To secure the best possible project development, it is important to have good working environment. And the last part is about product. There belongs 1, 2, 3, 7, 8, 9 and 10. To achieve common goals, it is essential to communicate openly, evade possible disturbance and reduce activities, which contributes to waste (Layton 2022).

1.2.2   Basic tools with updated knowledge

Agile can be used as a set of rules, it has to be understood and adopted by the company, otherwise it will lead to failure. Areas where can be agile philosophy applied, exist all over the company. But

basic place, where to start is a team. Creating an **agile team** is a lengthy process and requires acceptance of agile principles. In every team exist advised team range, for effective team management it is recommended to have from three to nine team members. Attributes of agile team are introduced in following table 4 (Project management Institute 2017).

Table 4: Attributes of Successful agile teams

Attribute	Goal
Dedicated people	Increased focus and productivity Small team, max. 9 people
Cross-functional team members	Develop and deliver often Deliver finished value as an independent team Integrate all the work activities to deliver finished work Provide feedback from inside the team and from others (product owner)
Colocation or ability to manage any location challenges	Better communication Improved team dynamics Knowledge sharing Reduced cost of learning Able to commit to collaborating with each other
Mixed team of generalists and specialists	Specialists provide deep expertise and generalist provide flexibility of who does what Team brings their specialist capabilities and often generalized specialist (with experience across multiple skills)
Stable work environment	Depend on each other to deliver Agreed-upon approach to the work Simplified team cost calculations Preservation and expansion of intellectual capita

Source: Agile study guide (2017)

Three roles in agile team are cross-functional team members, product owner and team facilitator. Cross-functional member is a person with necessary skills to complete the work. These members are crucial, because they can deliver the tasks in the shortest possible time, in the best quality and in absence of external dependencies. Product owner is in control of management of the products. He/she is working on daily basis with every team member; provides feedback; explains next steps of the projects; is a communication link among team, stakeholders, and customer. Special attribute is, that owner provides a backlog for and within the team to conduct the best value without making any waste. Last team role is team facilitator, usually is called project manager, scrum master or team coach. This role brings so-called servant leadership. Common practice is to use an external coaches, which have more experiences, but struggles with lack of team relationship. On the other hand, an internal coaches have good relationship, but can have lower knowledge in the field of agile leadership (Project management Institute 2017). After finding the right people for suitable agile role, starts a creation of team. According to Bruce Tuckman, five phases of team creating exist.

1. Forming= At the begging exist no team only group of unknown people. In this phase a goal of the project must be explained, it is important to give to the group a clear direction. Usually, project members are learning new concepts and tools.

2. Storming= After defining rules and objective of the cooperation, begin the critical part of team creation. In this phase people are discovering how to work together and how to manage the occurring conflicts. If no actions are taken, project fails. Milestone is to develop and learn principles of teamwork.

3. Norming= In this stage exist team members, which know how to manage conflicts and how to work together. A greater emphasis is placed on the acceptance of modifications, as failure of the project may result. Knowing who will manage the change and move forward is crucial. Main goal is to create a self-sufficient team.

4. Performing= Now team exist, team members cooperate together effectively and fast. Atmosphere is dynamic, full of energy, but also calm without personal conflicts. Important is to do periodical controls.

5. Dissolving= Last phase of teamwork-life is ending the project or the work (Doležal 2022).

In agile practice it is advised to don´t bring people to work, but to bring work to people. That can be understood that it is better and more efficient to create a strong and good-working team, rather than create a team for each project. Tendency is to move from line organization structure to team structure by reducing organization level, for example from 5 organization levels to only three (Doležal 2022). In year 2014 was introduced term „teal organization", author Frederic Laloux in his book Reinventing organizations, address issue of the organization development. Besides others, the book inspired researcher in the agile management to investigate the development of the team. Laloux classified a development of the human civilization and change of the organization behind specific times. The outcome is five types of organization. In the following table 5 are types explained.

Table 5: Types of organization

Type	Description	Main goal	Examples nowadays
Red Wolf pack	Continuous demonstration of power in order to secure surviving. The group is very active, serves a short time goals. Is successful in chaotic environment.	Strict tasks division. Leader/ dictator	Organized crime Gangs Tribal militia
Amber Army	Very formal, hierarchical structure. Competencies are managed from top to bottom.	Stable and repeating processes	Church Army State apparatus
Orange Machine	Goal is to fight the competitions, gain more profit, expand. Usually short-term planning.	Innovation Responsiveness Meritocracy	Multinational companies Investment banks Private schools
Green Family	Focus on culture, empowerment, and employee motivation. Existence of a stakeholders.	Equal management Stakeholders	Organization with developed well-being (Starbucks, Zappos, …)
Teal Living organism	Instead of fixed hierarchy self-management. Organization is viewed as living entity focused on realization of their potential.	Self-management Integration Evolutionary selection	Pioneering organizations (Morning Star Co., Patagonia, …)

Source: Own processing according to Doležal (2022)

The ideal type of organization would be teal. Appearance of teal type was after year 2000, tendency is to have decentralized organization structure based on network of small self-sufficient teams. Goal of management is not command and control, but to creates a suitable environment for teams. Another task of management is to define vision and common purpose of existence. Key role plays an education of employees, it helps to keep cross-functional advantage of this organization type (Doležal 2022).

To secure full engagement of team members, it is important to keep them motivated. Nowadays is used term **Motivation 3.0**, this approach provides to the management advise how to better motivate employees. (Project management Institute 2017) The first predecessor was motivation 1.0, which was led by primary instincts to secure a surviving. That was in prehistoric times. After that came motivation 2.0. This was characterized with saying: sugar and whip. Main principle was to satisfy the person with higher position in order to gain „sugar" and to behaved to avoid any punishment. This was applied through history till today. Thinking that reward is main driving force has shown, after years of research, that it loses it effect in a certain stage of work. Performance based on principle if … then; is wrong because it usually leads to dishonest and fraudulent behaviour. Revolutionary concept of motivation 3.0, bring the idea of inner motivation. That can be described as a drive. This initiates inside people a will or wish to do something. Three elements behind this concept are:

- Autonomy= the desire to lead his/hers life on its own
- Mastery= the tendency to be better in things that matters
- Purpose= the aspiration to be part of something greater the us

Absence of one of mention above leads to the feelings of frustration and that demotivate employees and leads to poorer quality of company performance (Doležal 2022).

According to Schwaber and Sutherland (2020) is **Scrum** the most used method of agile. The term was basically used in rugby game, where a team connected around a piece of equipment in order to create a pressure against another team. This statement refers back to Takeuchi and Nonaka because the authors highlight the importance of self-organized team and simultaneous development to create value. Principle of scrum is to divide a complex and extensive tasks into small, manageable increments, which are applied one after another after two- or four-week sprints. At the end of the sprints, a customer can evaluate functional results (Hartel 2022). Pillars of scrum are:

- Transparency= All processes must be visible for those, who are working on it as well as for those, who are receiving the job after. Transparency enables inspection, and that without transparency is misleading and wasteful.
- Inspection= Each process and work must be inspected frequently and diligently to detect potentially undesirable variance or problems. Inspection enables adaptation, inspection without adaptation is pointless.
- Adaptation= If any process shows deviations or its result is unacceptable, an adjustment must take place as soon as possible to minimize future deviations. Adaptation is more difficult if team members are not empowered or self-managed. Scrum actions are proposed to firstly enabled an inspection and to initiate a change (Schwaber and Sutherland 2020).

After pillars follows a five scrum values. Commitment, focus, openness, respect, and courage are values, which are expected to be honoured and accepted by team members. The most important part of submitting to those values is trust, with that can team investigate and learn better and after that improve their performance (Doležal 2022). Scrum process is called sprint and is divided into five parts. Sprint has fixed length (usually two- or four-weeks), it starts immediately after the end of the previous sprint. Sprint is focused on fulfilling product goal. Parts of sprints are sprint planning, daily scrum, sprint review, and sprint retrospective. During the sprint is not accepted anything, what could harm the goal, quality does not lower, the product backlog is refiled when it is needed, scope can be adjusted with product owner after new useful findings. The sprint can be cancelled if the goal became obsolete, but only by product owner (Schwaber and Sutherland 2020). In sprint planning phase, a whole scrum team creates a plan. In planning can be involved other people, usually to provide a deeper knowledge in a specific field. Planning addresses three important

44

questions. Why is this sprint valuable? What can be done in this sprint? How will the chosen work get done? Planning stage is time-limited, maximum is eight hours for one-month. Function of daily scrum is check on progress towards the sprint goal and to initiate the changes for the sprint backlog by adjusting the future planned work. Daily scrum is 15-minutes long. It can bring positive change in communication, it helps to identify impediments, promotes quick decision-making, and consequently eliminate the need for other meetings (Doležal 2022). Sprint review investigated the output of the whole sprint and define future adaptations. The outcome is presented to key stakeholders and the movement towards the product goal is discussed. Review is limited into four hours for one-month sprint. Last step is to define a retrospective. Retrospective plan contains ways to increase quality and effectiveness. In this stage is the whole active sprint discussed, what have happened, what problems have occurred and many more. Time limitation is three hours for one-month sprint (Schwaber and Sutherland 2020). To complete the scrum process, it is necessary to explain a scrum three artifacts. They represent work or value; they support transparency policy. Product backlog is always refilling list with improvements of the product. Product backlog refinements are break down into smaller and more detailed parts. In sprint backlog, the parts from product backlog are selected and a plan for their implementation is created. An objective of sprint backlog is a sprint goal. An increment is concrete use of things from backlog. Part of increment is the definition of done, which is formal presentation of the state, when the quality measures are fulfilled. The moment when the product backlog item meets the definition of done, an increment arises (Schwaber and Sutherland 2020).
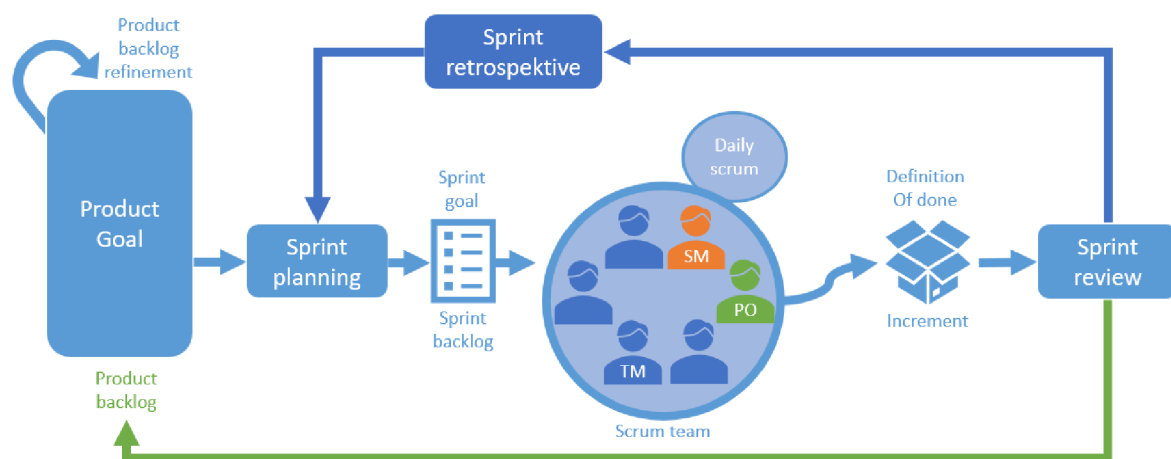

Figure 14: Scrum process
Source: Own processing according to Schwaber (2020)

An advance scrum suitable for large enterprises is Large scale scrum (LeSS). The principles and methods of scrum are same, only difference is that there are applied on bigger scale, from two to eight teams with eight members. In LeSS is only one product backlog for one product (not for team),

one definition of DOD for all teams, one package of increment, only one product owner, many complete cross-functional teams, one sprint (Project management Institute 2017). The Nexus is also based on scrum, but adds nexus integration team according to scrum principles, all artefacts are shared and according to nexus not everyone is always needed for smooth flow (Doležal 2022). Another term connected with scrum is dark scrum, which is a wrong perception of agile and scrum principles. It appears when new tools are only technically accepted and not as a new mindset. It is important to use agile as a path to complete the project and not as a tool. Demonstration of dark scrum can be wrong or strangely distant communication in teams; low initiative and activity of members; team never saw the product owner; retrospective is perceived as loss of time and more. Rightly implemented scrum is influencing company´s principles, values, culture, goals, customer, and main employees (Doležal 2022).

Kanban is a method arising from the lean principles. Kanban is a term from Japanese, which can be translated into signboard, that exactly refers to a main tool. Kanban board is used for better optimizing of processes, method is based on pull system through continuous and limiting work in progress to optimize the flow. Precondition for effective use of kanban are flexibility (teams have no fixed time schedule; work is organized by the importance of tasks), focus on continuous delivery (undisturbed flow to complete the actual process; a new work will not start until the previous work is closed), increased productivity and quality (limiting the work in progress), increased efficiency (investigation value adding and non-value adding activities), team member focus, variability in the workloads and reduction of waste (Project management Institute 2022).

Kanban method is based on three principles, which are applied on kanban board. First is to visualized the work of team, the workflow is visualized and enables identifying possible weak space and creates prevention moves towards it. The second principle is limit work in progress (WIP). Working on more than one tasks is not in agreement with agile philosophy, also working on more tasks makes delivery time longer. The third principle is to manage the flow. Chaos is harming the performance; therefore, it is needed to manage tasks and people to prevent it (Layton 2020). Advance kanban board is visualized in following figure 16. The basic board is divided into three parts: To do, in progress and done. The goal of the kanban structure is to clarify general workflow and processes to all interested parts of the project (Project management Institute 2017).
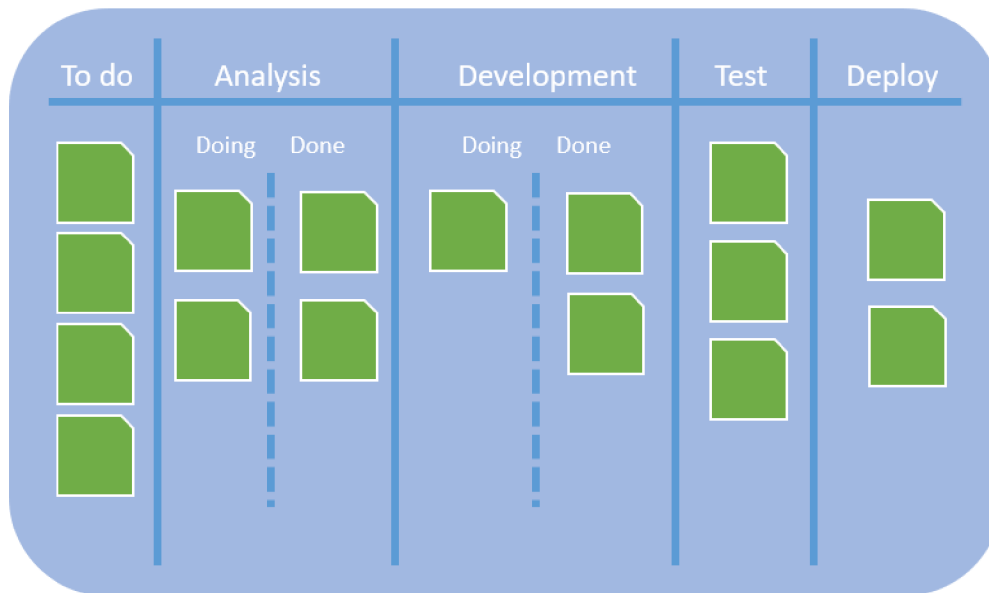
Figure 15: Advance kanban board
Source: Own processing according to Project management Institute (2017)

Scrumban is name for hybrid work between two agile approaches, scrum and kanban. Kanban is easy to use thanks to its simplicity and low number of rules, on the other hand scrum is useful for the projects with bigger number of participants with various roles and with higher level of complexity. Scrumban divide the project into small sprints, and each is visualized on kanban board to ease the control of project development. WIP limits are placed between sprints. Tool of Scrumban is daily management, which secures smooth cooperation among team members and helps to remove any project obstacles. Next tool is a planning trigger, which is an advance team planning. Usually, it takes place when WIP level is lower than a predetermined limit (Project management Institute 2017).

Disciplined agile (DA) is a process decision framework that connected agile best practice into a comprehensive model. Goal of DA is to help to the enterprise to find balance in various agile tools. Principles of DA are people first, learning oriented, full delivery life cycle, goal driven, enterprise awareness and scalable (Project management Institute 2017).

Kaizen is more than a tool, it is a concept focused on continuous improvement of all functions, all employees starting with CEO and ends with an assembly line workers. It is another tool based on lean theory. This method is based on four main core principles.

- Management commitment= Top management has to be the leading example of positive changes, to motivate the employees.

- Employee empowerment= It is assuming that the employee is a person, who knows the best way to get his/her work done. Management should create a motivating environment, where the employees are empowered. That leads to improved moral and to better overall performance of the company.
- Gemba walk= Is a term for „the real place", the idea is to go and see the workplace; ask why is better to understand the processes and value stream (here can be used tool called five why`s); identify possible problematic spaces; show respect in understanding the challenges and cooperate on the problem solving. Last step is to monitor the improvements and initiate the Gemba walk once again if it is necessary (Schwämmle 2022).
- 5S (6S)= It is a tool focused on continuous improvement, constant looking for waste and promoting a high level of productivity and safety through the whole enterprise. Into 5S is added safety as a final step in order to find hazards and to set prevention activities so that employees are safe during the work process (Lochmannová 2022).

Figure 16: 5S (6S) cycle
Source: On processing according to Schwämmle (2022)

Agile approach is strongly focused on customer, therefore customer-oriented tools are required. Important is to understand the customer needs, to create the best possible outcome. To visualize a starting point of a project, a use of **product canvas** could be one of the suitable methods. This method explains desired goals or product outcome and validates assumption of problem-solving. The canvas also helps the product owner to build up the product strategy. There is no prescribe structure of canvas and it can be adjusted to various purposes (Layton 2020).

Figure 17: Product canvas
Source: Own processing according to Carvalho (2022)

Next tool is a **customer map**, which also enables team to gain better view in the customer position. The basic types of customer map are a journey map and an empathy map. The journey map is conducted of day-to-day customer's experience, goals, and their actions, it also observes an emotion of the customer. In the empathy map, team investigates the costumers emotions, needs, motivation and senses in order to avoid negative users experiences (Hartel 2022).

During the whole project various obstacles can appear, and they can disrupt the planned actions. In order to avoid them a **root cause analysis** (RCA) is used. The basic principle is to identify the roots of the problems, then is important to took prevention steps to eliminate symptoms of the issue. Several approaches can be used with the aim of investigating the root causes (Layton 2020). The most well-known are:

- The Pareto rule (80/20 rule)= it says that 80% of effects come from 20% of the causes.
- Five Why´s= This method is used to break down the problem into the layers for the purpose of more effective problem-solving. Mind map is used to visualised the problem at its causes.
- Ishikawa (cause-and-effect diagram)= Fish bone diagram is conducted of categories that effects the problem. Firstly, the problem is addressed, then the categories are defined (spine of the fish bone). Usually the categories are people, process, culture, tools, environment, and

management. Through a discussion about categories, the root causes can be found (Lochmannová 2022).
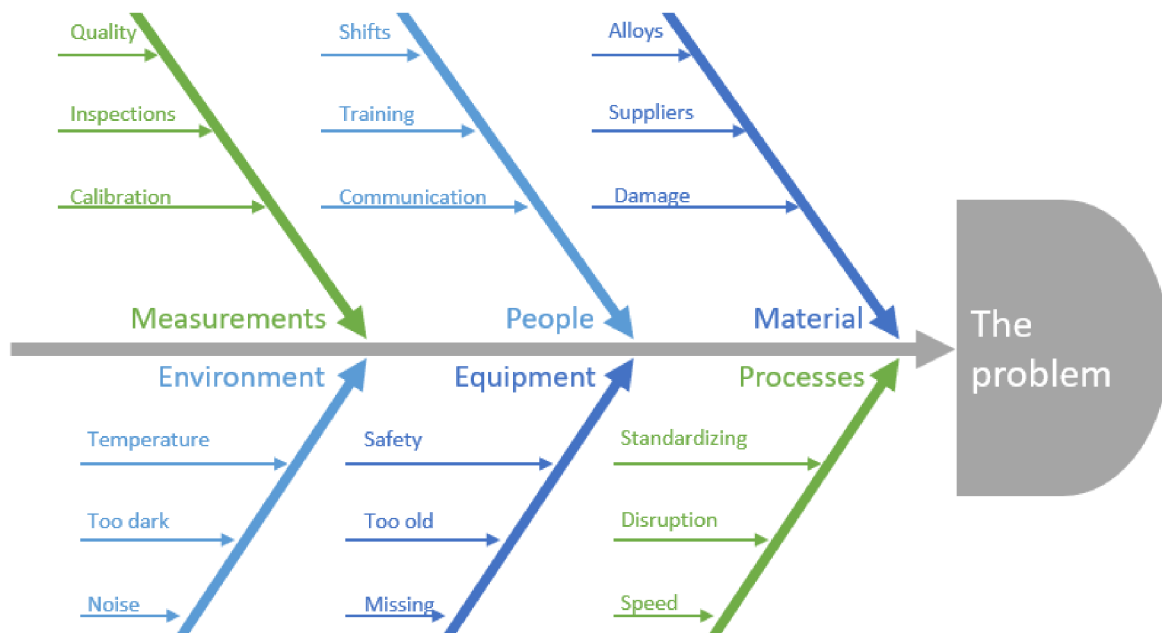
Figure 18: Ishikawa diagram
Source: Own processing according to Layton (2020)

1.3 Success factor in cooperation in SC and agile management

Companies are existing among various supply chains, usually their strategy for each SC level is based mainly on an experiences and traditional approaches through years. Some companies have understood the need of updating the strategies in order to gain the advantage over the competitors. Positive development through SC delivered by logistics department, effect positively collaboration with suppliers and customers. Nowadays is agile in logistic management gaining on its popularity. How to effectively apply agile into SC will be discussed in the following chapter.

1.3.1 Comparison traditional and agile approach

According to Layton (2020) a term traditional project approach is connected with a scope bloat, which means an unnecessary product features. An example is a software in common firms. A study from 2017 express that only 20% of software feature are actively use and in opposition, 80% are infrequently (30%) or hardly ever used (50%) features. This example is very fitting in describing the main disadvantage of the traditional approach. To better understand the need of movement from

50

traditional to agile management, it is important to address their differences in various management parts. Approaches are compared in table 6.

Table 6: Tradition vs. agile approach

Field of comparison	Traditional approach	Agile approach
Team	Fixed structure; command-and-control principle; one project manager who delegate tasks; evaluation of individual; work on more than one project; unlimited team size	Self-sufficient, -managing, -organized without leader; use of servant-leader coaches; evaluation of team; one project at the time; cross-functional team; 3-9 people
Communication	Undirect communication; use of emails; high emphasis on documentation; compulsory and excess meetings	Face-to-face communication; low level of documentation; simple structure of documents; quick and repeating meetings
Project planning	Preparation of all documents at the start; meetings on week basis with all involved parties; detailed meetings report; detailed project structure; strictly assigned tasks	Creating product backlog based on priority; daily 15-minuts meetings; short day reports for stakeholders; project sprints; team creates pull for their tasks
Project procurement	Project manager decides; fixed requirements towards suppliers; occurrence of stress due to fixed requirements; costly changes in adjustment of vendors	Team decided; possible changes of contracts at the end of any sprint; emphasis on positive relationship with suppliers
Perception of changes	As a failure, hard to respond; additional modifications are failure and costly	As an opportunity, changes are possible at the end of sprints
Time management	Schedule with fixed scope; clear definition of time requirements; no differ time-window for critical and optional tasks; time can be adjust	No fixed scope: high-value tasks are completed ASAP; sprint timeframe is fixed
Cost management	All-or-nothing budged planning; budged plan is completed at the start; no revenue before the end of the project	Budget plan after end of planning phase; financing and resources can be adjust at any time; revenue is generating during the project

Source: Own processing according to Layton (2020)

The huge difference between tradition and agile approach can be demonstrated on a comparison of their popular tools, waterfall, and scrum. Waterfall was applied firstly in 1970 by Winston W. Royce. This tool was popular among software developing companies (Maier 2022). Lifecycle for waterfall projects is linear with sequential planning. Waterfall is stricter, have formal requirements for each phase of the project, without the completing of the previous phase the next will not start. Waterfall is definitely more rigid, team members are usually standing alone, important is the work of individual rather than the whole team, that can result into unhealthy and unhappy work environment (Doležal 2022). Life cycle of scrum is based on repeating cycles, which are self-standing parts of project, with are flexible, change-welcoming, and short stages. Teams are the most important part; individuals bring various skills in order to secure cross-functional team. Successful scrum team is self-sufficient with nice and motivating atmosphere (Layton 2020).
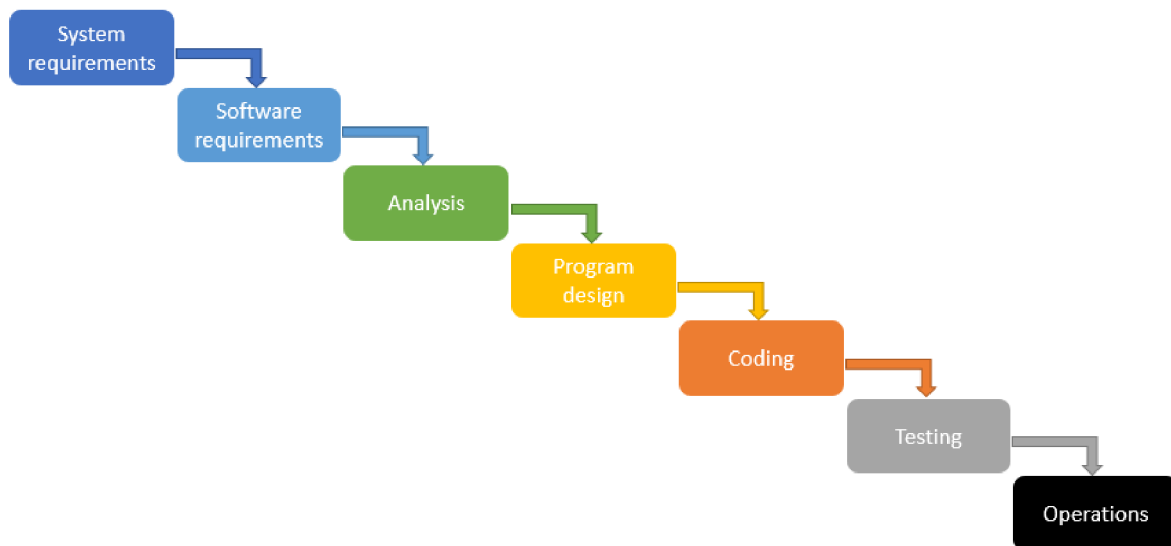
Figure 19: Waterfall
Source: Own processing according to Dolezal (2022)

The interesting idea is to combine this two method into hybrid agile waterfall. Basic waterfall phases are inside divided into scrum sprints with additional daily meetings. This can be beneficial for companies, which starts with agile methodology or for large companies, it also helps to provide better response toward unpredicted changes through project lifecycle (Hartel 2022).

1.3.2   Agile transformation and critical factors

The agile can be beneficial for every company, no matter the size and object of business. In is important to understand the agile principles and tools with the acceptance of agile philosophy (Layton 2020). Attributes of agile company are focus on the value for the customer; identification and optimization of all flows; reducing the waste; flexible response toward unpredicted situations within typical agile tools; simple organization structure with cross-functional teams; employees understand the mission and vision of the company and are motivated, empowered and have good level of self-management; level of the corporate culture is high (Doležal 2022). With the interest of being agile in supply chain according to Hartel (2022) several recommendations are listed:

- Corporate culture and management must be started with the implementation of agile approach. When they adapt to it, then they can prepare and train other employees. Without trust and independent actions, the agile transformation will fail.
- To put agile in use, it is advised to start with smaller projects.
- To effectively support the agile transformation, it is important to establish the standards by the help of project management office.

52

- Property training of every person, who is involved, is necessary. Managers should be the best leading example of the new approach. In order to provide to the employees an environment, which allows them to grown into self-responsible team members.
- Performance of the implementation of agile manner heavily depends on well-build teams (Hartel 2022).

Success of agile transformation is hard to secure, but with proper training and avoiding of the basic pitfalls, chances of implementation increase. According to Doležal (2022) adaptation of change can be conducted with the use of the eight-step process from John Kotter.

1. Create urgency= Identify the problem and create an urgency to pull employees, help them to see the need of the change. Leader must communicate the urgency.
2. Form a powerful coalition= Creating group with various employees from different management level. Transform the group into team or teams.
3. Create a vision for change= Define the vision, which will be followed and its strategy.
4. Enlist a volunteer army= Use all possible resources to secure leader´s effective communication. Spread the vision among potential, interest persons.
5. Removing barriers= Enable barriers which are blocking the change (structure, processes, …)
6. Create quick wins= Short-term wins are an evidence of change; it helps to motivated people.
7. Sustain acceleration= Leader must act to focus on keeping the acceleration, overcommunicate the vision throughout the transformation.
8. Institute change= Leader connected the success and the new behaviour with the culture evolution, took prevention step to prevent old habits to appear.
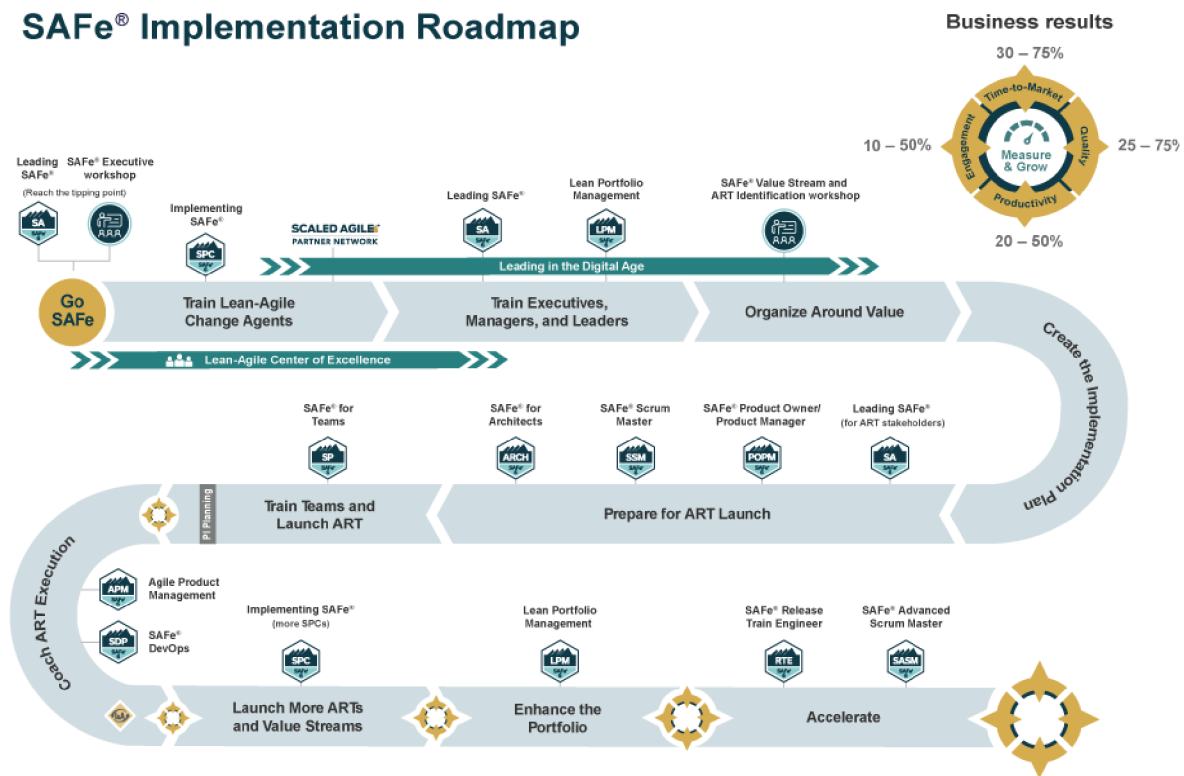
Figure 20: SAFe Implementation roadmap
Source: Scaled Agile (2023)

A practical example of agile implementation is SAFe Implementation roadmap (Figure 21), which is created according to Kotter eight steps. At the beginning is the creation of the sense of the urgency and the need of business agile transformation. Next is the conduction of coalition of trained people, managers, and leaders. That results into Lean Agile Centre of Excellence. The third step is to represent value flows, choosing the right business value stream to create Agile Release Train (ART) and to plan its setting. After that is enabled the initiation of the first ART with help of the „army", identification and removing of existing barriers starts. First positive reactions are represented and on them is created new ART. At the end, the wished change is realized, and agile transformation is secure, but also needs to be supported with an education of others (Doležal 2022).

The idea path how to reach the implementing of agile is conducted. But in every stage can appear some problems. In the following table 8 are the most common problems with possible solution listed. This so-called pitfalls are appearing when the transformation struggles with the lack of support from the top management. When the support is low, the project team tends to return to the old manners (Layton 2020).

Table 7: Common agile transformation problems

Problem	Description	Potential solution
Fake agile or double work	Use of some agile practise, but without agile principles, use of traditional waterfall deliverables and products. Attempt of hybrid waterfall, but creating double documentation and meetings, that result into burnout team.	Keep agile process in mind, find agile coach from outside of the company.
Lack of training	Overload of training books, videos, blog, or papers is not effective that hands-on training class. Lack of training says that the organization have lack of the commitment in agile methods.	Provide training and implement into the strategy. Skills and knowledge are critical success factor for agile application.
Ineffective product owner	Product owner is non-typical role, wrong assignment or poor motivation can undermine all product developers effort.	Choose the right person, with needed knowledge, but also temperament.
Lack of automated testing	In order to secure smooth sprint, it is important to have automated testing, because the manual one is time demanding.	Find the most suitable, low-cost, and even open-source testing tools.
Lack of transition support	The successful transition is very hard and not guaranteed. It is important to secure the first and right transition with the experienced people.	Find help of experienced agile product development so called agile coach.
Inappropriate physical environment	Poor team collaboration caused by lack of space.	Have team in the same area.
Poor team selection	Not motivated people even tend to sabotage the new approach.	Consider potential of members, mainly in the field of versatility and willingness to learn.
Discipline slips	Avoid old behaviour, like delaying testing until the end of the sprint.	Manage the progress with daily meetings, use retrospective sprints.
Diluting until dead	Slipping from new agile approach to the old waterfall.	Take retrospective sprint, remember that maximizing work is not essential.

Source: Own processing according to Layton (2020)

The overall, the critical factor of success are deeply connected with people and their willingness to learn and to adapt a new way of doing things. Overall agile application into company culture is beneficial. According to Layton (2020) main benefits are higher customer satisfaction due to emphasis on customer involvement during the project development; better product quality by the setting of agile project processes and tools; reduction of risks by better organization and dividing processes; increased collaboration and ownership; improved performance visibility; increased investment control caused by daily meetings, face-to-face conversation and sprint retrospective; improved predictability; higher team morale (Rigby 2020).

1.3.3   Examples of successful agile implementation in SC

The following example describes a successful implementation of agile methods in various industries, in order to prove the variability of agile approach. Listed case studies are demonstrating an update in the supply chain of companies in order to increase their performance, to improve their cooperation with suppliers and to gain better the relationship with the customer.

The first example is about transformation of a firm´s logistic, from decentralized inbound SC to a centralized 4PL-driven inbound SC. This transformation was performed during 2014-2016 in AGCO, which is world leading producer of agricultural equipment. The AGCO company has more than 20,000 employees all over the world, their vision is „High-tech solution for farmers feeding the world" therefore the company focuses on innovations to enhance the market. Securing the wished improvement, the company have decides to boost their collaboration among their partners in SC. First step was to execute the innovation into all plants, they used tool as machine data acquisitions (MES), augmented reality, self-controlling material flow and fully integrated shop floors. All of the mention above was based on Industry 4.0 and big data. That results into Smart logistic, the quality and efficiency have increase, while the SC´s agility and the resiliency towards risk improved. By better connection of people, processes and technologies, the company level-up their supply chain. After first successful stage, number of employees, knowledge and innovation increased. And with that also a number of challenges. New questions were addressed, such as: How to manage this high level of complexity? What is our global strategy? How to connect the flexibility with security in the volatilized market? The company position was highly decentralized due to the rapid expansion, AGCO faced challenge in integrating the newly acquired local, regional, and global brands. The level of complication was even higher because of expansion in supplier base, production sites, brand-focused development, various IT systems architectures, master data and many more. Specifically in Europe had AGCO ten separate productions.
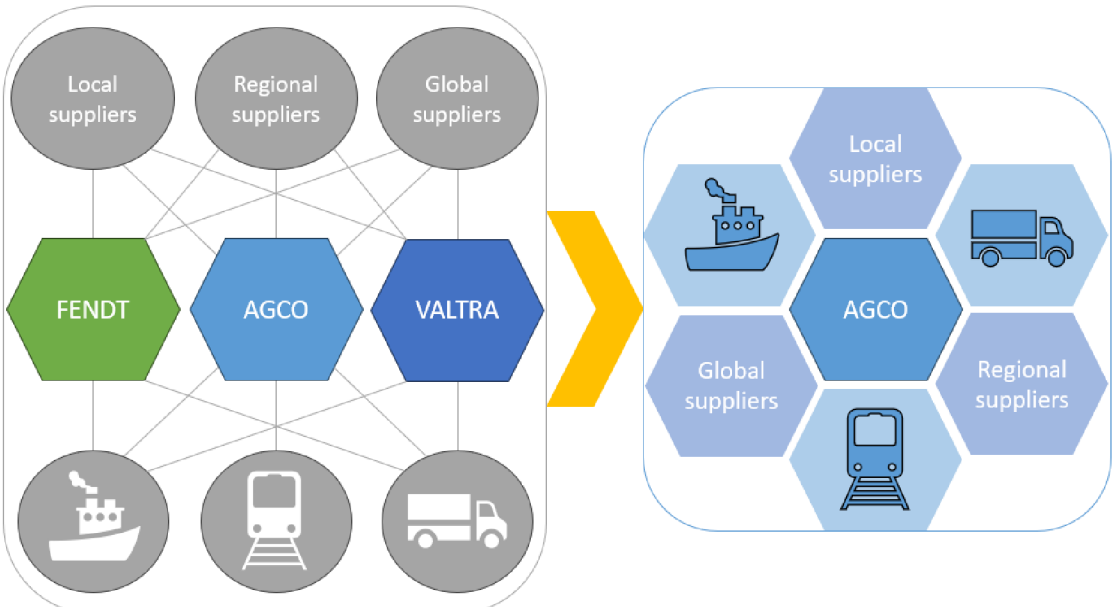
Figure 21: Transformation from traditional inbound logistics to Smart logistic
Source: Own processing according to Ileri (2022)

The new challenge was to enable the smooth flow of the material despite the network complexity and at the same time secure a push for high level of connection. At this point, project urgency was recognized. The first phase was characterized by defining the objective of the project. The object was to sustainably increase the company performance and to reduce the costs. In order to achieve this, corporate strategy had to be investigated and adjusted along the value chain. For this reason, parts of business such as sales, R&D, purchasing, production, and logistic, must be in the best possible way harmonized. Main priority was the inbound logistic, cause by the connection among plants and procurement market. An additional task was to make processes more transparent, proving data basis to actively support the new changes. To fulfil this objective, AGCO was counting on the involvement and experience of its employees and partners. The project conception was all about redefining the inbound processes and systems from scratch. With that helped cross-site team conducted of SC experts, they mentioned three alternative:

1. Creation of an internal organization.
2. Full outsourcing by an external partner.
3. Conduction of hybrid approach together with an external partner.

The management have decided for the third alternative. They searched for 4PL service provider, which would secure the neutral decision-making, the long-standing planning and effective control. 4PL services provides a whole SC management including the evaluation, design, construction, implementation, and measurement. After the found of the 4PL partner, the communication within IT system must have been adjusted. The easy access to information was a key condition for success. New IT system was conducted from four IT-subsystems based on Big Data to support the process and cost optimization. The next step was to monitor and control the new smart logistics. Testing was used to find any errors; analysis was conduct automatically in periods. Each test was provided to involved partners. Outcome of this phase was, that increased transparency, clear communication and new process standards led to positive feedback from all network partners. Last stage of the project was the implementation, which was considered as successful due to lower cost of 28%. The use of AGCO Smart Logistic enabled the company to have comprehensive neutral view of the inbound SC and that results into extraordinary transparency and high-level agility. Due to that, optimization in all plants was allowed. The transformation positive influence a sustainable on-time delivery and increased productivity. The change is visualized in figure 22 (Ileri 2022). This example describes the new trends in SC and put emphasis on close connection between people, processes, and technologies.

This example is about adopting Kaizen philosophy in an existing retail warehouse and to motivate a team to adjust to it. The project took place in warehouse located in German Bavaria region. The project initiative was launched by managers, who have decided to reorganized in order to gain positive economic turn. The first part was to investigate the warehouse itself and employees working there. Condition of warehouse was described as very poor orderliness and cleanliness; absence of fixed and visualized places for work items; technical equipment was old but sufficient; poorly maintained production structure (old items); poor and almost not existing basic structure and all mentioned above were resulting into increasing waiting time for fulfilling the customers' orders. The employees were described as willing to learn new ideas and open to adjust to continuous improvement process; employees have identified gaps in areas of leadership, know how, prioritization of tasks and poor organization of shift times. After summarizing the precondition, a project has started. The project goal was to applied Kaizen into organization and to create the best industry-specific warehouse in the region. The time measurement was one year. Project organization is in figure 23. The emphasis in Kaizen method is continuous improvement of all involved employees.
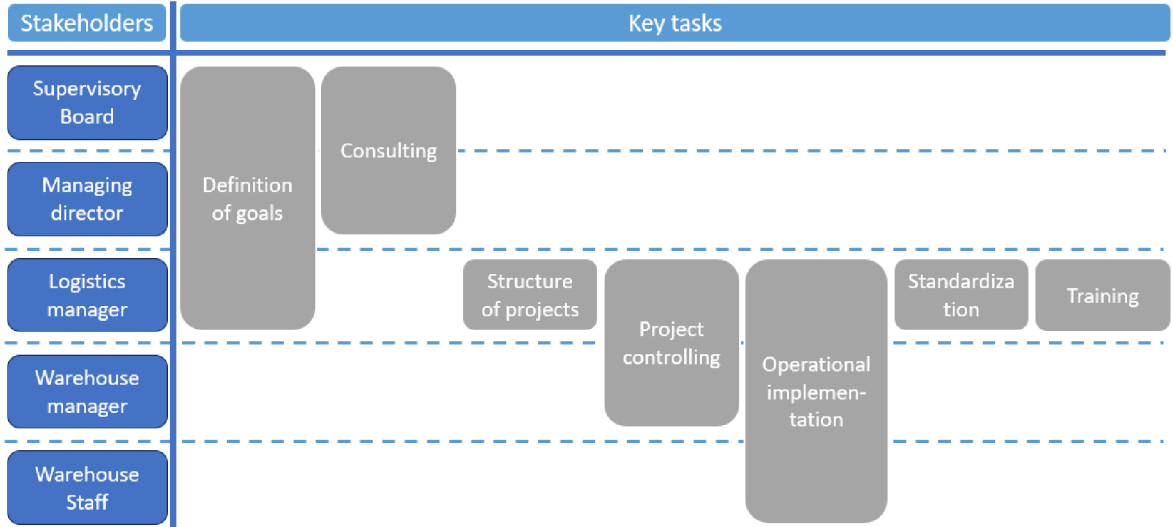
Figure 22: Project organization of warehouse
Source: Own processing according to Schwämmle (2022)

This first area of improvement was corporate culture and strategy. Basic step was to provide a kaizen training for employees, to obtain all necessary technical knowledge. Way to learn was conducted by 6S, key was to lead employees to self-discipline. The process of learning Kaizen was discussed on daily meetings and on larger scale through a monthly feedback. Every discussion was open to any reminders because an open communication is considered as the important feature of new culture. Leader of the warehouse had become an example of change, he led positive change

in discipline, order, and cleanliness. The strategy was according to the PDCAST cycle, which is divided into six phases, plan, do, check, act, standard and training. Continuous improvement was supported with the repetition of PDCAST cycle. The outcome of hours of training of all staff and adjusting the culture, result into optimized warehouse structure, established and well-organized workspace, the improvement of processes led to lowering expenses and saving more money to purchase new work equipment. The goal of the project was fulfilled, and the warehouse became a leading company in their region and moreover they have proved the benefits of Kaizen (Schwämmle 2022).

Last example is about modular logistic at Würth. The company is the world´s leading supplier in the field of fastening and assembly technology. Würth is using project logistic modularization to obtain a multi-stage project management approach. After identification of urgency to change past basic attitude towards certain market segments, management initiate more market- and customer-oriented approach. Previous approach was characterized by highly specialized and standardized concept. A new project organization was based on change of the whole project mindset, important aspect was to adjust the perception of project managers. Instead of viewing manager as creator, rather view him/her as an important assistant, who is skilled with all available resources and tools. Manager supervised a project schedule, set boundaries condition, and check on availability of resources. Huge emphasis from manager´s side was put on moderating and caring about motivation of his/her team. Each team has its separate budget in order to enable quick and unbureaucratic decisions. Another aspect of the unique Würth project approach was multi-channel integration of large variety of logistic modules. Each structure is based on standardized attitude, but is also adjusted for each customer, to optimized and secure the best possible cooperation. The new enhanced logistic have brought lower costs, lower stock level and increase level of service, productivity, and the whole logistic performance. The new system appeared as a highly flexible with good potential for future optimizing. High agility in logistic overall increased the company performance and help them to learn the e-business to reach new customers (Becker 2022).

An overall outcome is that agile can be very use-full for logistic department. The right implementation has positive effect on the company´s performance and its relationship with suppliers and also customers. By better understanding of the whole SC and the company position in it and by improved knowledge in the field of agile management, the company can through right communication and cooperation secure their position on the market. The company can effectively fight the competitors and can better face any grudging challenges (Hartel 2022).

2 Case study

With a collaboration of the world-know enterprise, a comprehensive investigation into supply chain relationships is going to be described. Field of interest will be in logistic department; the case study is going to be grounded on the data provided from one of the plant of the company. The decision behind selecting the logistics department was due to the fact that supply chain management is mainly conducted by this part of company. After introducing the company and its strategy towards supply chain management, chapter focus on use of agile methodology on real examples is going to follow. Author of the case study was a part of the project and have actively contribute to the agile implementation.

2.1   Company

Worldwide has the company about 25000 suppliers for their 220 plants, overall has 780 warehouses, which are supporting the smoothest possible flow of goods. Goal of the company supply chain ambition is to manage the cooperation among the whole supply chain´s partners by collective responsibility to sustainability and ethical approach towards SC environment. Also, to find common solution in field of social and ecological challenges in future.

2.1.1   Corporate SCM

Before introduction of the corporate SC strategy, is good to investigate closely the influences behind it. The environmental aspect of the business plays key role in decision making and performance of the company. The utilization of the circular economy is paramount for the company, as it places great emphasis on the current trend of sustainability. This not only helps in reducing costs and the consumption of natural resources, but also aids in attracting a larger customer base. The additional reason for this focus is that the procurement process contributes significantly to the carbon footprint. Consequently, the company has set quantitative targets to be achieved by the year 2025. These targets primarily aim to decrease the usage of new raw materials and increase the utilization of recycled materials in packaging, as well as incorporating recycled plastic in the product housing. As a whole, the supply chain management policy is greatly influenced by the objective of reducing CO_2 emissions. An integral aspect of the business involves the utilization of various essential raw materials, including conflict materials such as 3TG, aluminium,

nickel, and natural rubber. The challenges associated with this group of problematic materials necessitate the company to exercise caution when selecting suppliers. As a result, there is mounting pressure to establish more efficient and flexible supply chains. Among ecological aspect of business belong environment protection; proactive climate action; lowering of the water consumption and also improving the quality of water, air and soil; active contribution into recycling and waste management and more. In figure 23 is display the current strategy, which is implemented in plants. The realization is taking place on three levels, the first level is carried out by contribution of customer by recycling parts of the products. Second level is realized before the end pf products life, by repairing it and using it again. The third level is realized in production itself, by more efficient use of material.
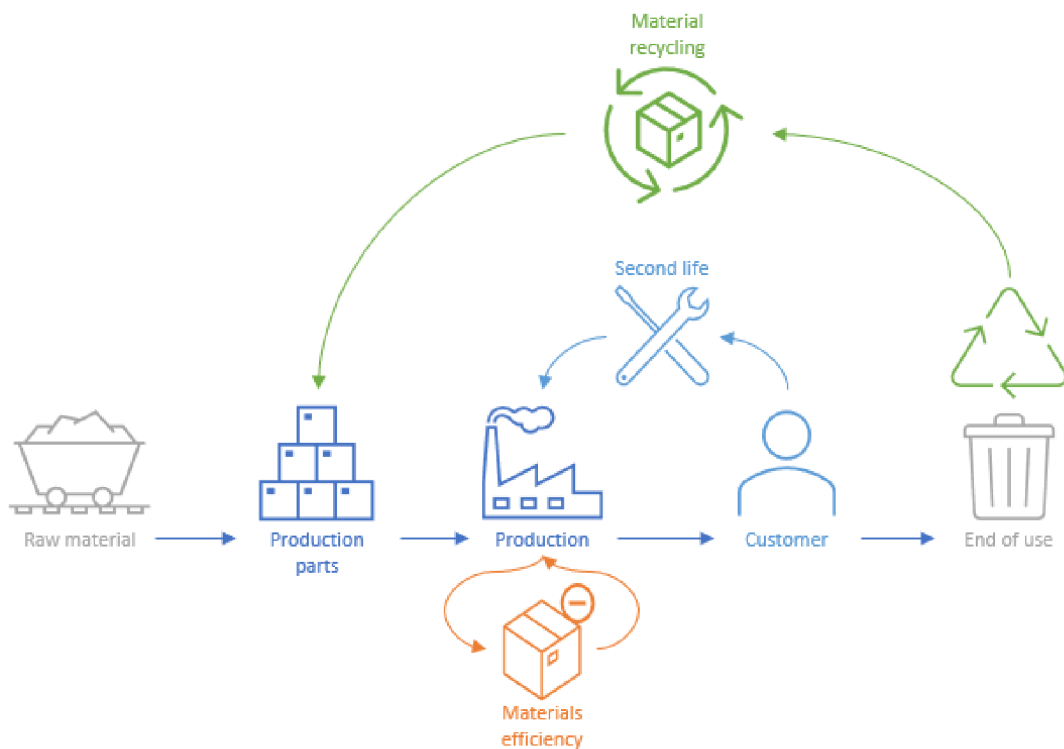
Figure 23: Recycling strategy
Source: Own processing according to Company (2022)

Besides the ecological side of the requirement, there is also social side. Company responsible SCM is defined by requirement in the following table 8. Requirements are supplemented by assessment and further development. Addressing requirements for improvement in for example in quality and CSR, the company has decided on monitoring supplier performance and to support supplier in improving their performance by providing them trainings.

Table 8: Responsible SCM

Requirements	Assessment	Further development
Terms and conditions of purchase	Sanctioned party list screening	Individual measures
Codes of conduct for business partners	Supplier classification	Reassessments
Agreements on quality and CSR	Supplier assessments	Training
Policy for conflict raw materials	Reporting systems	Supplier days

Source: Own processing according to Company (2022)

Social standards are very important for the company, that is why they have built up requirements in this area for any potential business partner. Company emphasis on human right by fighting against modern slavery; prohibition of child and forced labour is important; focus in providing equal opportunities and fair conducting; emphasis on health and safety is requested and more. Not only does the company obligated themselves to observed those requirement, but also each of their business partner must be in alignment with the corporate social and environmental requirements.

On those requirements arise SC strategy, which can be described as: finding the synergies along the SC and save costs by being more cross-functional, open and more trusting cooperations between associates and executives. The corporate SCM has core task in ensuring robust and agile SC. Crucial for the management is use of innovative technologies and optimizing connection of flows. Used technologies are based on the newest trends such as IoT, Industry 4.0, AI, digital twins, automatization and more. The company subtask is to keep maintaining the highest standards continuously. Logistic and purchasing department are key areas, which should secure better overall performance for the whole enterprise. These two departments are pioneer in applying new tools and technologies. The optimization of SCM can be achieved through the utilization of trends and innovative approaches. The newest strategy of the company can be summarized into three terms: digital, competitive and responsible. The goals are monitored by KPI focused on logistic quality by evaluating logistic incidents, costs and delivery performance. In order to ensure improvement in these areas, the company is implementing four strategies to enhance existing processes.

1. P2P= process to pay
   o The P2P focused on inbound logistic, each process is supported by so called digital twin, which already starts at the supplier and at the same time in ERP system. Reason to use this tool, is to secure the best possible data transparency. Use of the right type of labels is important and contributes to easy data transfer and with combination of correct packaging, the transportation becomes easier and more united. The tracking of the goods is accessible, and it enables the transportation of IT system to plan more efficient as well as contributes to optimizing the utilization of trucks and help with reducing the CO_2 levels. Claim management closes the P2P

process. Goal in this field is to have 0-tolerance to failures and to have faster communication with all interested parties.

2. O2C= order to cash

   o The second strategy is about outbound logistic. The flow of information and money play an important role in optimizing SCM. Main goal for O2C is to reduce the risk of financial defaults to zero. Mostly is this part carried out by central financial department, they are investigating legal aspect for each country, adjusting financing processes and informing the interested plants and their departments. Goal is to secure more and later fully automated invoicing by the support of ERP system. Consequently, the customers claims are going to be improved with the alignment to the global standards.

3. P2F= plan to fulfil

   o Third part revolve about all logistic processes, beginning with the creation of forecast by analysing previous demands and current market situation. This plan is developed with closer cooperation with sales, procurement and logistic department. On the forecast more detailer operation plan is developed in order to create and keep a balance between stock supply and customer demand. The success of the operation planning is depending on the level of cooperation among the whole SC. That is supported by ERP system and various IT tools, additional task to it is to create the transparent data flow, which will be completely online.

4. I2D= intralogistics to demand

   o This strategy cares about intralogistics to demand, this provides guidelines how should be tools for digitalization and automatization used in order to satisfy the customer. Focus on the flow of material starts already by the supplier. For their more efficient performance, their access to the company planning system is crucial. In this field, tool called JIT is applied. Consequently, for quicker and more smooth flow of material a unified transport management is required, that includes plant, supplier and shipper. The sorting of goods is supported by technologies. This growing trend is in praxis carried out by cameras, scanners and various labels or QR-codes. That also enables warehouses to optimize and better control their real time stock management. But the use of technology is furthermore used in the warehouse itself. Actual material status from production is project by dashboard in warehouse and it informs the employees about it. Automated vehicles are used for

inside transportation, easier movement of goods is bolstered up with unified packaging. All mention above contributes to better traceability.

As mentioned above purchasing department has a key role in SCM, the main areas of the interest of the corporate purchasing can be divided into suppliers and digitalization. Comprehensive goal for every purchasing department in the company is a continuous improvement towards customers' requirements. That can be achieved through reactions, active use of innovations, creating of connected working environment and by digital SC. The company policy is putting huge emphasis on close collaboration among their 25 thousand suppliers. Improved cooperation should secure by faster purchasing processes, which will contribute to a better transparency through digitalization. In the case of suppliers, sustainability and responsibility are key terms to main corporate goal, point out to be more resource friendly. The company is well aware of the resource limitation and is already taking steps in nature protection, these emphasis also on the suppliers. The company also rewards their suppliers periodically their reward program. The evaluator criteria's are not only cost and quality, but also delivery reliability and sustainability of their business. The corporate approach to suppliers is active in order to have flexible pricing strategy. Supplier can also make use of the company financing program for business partners. Also, the close cooperation with all partners aims to proactive risk management, that helps to prevent any business disruption. Risk management for the plant is going to be closely introduced in chapter 2.1.4. The key role lays in effective communication. For this company has Corporate-Suppliers Software, which have monitored that thanks to the use of it, more than 85% of all communication is managed by the use of cloud and online platforms. This software enables better data acquisition and exchange. Even though that this have proved better quality of communication, the company wants to improve by applying a new 4 modules procedures.

1. Supplier Management= To this part belong all general company data like contacts data, certification and turnover information. Suppliers KPI can be found under this module, visualization of product quality, on-time delivery and supplier performance.
2. SC Collaboration= In this module all important documents (e.g., drawings, technical specifications, …) are exchanged. Shared communication platform for scheduling agreements, financial data and more is part of SC collaboration. Also, for better managing of the company inventory, shared VMI is available for both sides, the supplier can visualized company stocks and see their current plan for the production.
3. Procure to pay= As it was mentioned above this emphasis on e-invoicing.

4. Quality management= Automated control of received goods is visualized and documented by electronic inspection reports. This helps to have more fast complaint management, additionally complains are handled by 8D reports. Each control is proved by the enterprise quality norm system.

The activities between the purchasing department and suppliers are strongly interconnected with IT technology. This is a determining area for the purchasing department and the company is fully aware of it. Newest trends are bringing many opportunities. Currently is purchasing department taking an advantage of IoT and artificial intelligence (AI). Goal is to have digitalized future and that can be secure by prudence and sustainability. The company is also aware of the possible unpredictable risk, which are connected with AI. Therefore, the enterprise has developed an Ethical Guidelines for AI. The codex is underlining the importance of innovation and its alignment with social responsibility. No decision based on AI should be accepted without a human arbiter, AI is tool, which should help not lead. Company strives for safe development, transparent and trustworthy AI products. Nevertheless, legal aspects are taken into account. This principles are drawing a red line for AI. Generally, digitalization and development of IT is very important, main steps in this field are steer through improved analysis, smart automation and digital innovation.

The efforts of the purchasing department are improving data quality, reducing of workload and decrease of process time execution within achieving great quality and sustainability. This will be achieved by active cooperation with the supplier and by the use of the newest knowledge on the IT field and all of that will contribute to the faster fulfilment of more individual customers' requirements.

As well as the purchasing department contributes actively to the success of the SC performance, the logistics provides valuable activities, which are as well crucial as purchasing activities. Main challenge in the field of the logistics is to find solution for the most effective and efficient transportation from 220 plants to the customers every day. The company sees the digitalization as a key aspect for improving logistic activities and processes. IoT and AI are considered as suitable tool for monitoring each flow of goods and to optimized processes. The company itself developed a unique logistic concept, in order to have more competitive, reliable and more stable SC. In praxis, use of digitalization looks like a proactive use of innovative technologies. Automated software tool helps in everyday work in warehouses by managing, visualizing and optimizing processes, goal is to have current production situation in real time on dashboard in the concrete plant. Another example of the innovative active approach is a tracking app, which includes connection of every participant

in the SC. This application aims to reduce any errors, helps to optimized processes by aggregating data, provides support by decision making and the most important feature is that it provides an end-to-end process monitoring. The app is also preventing information overload of employees by different modules for different role of the participant. The process of inserting the data is user friendly to ensure easy, but reliable and valuable information input. Each input is only provided to the right persons at the right time by automated notification system. The application makes real time tracking easier and contributes to more flexible production plan. Part of this app is focused on improving the work of transportation employees by facilitating arriving and departing processes, that helps to register quickly. Additional benefit of this tool is reducing of paperwork.

The strategical logistics approach is not only focused on costs, time and transportation quality indicators, but also on transparency and efficiency. Those last two terms play a key role in the whole logistic strategy. The company is actively contributing to the lowering CO_2 emissions along with the aim of better resource conservation. For better logistic planning is transport management centre (TMC) used. This software is analysing and optimizing logistic networks by considering the design of network, cross docks and hubs; it defines standard routes by calculation transport distance and implements better routs; tools focus on balancing of load of the transport and at the same time it monitors KPI; the last feature of this software is automated self-billing procedure. The integration of new technologies in the company has resulted in the integration of targeted innovation management in logistics projects. Company is fully aware of the opportunities, which are arising from the new technologies. Example can by that logistic teams are allowed and motivated to experiment with an augmented reality and its use in projects. The company is dedicated to preparing its employees for the future of logistics through training and skill enhancement, all of that with an effort to enhance sustainability, efficiency, and customer satisfaction with high-quality service delivery.

The corporate strategy for SCM is carried out by those two departments. Company is putting emphasis on the best possible cooperation between those. Tasks and activities are linked and cannot be directly written to only one department. To provide better insight into the company real SCM and the role of logistics in the SCM, closer investigation is going to be carried out in the following chapter 2.1.2.

2.1.2 Plant SCM

The case study is closely focused on plant in Germany. The SCM is coordinated by logistic and purchasing department at different levels, occasionally is quality department supporting various processes. In initiating phase, where is a new supplier contacted and its product is evaluated, the purchasing and the quality department cooperate and negotiate prise condition. During that logistic clarifies packaging requirements in terms of product protection, stack-ability, number of pieces, proportions of each package and the whole transport unit and more. All of the necessary information is summarized into unified packaging data sheet. This sheet contains raw data and pictures, so the recognition of the goods is user friendly and easy to access. For the veracity of the document is the supplier and logistic plus purchasing department responsible. After the agreement of new contract, communication with suppliers is mostly carried out by logistic department. In the event of any disruption, the purchasing and quality departments collaborate to identify and implement appropriate solutions, taking into consideration the nature of the incident. The supplier performance is actively monitored by the central company tools, which are going to be described in the following chapter about logistic quality.

The plant SC process begin with suppliers of raw material or semifinished products. Based on the production plan, the delivery schedule is adjusted. Transportations are planned with alignment to the production plan, important aspects that are influencing the delivery schedule are location of the supplier and the mode of transportation. If the materials are urgently needed, the logistics department selects the fastest mode of transportation, considering the associated costs. A significant aspect of the plant supply chain involves the use of an external warehouse, as the plant's capacity is limited. Based on that, the materials can arrive at the plant warehouse or to the external one. Dayli interconnection of plant and external warehouse is managed by logistic. The flow of material from external warehouse to the production is carried out by shipper approximately 7 times pro day. Ones is the product or part of it done, it is packed and shipped. The non-finished goods travel to another plant, where it is used into various products. In the case of finished goods, the products are shipped into a central warehouse in Germany. Subsequently, the products are distributed to regional warehouses based on additional market forecasts, ensuring prompt delivery to the final stage of the supply chain and ultimately to the end customer.
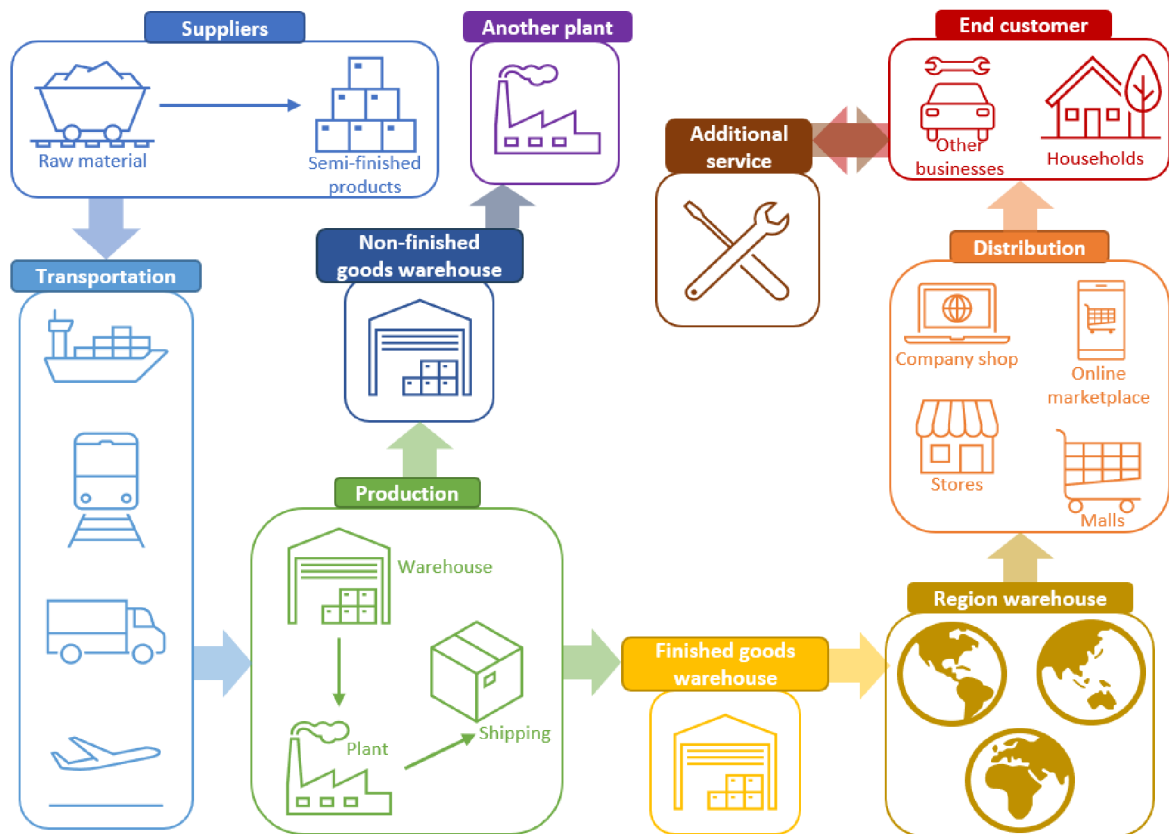
Figure 24: Plant supply chain
Source: Own processing

The role of logistic is determined by various tasks. The planning and adjustment of production stands as a critical responsibility of logistics. Planning is based on comprehensive forecast, which is based on market analysis, customer demand and production capacity. The company strives for the fastest response towards any changes, so that is why logistic has for each product its own manager or manageress , who cares and monitors the flow of materials. In a case of missing material or some production line disruption, production informs the responsible person immediately and he or she finds solutions of escalated the matter to further managers. An essential aspect of logistic tasks involves participating in daily management meetings, during which any issues such as a decrease in workforce due to illness or accidents are addressed. Subtasks of logistic team are maintaining the transportation; controlling and adjusting warehouse capacity; finding the scrap potential with emphasis on lowering stock costs; managing of custom duty and more.

The case study will continue by investigating more into the first part of the SC. Strategy towards suppliers is based on overall SCM strategy from central logistic and purchasing principles. Following chapters are going to be focused on suppliers their performance in the company SC.

2.1.3   Supplier´s overview

The most important goal for logistic is to secure the smooth flow of the material for the production, however, maintaining a good and strong relationship with the supplier is paramount. The number of suppliers for the company is 309. In the following graph, lands of origin are displayed. The location plays a crucial role in creating forecast. In order to fulfil department goal, calculation is conducted with emphasis on shorter or longer delivery distance. For instance, shipments from China typically take approximately four to six weeks for transportation. First contact is initiated by the purchasing department, after successful commitment to the partnership, communication is shift to the logistic. Suppliers are delivering various raw materials, semifinished goods and packaging materials.
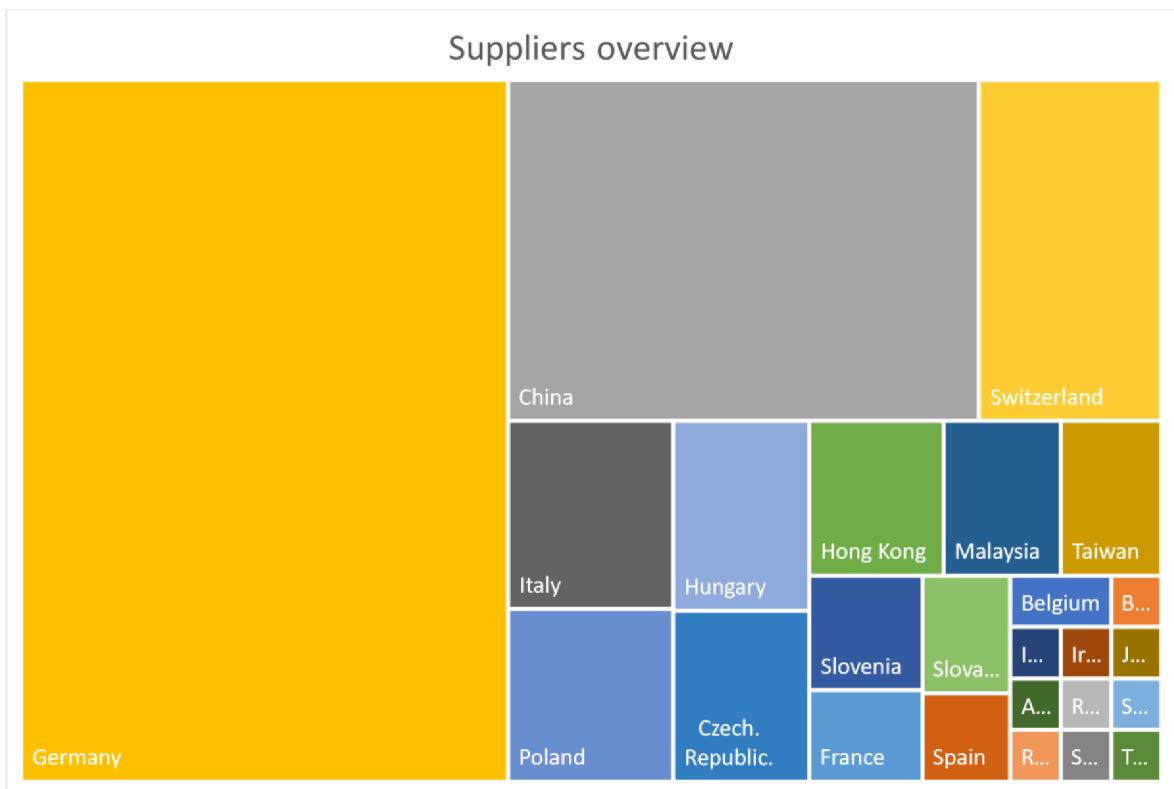
Figure 25: Suppliers overview
Source: Own processing

As it can be seen from the figure 25, most of the suppliers came from Germany, that contributes to the fast delivery and short time in case of adjusting packaging or new material protection. On the other hand, second most common land of the supplier origin is China, that refers to the lower costs, but disadvantage is longer delivery time.
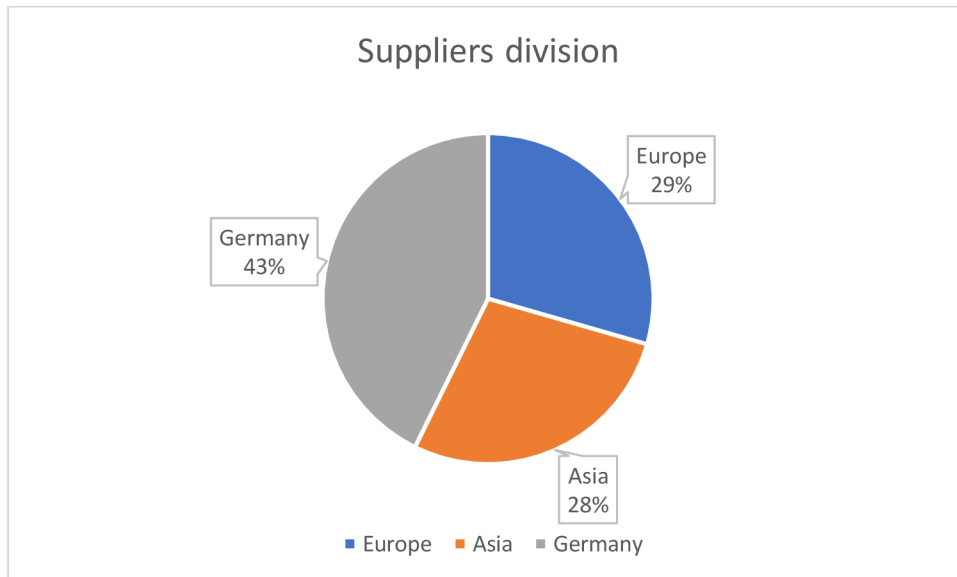
Figure 26: Geographical division
Source: Own processing

From geographical view on suppliers division, 72% of companies are located in Europe, that makes planning slightly easier than in case of Asian companies. International companies make 43%, from this reason communication is handled in German language. But in the case of 57% of suppliers, English is requested, because of the trend of globalization. Also, the communication is impacted by the fact of different cultures, nationalities and traditions. That is impacting the production planning, one example can be addressed. European countries and most parts of the world are celebrating in December winter/ Christmas holydays and that means, that recipient of goods must be adjusted, because of lack of employees. But on the other hand, China is celebrating new year at the end of January, when most of the production stops and people are not working. Regarding of this two main occasions in the calendar, the production must be adjusted. The international SC is influenced by various factors and some of them are resulting into opportunities, but some of them may result into possible threats, which are described in following chapter.

2.1.4 Risk matrix

The proactive stance of a company towards new management knowledge is evidenced by its risk-management strategy, which plays a crucial role in the company's strategic approach. Having an extensive overview of the environment around the company, it is beneficial to perform an analysis of the possible risks. The company is using risk assessment table for better risk management. The concrete risk is break down by process analysis accompanied by direct root causes description focused on errors and external influences. The process analysis is followed by risk evaluation and

risk response analysis, which is already considered in risk evaluation. In that part preventive and detective controls are suggested. At end of row, risk score is calculated, and the further respond is ask, if it is needed. The table structure was created with alignment to the FMEA table. The report is complemented by risk assessment concept, where are values and limitations for the categories written and the risk score is described.

For the case study a simpler risk assessment was created. Firstly, possible threats towards company were found through brainstorming activity. Outcome is recorded in table 9, the team has decided on divination into three groups. It is important to address, that this analysis cannot cover every risk, because of any unforeseen or novel risks may emerge at any time.

Table 9: Company threats

Internal	External	Global
Material damage	Loss of supplier	Pandemic
Lower production	Transport accident	War, global conflicts
Machinery disruption	Delay of transportation	Political changes
Fire	Poor quality of material	Grown of energy costs (oil, electric)
Overstock/ understock	Bad packaging	Nature disaster (flood)
Lack of staff	Competitors	Strike
Communication gaps	Low customer interest	Currency fluctuation
Theft	Cybernetic attack	New EU regulation (CO_2 levels)
Forecast errors	Supply chain disruption	Market change
Wasted talents	Costs instability	

Source: Own processing

The following step was to evaluate the risks by the logistics team. Risk matrix was established for each identified group. On scale from 1 to 5, employees evaluated the likelihood of occurrence of the possible threats and its possible impact on the company. Each risk was rated and displayed on a risk matrix for better identification of risk score. The results are summarized in four figures, three are focus on each group of threats and the last one compares all groups. For two groups, simple Ishikawa diagram for one example of possible risk was conducted, for the purpose of better understanding of the root cause behind the issue and to address the company steps towards it or to point out absence of preventive steps, following by suggestions action.

Figure 27: Internal threats

	Possible risks	Likelihood	Impact
1	Material damage	2,75	3
2	Lower production	3	3,75
3	Machinery disruption	3	4
4	Fire	1,25	5
5	Overstock/ understock	3,25	3,75
6	Lack of staff	3	4
7	Communication gaps	2,5	2,75
8	Theft	2,5	3
9	Forecast errors	1,75	4,5
10	Wasted talents	1,75	1,75
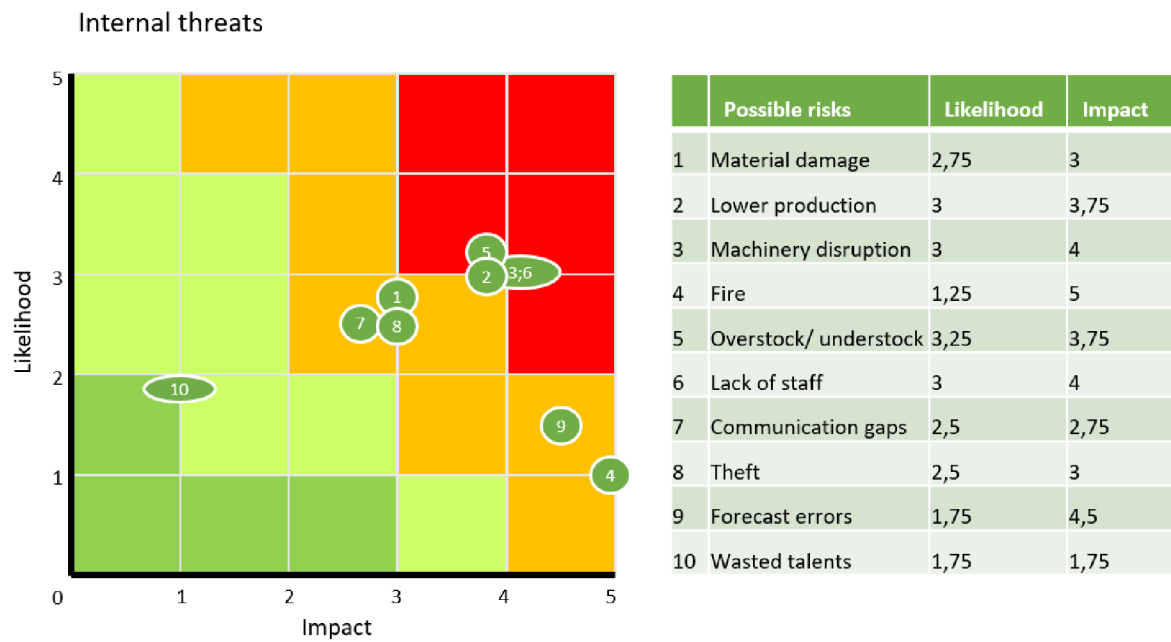
Figure 27: Internal threats
Source: Own processing

Internal risks are factors that the organization can directly control and address promptly. The occurrence of these internal vulnerabilities is greatly influenced by the commitment and training level of employees. Company is in the case of internal risks performing 4 of 5 risk strategies. Risk retention, diversification, transfer and reduction. Company steps are active and preventive, mainly focused on trainings and preventive controls. However, as previously stated, certain incidents may be unavoidable.

Most of the internal risks were evaluated into group with substantial risk score. According to the company employees, the biggest likelihood has risk of lower production, machinery disruption and lack of staff, all of that can lead company to the smaller production volume and in extreme case it can result into longer waiting and delivery times for consumers. Logistic employees have evaluated wasted talents as a risk with the lowest likelihood and impact. Reason for that is the company talent policy, which cares for employees skills training and for employees retention. Interesting finding was that the lowest likelihood was recognized in a case of fire accident, but the impact of it, is considered as the highest one. The fire can cause serious damages in production and even on persons.
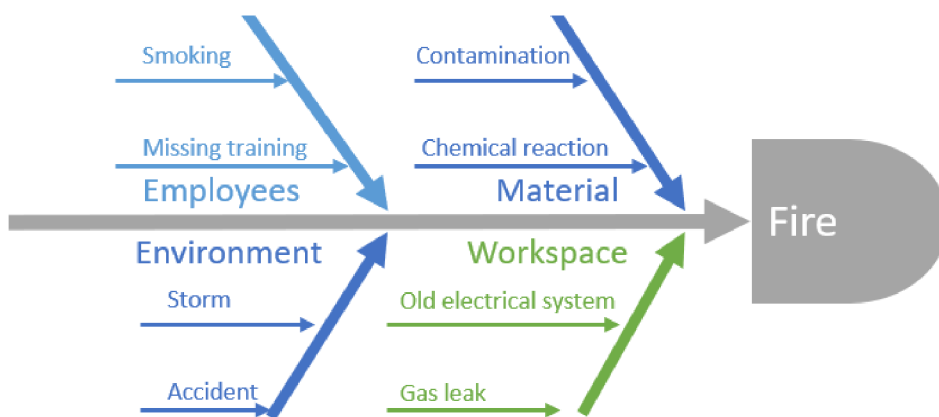
Figure 28: Ishikawa diagram: Fire
Source: Own processing

Figure 28 address possible reasons for the fire, by Ishikawa tool main causes for this threats can be employees, material issues or some kind of workspace accident, all of that can be solved by preventive steps. The preventive steps are conducted by regular training of employees. Additionally, company has standards for handling materials and cares about periodical inspection of workspace, this contributes to the better safety of employees and business. Nevertheless, the causes from environment are highly unpredictable, some preventive steps can be addressed, but overall, it can be solved only, when it happening.

External threats are rarely unpredictable, but by implementing well-established processes and effective risk management strategies, their impact can be mitigated. From the figure 29 it can be seen, that six from 10 risk are in the red field and are considered as high threatening risk. The risk, which was considered as the most threatening, was cybernetic attack. The strategy against this risk is to educate all employees, no matter the position in the hierarchy. The trainings how to identify spams, or another potential risky email is carried continuously by sending an "examples" or by conducting online trainings. On the other hand, a risk with the highest likelihood was costs instability. Regarding the actual economic situation, this is highly probable and considered as very threatening. To address this, active market monitoring is essential, along with the ability to adjust production plans and implement an active price policy. Bad packaging is located on the boundary of moderate and substantial risk score, the likelihood was considered as one of the lowest. The resound behind it, it that the company has well established packaging policy. From mentioned above, it is evident, that company has built up many guidelines towards various risks.

External threats

	Possible risks	Likelihood	Impact
1	Lost of supplier (example: Bankruptcy)	2	4
2	Transport accident on way	2,25	3,25
3	Delay of transportation	3,25	4
4	Poor quality of supplier (low production, quality)	2,5	4,5
5	Bad packaging	2,25	3
6	New competitors	2,5	3
7	Low customer interest	2,5	4,5
8	Cybernetic attack	2,5	5
9	Supply chain disruption	2,75	4,75
10	Costs instability	3,75	3,5

Figure 29: External threats
Source: Own processing

However, the most effective way to manage external risks is to place emphasis on each employee's skills and involvement, as well as maintaining strong relationships with business partners. By ensuring that, every individual within the organization understands their role in risk management and by maintaining open communication with external stakeholders, the impact of external threats can be minimized.

A current example of the externa threats is a transportation deviation. As previously stated, shipping from China or other Asian nations typically takes four to six weeks. However, in March 2024 due to political tensions near the Suez Canal, ships are now compelled to circumnavigate the entire African continent, resulting in extended delivery times from six to ten weeks. This results into big delays in production planning. For this example, the root causes of this disruption are certain, but transportation delays can have further origins, which are displayed in figure 30. To lower the impact of this risk, the company can be building up safety stocks or quickly order for the supplier, but with different type of transportation such as air transportation or to order from closer supplier. All the solutions are costly but prevents from delivery delays to the customers.
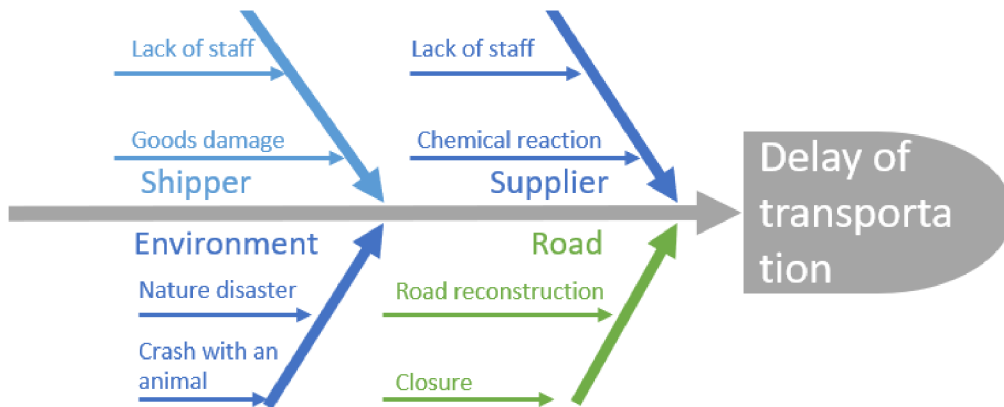
Figure 30: Delay of transportation
Source: Own processing

Global threats, the final category of potential risks, are characterized by their high level of unpredictability, making it extremely challenging to formulate an effective response. Typically, these risks are addressed in the highest level of management. Most of the risk were evaluated as substantial. Since the COVID-19 pandemic, the company recognized any kind of pandemic as risk with the highest risk score. War conflicts are nowadays representing a serious threat, which is strongly influencing business due to their global interconnection. These events are highly, heavily and mostly badly impacting the company, not only at the side from suppliers by the longer delivery times, lack of resources or some political regulations, but also on the customer side by reduction of demand. Issue, which is closely connected with global conflicts, is price instability of energy cost. These three threats are highly threatening, company is having defined processes against them, but there is also space for some improvement like more flexible SCM. The employees have identified political and monetary issues as not threatening as previous problems but are still considered as substantial risks. This group of threats are most expressed by differences in price policy or by new or adjusted standards or regulations, which is usually accompanied by cost increasement.

Global threats

	Possible risks	Likelihood	Impact
1	Pandemic	2,75	4,5
2	War, global conflicts	3,25	4,75
3	Political changes	2,5	2,75
4	Grown of energy costs (oil, electric)	4	3,75
5	Nature disaster (flood)	1,5	3
6	Strike	2,25	3
7	Currency fluctuation	2,5	3
8	New EU regulation (CO2 levels)	2,5	3,25
9	Market change	2,75	3,75
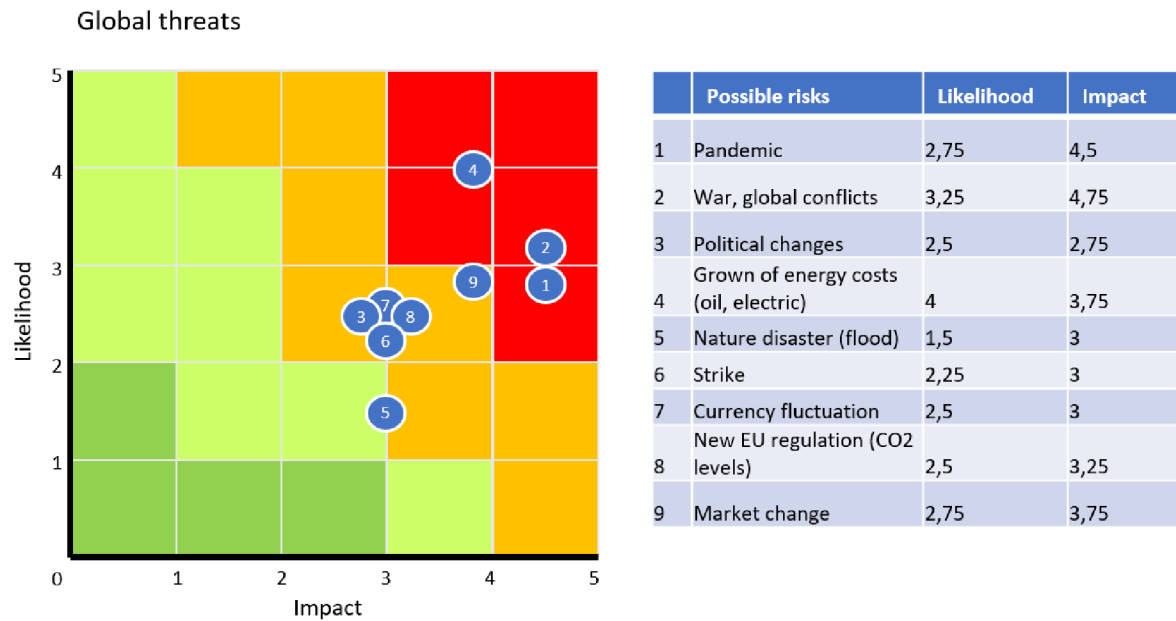
Figure 31: Global threats
Source: Own processing

For global risk no Ishikawa diagram was conduct, because of complexity behind each possible risk. Company knows that various reasons can have character of an accident, long term political tension, nature disaster caused by periodically repeating events or by earth movements, social tension can also results into heavily impacting actions and more can happen. To address direct cause of the global risk is really hard and based on that more demanding strategy approach towards this kind of threats is needed.

Figure 32 provides a comprehensive overview of all risks, revealing that the majority of risks are evaluated as substantial or highly threatening, with only 2 exceptions. Internal risks, stemming from the company itself, were found to have lower likelihood and impact, thus making them easier to handle. In contrast, external threats are closely grouped together and share similar likelihood levels. The management of company risks primarily relies on an active approach, which involves training and taking preventive measures such as regular and periodic monitoring. Unforeseen threats are treated through established processes. It is important to emphasize that a company cannot accurately forecast the future or have specific procedures or guidelines for every potential issue. The risk management is crucial for business and for SCM. By enhancing the level of risk management, a company can exert a positive influence on its business partners and thereby contribute to a more resilient supply chain.
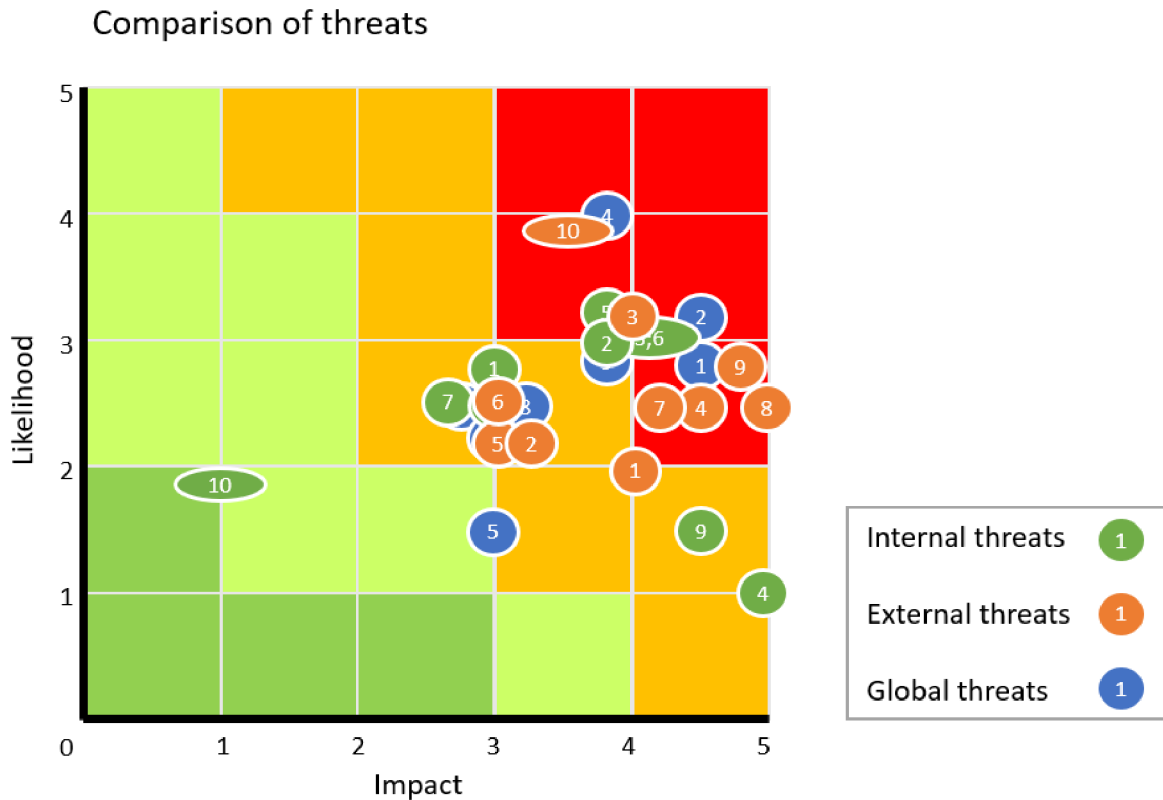
Figure 32: Comparison of threats
Source: Own processing

2.2 Logistic quality

The quality of supply chain management is connected with the overarching logistic goal, which includes maintaining low stock, short delivery times and minimizing or eliminating disruption of the production. All of those goals are important aspects of the final company performance. However, the company does not solely influence those factors itself, but also important role has the suppliers and other variables, which are mentioned above in chapter 2.1.4. Nonetheless, the company is committed to delivering optimal performance to its customers, business partners, and stakeholders. To uphold these standards, it is crucial to have clearly defined metrics and key performance indicators (KPIs) for monitoring progress and identifying any deviations.

2.2.1 Cooperation with suppliers

To secure the satisfaction of all partners among SC, the company has implemented ISO norms as base for quality standards. The ISO norms are representing measurement, safety and environmental requirements towards suppliers, additionally the company has created their own

guidelines for suppliers. Through online sessions, the company meets with the representative of the supplier and negotiate conditions for cooperation. The supplier is responsible for observing the standards, in the event of any deviations, it is imperative that the company is promptly contacted and a resolution to the issue is secured. Main document for every supplier is Supplier logistic manual, which is updated according to the latest strategy. In it, main processes are defined, packaging specifications are addressed in terms of capacity management and transportation rules for one-way or for returnable packaging, processes for transport logistic are introduced and the last part is focused on complaint and claim management. These guidelines also highlight necessary packaging protection for various materials and packaging restriction. Great emphasis is put on correct labelling for making goods receiving and further movement easier and automated. Effective cooperation among all SC partners relies heavily on communication. The company places great importance on timely communication, prompt responses, and establishing strong partnerships with suppliers. The company departments maintain daily contact with suppliers, primarily through online calls or emails. As previously stated, the plant logistic department assigns specific employees to handle communication with individual suppliers, ensuring active engagement and effective collaboration.

Nowadays key role in SCM have various IT tools, which are going to be described in following chapter. These tools support the enhancement of SCM effectiveness and contribute to the fulfilment of company supply chain goals.

2.2.2 IT Tools

The IT tools can be divided into two categories: managing and evaluating tools of supplier performance. Besides that, the plant monitors additional KPI through online platforms, which are serving internal purposes. Moreover, company uses the monitoring for identifying possible weak or suitable places for doable improvements.

An external firm SupplyOn handles transport management centre (TMC). This tool endeavour for seamless integration of transportation and material management. This software overtakes some tasks from the logistics department, such as creating of advance shipping notification (ASN) or forwarder pickup advice. The software associate company with supplier and shipper, as that is informing about transportation statuses. Main benefits for the company are consistent processes from the begging to the end; reducing entry of double data to zero; using information from one

document for filling up other; due to clear predefined process better transparency is secured; the software is user-friendly and provides all important data to the right persons. SupplyOn software is continuously updating with alignment to agile principle, it seeks for agile goals and focuses on acquiring new knowledge in digitalization.

Another IT tool is Vendor managed inventory (VMI), which is commonly used software. It enables supplier to take control over the company inventory replenishment and makes decisions connected with it. The idea behind this system is to have more flexible and transparent SC in terms of information sharing and clearly divided responsibilities. System is based on supplier observing the customers (the company) demand and inventory. After collecting all necessary information, system creates forecast for delivery to the storage. Before the supplier access the VMI, must agree with the company on factors like minimal or maximal inventory levels, delivery time frames, communication, the quantity of delivery and its frequency. The company sees benefits of this tool in more resilient and optimized processes; improved stock management by lowering stock levels not only in warehouses, but also in buffer stocks; it contributes to reducing out-house and in-house transportation and to better flexibility in shipping amount. Overall outcome from the VMI is strengthening of cooperation among whole SC.

The second group of IT tools concentrate around the supplier performance. For comprehensive evaluation of the supplier, performance matrix is used. That is conduct of four assessing criteria, focused on quality, costs, logistic and legal aspects of the supplier performance. Each type has one to three sub-criteria. Used data are inserted either automatically or manually, after the data are submitted, they are evaluated by 5-part scale or simple calculation is used. All of that results into sum of performance points. Logistic planners assess the points and in supplier management dashboard labelled the supplier by the traffic lights system. Green colour represents the best performing suppliers, who are allowed to increase their volume of deliveries without obstacles. Into orange category belongs new suppliers, suppliers of new technology or not so greatly performing. This group is periodically monitored. The last group is red, companies in this group can be threatening whole SC, action towards them is escalation in case of no tendency to improve, when that happened the supplier move to the No-Go section and will be replaced by other or new supplier. The light system is actualized every week and any kind of deviation is consulted on monthly-basis meetings with higher management level. To support the decision making, the performance dashboard is complemented by Performance radar chart.
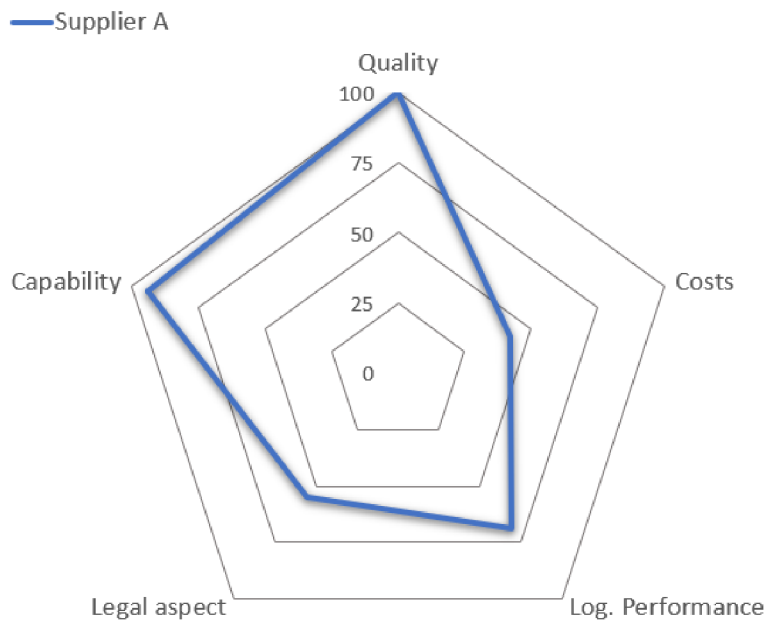
Figure 33: Performance radar chart
Source: Own processing

Following IT tool for monitoring the performance of the supplier is the Supplier service level 3 (SSL3). This tool is used to measure the supplier performance and to compare actual and expected delivery time and quantity of material. With respect to vendor management inventory, stock levels are monitor with no time and no specific quality tolerance, it uses only defined minimal and maximal level, tool used for monitoring is again SupplyOn software. Additional monitoring is dependent on Kanban, push and pull observing, data are collected by SAP software. There is allowed tolerance in time and also partially in quantity. SSL3 reports are conducted on monthly basis. The report serves to identify the worst suppliers and based on that needed escalation level is assign; it provides support for management in order to initiate any kind of measures towards the suppliers. The definition of the worst suppliers is characterized by the ranking base of the SSL3. The number of order lines in relation to poorly graded goods receipts, purchasing volume and by the impact on connection to the line stops. For the escalation are four level used, if in further monitoring the supplier improve their performance escalation and monitoring will stop.

- Level 1= The worst supplier or the past quarter are placed into level 1. In this stage for initial monitoring of 8D-Report or Problem-Solving sheet is used. The supplier is comforted with the situation and questioned about the root cause of the current situation.
- Level 2= The problematic situation is staying same for past 6 months, the logistic or the representative of the plant invites the supplier to SSL meeting.

- Level 3= Situation is still not changing and is repeating in past 9 months. The supplier is invited by purchasing department in SSL meeting.

- Level 4= No improvement in past 12 months was done; the situation is consider as a permanent. Following SSL meeting is going to decide about the supplier status in the SC, if further improvement will be promised or if the supplier will be deleted and replaced.

SSL3 is utilized by the company to proactively monitor suppliers and anticipate potential incidents before they escalate. This proactive approach enables the company to swiftly respond and mitigate any significant disruptions to the supply chain.

Further company also uses various internal KPI. Internal dashboards are providing the current number of production utilization, so every employee knows actual production status. Furthermore, each department within the company has its own set of KPI systems. In the logistic department, the following list presents the most commonly used KPIs.

- Bottleneck table= This tool provides comprehensive view on production through weeks, it compares forecast and real status of each product. Furthermore, it presents the quantities of goods that have been produced and those that have been requested. The table is mainly used for logistic production planning, but the information is also passing to the managers in order to inform them about the production and it´s really status.

- Workload of the receipt of goods= Observed is amount of goods, its quality and correct packaging. When goods arrive and is accepted on goods receiving place, it is controlled, and it will be stored in warehouse or directly shipped to the production. The goal is to ensure the controlled movement of materials.

- Number of trucks and their utilization= Purpose is to observe the utilization of trucks and to optimized number of deliveries. When necessary, the logistics department increases the volume of goods and books for transportation. On the other hand, in the case of lower production due to sickness, logistic worker decreases the amount of transportation. This serves to smoothen the flow of received goods and to optimized transportation costs.

- Inhouse transportation= It is conduct of material, finished goods and waste movement through the plant. It provides insight to actual moves of goods and helps to find space for possible investments in order to secure faster transportation. An example from the past is in-house automated lift, which contributes to faster material movement. That aimed to reducing actual steps of workers. The decision to build this was the highly frequented transportation from

basement (where is warehouse and goods receiving) to the ground floor, where the biggest part of production line is located.

- Summarizing logistic table= Data from various areas such as quality, safety, delivery, organization issues, projects tasks and more are monitored in this comprehensive table. The KPIs are collected every day, and one sheet provides a monthly overview. For every sub-category the acceptance limit is addressed, if the limit is overreached, a red square occurs and indicates, that some steps are requested. This contributes to evaluation of current plant logistic performance.

The utilization of IT tools within the company serves to support decision-making processes and improve the understanding of supply chain management operations. In some tools are the agile principles already implemented. For the purpose of the plant new process is going to be established according to the agile and one more example of possible adjustment of current process also according to the agile is going to be draft.

2.3   Draft of new agile approach

Company is fully aware of the need of acquiring new knowledge. The company emphasis on applying agility among its plants, even the individual departments can themselves apply for agility training. The trainings are approximately six months long and emphasis on improving motivation and cooperation within team and projects. The company is already implementing agility to its SCM, the statement for this new approach is that use of digital SC levels can unlock significant improvement at all SC levels. Following table 10 is presenting expected outcome after applying agile methods through digital SC. Improved functional excellence brings improvement maximally to 50%, but with combination of digital SC the number can improved to 80%. The company sees the biggest improvement in building up digital SC and functional excellence in inventories.

Table 10: Agility in digital SC

SC Level		Standard performance	Functional excellence	Digital SC and functional excellence
Service	Lost sales and services	Currently full	Lower by 50%	Lower by 65-70%
Costs	Transport and warehousing	Currently full	Lower by 10-15%	Lower by 15-30%
	Administrative	Currently full	Lower by 5-10%	Lower by 50-80%
Capital	Inventories	Currently full	Lower by 20-50%	Lower by 35-75%

Resource: Own processing according to the company (2024)

For the purposes of the case study two example of applying agility to new and common processes are going to be described. First example is going to be about developing the new process with contribution to the agility management and agility occurs in the whole process of the project work. Second example is going to be describe from the observing position on existing process, current status is going to be presented and on that possible improvement in alignment with agility is going to be suggested.

2.3.1   New process draft

Logistic department decided on creating a clear process description and guideline for occasionally used procedure about the logistic complaint. As it was considered as a new process, the use of agility in this field was welcomed. At the begging, materials such as existing guidelines or close processes ware collected and other plants were in the matter of logistic complaints contacted, in order to acknowledged existing approaches by the logistic workers towards this matter. Collected materials were discussed with employees, who are by this topic directly influenced. The main role in this process has logistic employees, but colleagues from quality department and warehouse are informed and by some part of the process are needed.

So, in the first phase all necessary existing materials were collected, supporting persons were contacted and regular meeting were planned. The second step was about the classification of logistic complaints. Based on central failure catalogue, three groups of possible incidents were identified.

1. Category 1. = Administrative issues
   - o   Shipping documents wrong or missing
   - o   ASN wrong or missing
   - o   Label wrong or missing
2. Category 2.= Supplier or shipper issues
   - o   Delivery time early or late
   - o   Transport order time late or missing
   - o   Cancelation or delay of transport or pick-up
3. Category 3.= Material issues
   - o   Over- or under- delivery
   - o   Transportation damage

- o   Contamination

- o   Incorrect product delivery

- o   Transport order content wrong

After the division of possible failures, first draft of a new process was created. The process was simple, information was based only on previous experiences without any kind of guidelines. Overall, it served the propose of initial starting point of process. This was introduced on regular meeting with logistic workers, meeting was 30 minutes long. This meetings were carried out in second part of whole project development. Outcome after each meeting brought more specific information about solving each group of failures. Meeting reports were written for the purpose of improvement of process creation. Third part was about creating process versions and on the end of this stage a process final diagram was created.
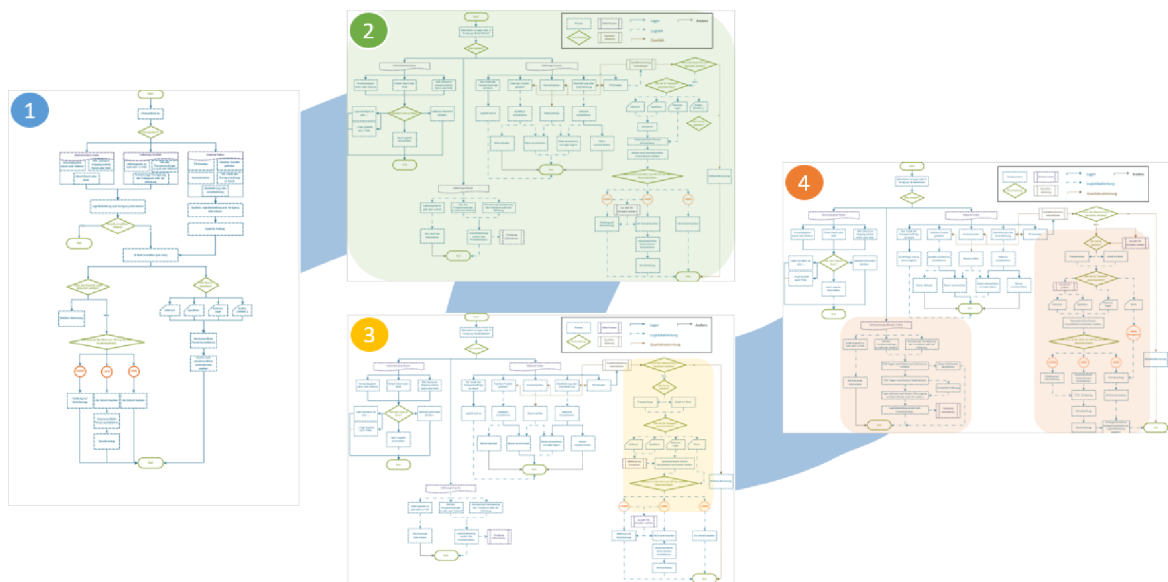
Figure 34: Process development
Source: Own processing

In figure 34 process development is visualized. Four versions of process were created, each change is coloured. As it can be seen, the first version was compared to the following versions simpler with fewer steps. The second version war significantly detailer, with task division on right upper corner, also processes were divided into two types, main and subprocesses. Third version focused on one complex process. The final version was created by two main adjustment and few spelling changes. The final version can be found under Appendix A.

The visualization itself is not sufficient for the internal use. So, for more detailed process description guideline in the fourth part was developed. It had also more than one version, which were adjusted

by the comments from workers. During one of meetings a new purpose of the adjusted process was discover. It can be used not only for logistic management, but also for warehouse worker. That also involves their active contribution to the logistic claim management. The task of warehouse workers is to monitor and record logistic claims into the excel table. Reason behind it, is that the occurrence of the incidents must be documented in order to monitor the supplier quality. Because not all issues were recorded in ERP system, so no change could be initiated. Only material issues were escalated to the upper management level. On the other hand, in a case of missing documents, the warehouse worker solves it him- or herself and no further action was taken. If it was only one-time issue, then it could be caused by some kind of an accident, but on the other hand, if that happens more than one time, it could be an evidence of poorer supplier quality. But since that, there is no existing monitoring tool, no proof of lower quality can be addressed. But during the process development this issue was found out and was handled. The table has two selection, one for suppliers and one for shipper. Each sheet contains every supplier or shipper in rows and in columns are possible logistic complaints recorded. On monthly basis the result will be discussed and in case of overreaching limits for each type of the accident, the supplier or the shipper will be confronted. The last phase of the project was to delivery final version to the head of logistic department and to assign implement it into everyday use.

Development of the creation of logistic complaints were conduct already in alignment with agility. Agility was already demonstrated in the process development, but also in the whole project existence. For example, there was absence of strict approach, any change or additional note was consider and assessed if it was useful and if it moves project towards improvement. No idea was ahead judged, that refers to the open-minded environment. In following figure visualized process development.
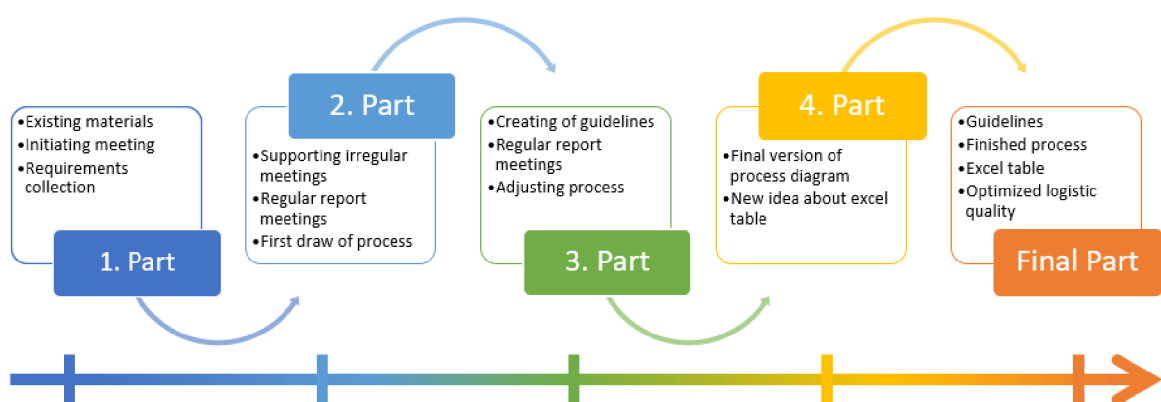
Figure 35: Process schedule
Source: Own processing

Outcome is comprehensive guideline, which is supported by A3 paper process diagram. Process itself was developed with focus on people rather than on tool. The diagram is colourful, the colours represent each process owner, so the orienting in it is really easy for users. Additional excel table enables warehouse worker to better monitor occurrence of accident. Based on collected data, the concrete supplier who is have in one of possible areas of reporting red status, will be confronted in order to improve logistic quality and also improve overall SC performance of the plant.

2.3.2 Existing process optimalization

In order to address the potential utilisation of agility more effectively within the SC, one of the current processes was selected for analysis and for demonstrating agility methodology. This process is going to be used in the case study to illustrate the potential for agile improvements. The supplier-oriented process was chosen, it is called Supplier escalation. The company uses monitoring tool called SSL3 and performance matrix to comprehensively evaluate suppliers. Company observes overall supplier performance in terms of costs, quality and more. If the observed category limits are overreached, the escalation process begins. Figure 36 illustrates the current workflow, with further details of the escalation process provided in Appendix B. The entire escalation process is accompanied by guidelines, although for the purposes of this case study, only the process itself will be discussed.
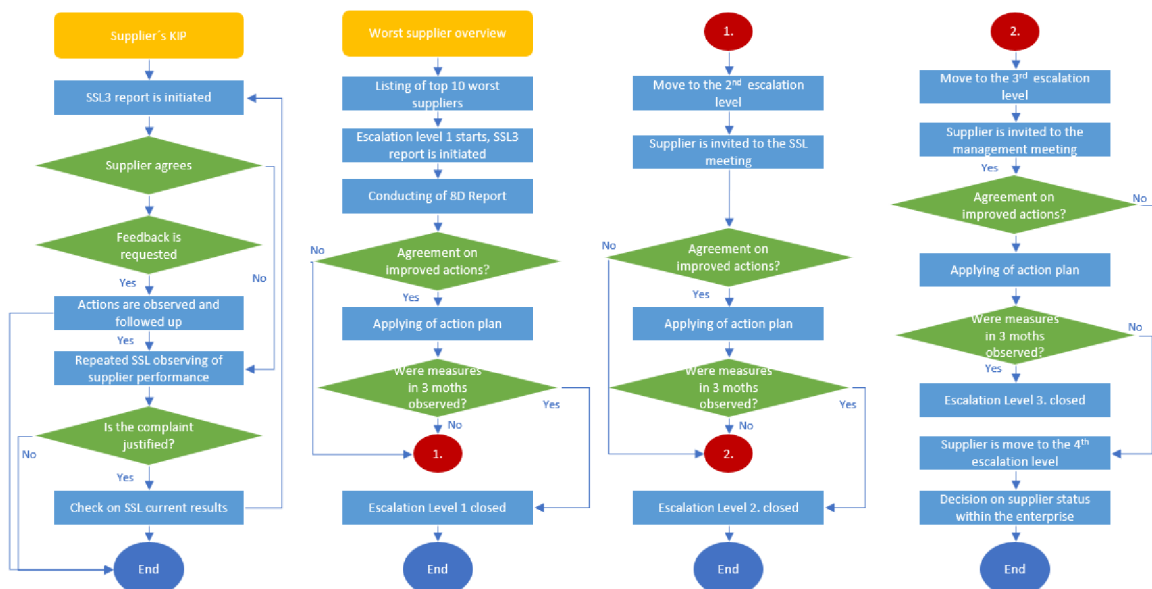
Figure 36: Current process flowchart
Source: Own processing according to company (2024)

The process itself has four stages. In the initial phase, the supplier status is monitored by the plant´s logistic department, which generates an SSL report and notifies the central authority about the status. Following the submission of the SSL report, the supplier is informed of its status and is invited to a meeting. During this meeting, feedback or some a kind of action plan will be requested. If the new strategy is correctly implemented and the SSL status improves, the process ends. In the event that no improvements are observed, the supplier is transferred to the escalation level 1. In the second stage, the plant logistic department assumes a more active role. Initially, the logistic worker analyses the SSL report on all suppliers and identifies the top 10 suppliers with the greatest deficiencies. Based on this analysis, an 8D report or a problem-solving sheet (PSS) is conducted. The supplier is requested to provide feedback on the action plan and to fulfil the measures. The desired outcome is that the supplier will implement the measures within three months and that the escalation level 1 will be closed. However, if the supplier does not provide feedback or implement the measures, the supplier will be moved to a further escalation level.

The subsequent stage (3rd) is the escalation stage 2. At the begging is the supplier invited into an SSL meeting and a new action plan is initiated. The supplier may consent to the proposed adjustments. If the supplier's performance improves within three months, this establishes the closure of escalation level 2. In the event of a lack of communication or a lack of improvement, the supplier is transferred to the third level. The responsibility in last stage is move to central purchasing department. The supplier management is invited into meeting and new improvement actions are requested. If the matter is handled positively, then the escalation is closed. However, if the supplier does not improve or does not meet the deadline for improvement, the purchasing department initiates a final and last management meeting, where the decision on future supplier status is discussed. The decision is to either maintain the current level of cooperation or to terminate the contract with the supplier.

As can be observed, the entire process can be divided into four further categories: pre-escalation phase, repetitive control phase, recurrent escalation and last escalation stage. In the following figure is visualized, what kind of processes are repetitive same, and which are unique. The pre-escalation stage is highlighted by orange, the phase is mainly focused on data collection and its evaluation. The begging stage is dependent on plant logistic department and on central purchasing department. The orange marked processes are locate in the first quarter part of the process and first part of the second quarter part of the process. Repetitive actions are occurring the second, third and in the last process stage, they are yellow and green marked. These actions are focused on

communication with the supplier and utilise a restricted timeframe, which is three months long. The distinction between these stages lies in the level of responsibility and the management meeting level, however the difference in the management level is not as significant as the current process describes. There is possible space for the process optimization for better process description and with that connected orientation in it. Finally, the last part concerns the most unsatisfactory performance of the supplier and the decision regarding future collaboration.

Figure 37: Process groups
Source: Own processing

Once the process and its analysis have been introduced, it is essential to assess a new steps. One of the most common agile practices is the use of the scrum process structure to create a clear and straightforward process. After all processes have been classified and their role in the process was explained, the steps can be reduced. Figure 38 illustrates the reduction from the 38 process steps to only 22 necessary steps, which has been achieved by eliminating repetition. The reduction of the process steps has the advantage of facilitating the learning of the process.
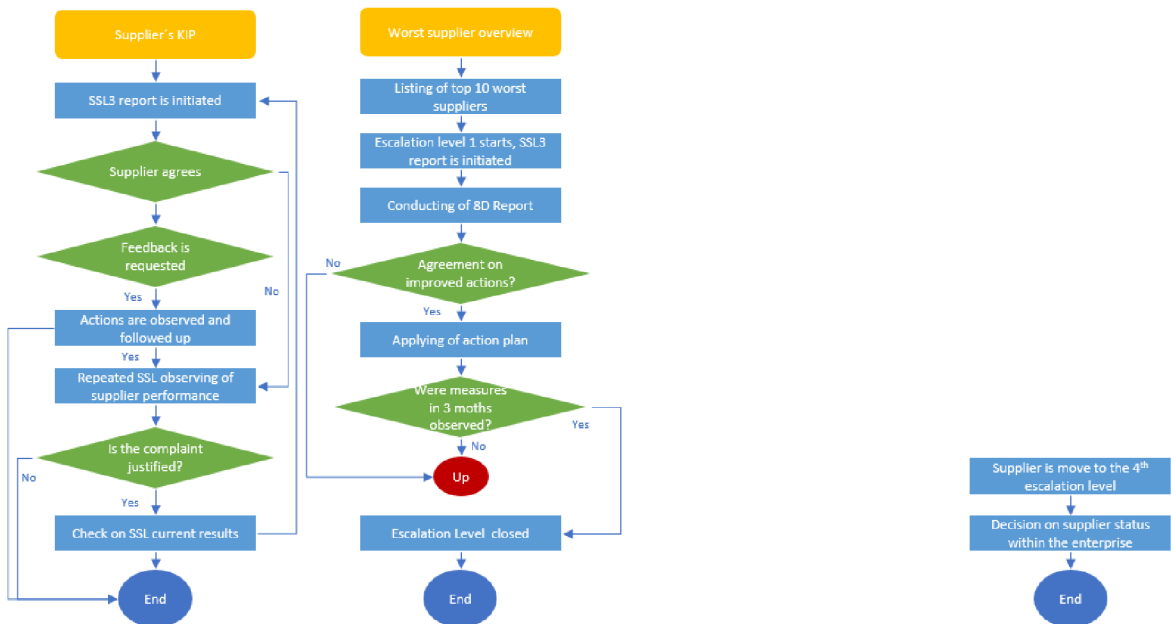
Figure 38: Process steps reduction
Source: Own processing

Also, not only the reduction of steps is advised, but adjustment of the concrete process steps as well. An effective update can be conducted during the creation of the SSL report. The analysis of the potential worst supplier can be conducted at the beginning of the process, rather than in the second stage. The monitoring of suppliers should be conducted automatically through central data collection, without the need for supplier direct agreement. This should be explained during the initial meeting before the cooperation begins. Continuous monitoring enables the company to better manage the SC performance. Consequently, the number of steps can be further reduced in order to optimise the process. However, it is important to retain the supporting aspect of the process, namely the discussions with the supplier regarding the current situation. Any deviation in the supplier performance may be caused by a one-time incident, which could be influenced by external factors from the supplier´s environment. It is therefore proposed that the entire process should be optimised by reducing the number of steps, building a new structure in accordance with the Agile Scrum methodology and making the process more straightforward and user-friendly.
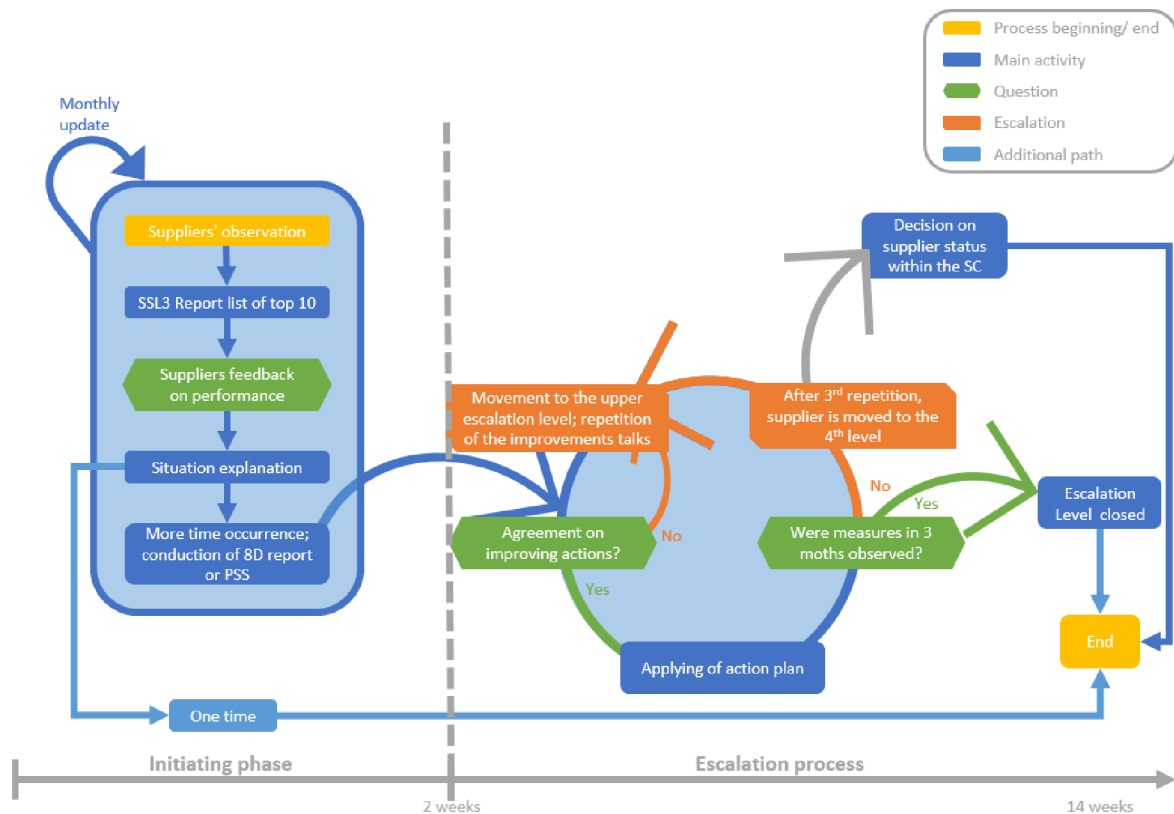
Figure 39: New process draft
Source: own processing

On the figure 39 the new process suggestion is portrayed. As it can be promptly seen, the process is lighter without missing the important steps. The repetitive actions have been reduced and transformed into a cyclical process, which can be repeated until the third escalation level. However, at the fourth level, the process cannot be repeated; instead, a single final escalation can be conducted and the decision about the supplier's further status must be made. The process has been reduced from four stages to two main parts. An additional path has been created for the case of a one-time disruption in supplier performance. The new process has an only two main parts, which are explained in the following list.

1. Initiating phase= The number of steps on the stage is significantly reduced in comparison to the currently used procedure. The practice is initiated at a later point in time than requested, with the aim of conducting it on a monthly basis. This is to ensure that the most accurate supplier situation is obtained, given that the data used is that of the previous month. The report software, which can be either an Excel table or an online dashboard, should display the production plant's suppliers automatically. Furthermore, the report's structure should highlight the top 10 best or worst performing suppliers. This information can be latter used by the logistic worker to gain a feedback on suppliers. In the event that the cause of the supplier's

performance deviation was a one-time occurrence and not indicative of a more time occurring issue, the process may be closed. However, if the supplier's performance decline over an extended period, the logistic worker should conduct an 8D report or PSS. Following this, the supplier will be moved into the escalation process.

2. Escalation phase= The process launches with a discussion about the supplier's performance improvements. In the event of a positive response, the implementation of an action plan starts. Over the course of three months, the effectiveness of the corrective actions is observed, and if they are evaluated as successful, the escalation level is terminated. However, in the event of disagreement regarding the necessity for improvement or failure to meet the measures, the supplier is elevated to a higher escalation level. This procedure is repeated until the third escalation level is reached. After the supplier failure to implement the requisite corrective measures, the supplier´s management will be invited to a management meeting with the central management of the company. At this meeting, the future of the supplier's involvement in the company's operations will be discussed. The outcome of this meeting may result in the obligation of additional control measures or the termination of the supplier's contract with the company.

The new process visualization is accompanied by a brief legend in the upper right corner, which serves to provide better orientation. The suggestion of the new process is limited with the condition on adjusting the guidelines for the escalation process. The time frame for the process is fourteen weeks. The process can be initiated at the beginning of each month, within two weeks of which the supplier should be contacted and his feedback will be requested. After providing the statement to the current situation in two weeks, the process should be moved into the escalation stage. It is estimated that it will take twelve weeks for the supplier to either improve or to be moved into the upper escalation stage. The main responsibility for the process lies with the plant logistics department, while the detailed breakdown of responsibility is provided in the table 11.

Table 11: RASIC matrix

Tasks	Plant logistic	Central purchasing department	Supplier
SSL data update	C/S	R	I
Supplier evaluation	R	C/S	
Meetings with supplier	R	I	C
Conducting of 8D report or PSS	R		C
Monitoring of escalation process	R	A	I
Closing the escalation level	R	S	I
Situation escalation	R	I/S	I
Decision on supplier status	I	R	I

Source: Own processing

As it can be seen more responsibility is shifted towards the plant logistic, rather than being distributed across various management levels at different escalation levels. The role of the central purchasing department is primarily supportive, with the main responsibility for decision-making regarding the supplier status within the entire SC remaining with the central department. Furthermore, the role of the supplier has evolved into a more active one. Not only the active communication is expected, but also active contribution in conducting the improvement plan is anticipated.

The agility concept was applied to the structure, tasks and responsibility division, with greater emphasis placed on communication with suppliers and cooperation. Additionally, process visualisation was engaged to align the agility application with the objective of serving the people, rather than the process. As a result, the process was made more user-friendly by modifying the structure, colour scheme and complexity level. The responsibility was adjusted, and more responsibility was moved to the plant logistics with active support of the central purchasing department. In conclusion, the primary outcome of implementing agility is to enhance procedures by placing greater emphasis on people and long-term improvement through active communication. These are key areas for future SCM.

Conclusion

The thesis' primary objective was to provide an overview of the current state of knowledge in the field of supply chain management and to investigate the potential application of agility knowledge in improving the overall performance of the company and its responses to changes in the supply chain. The main objective was to examine the potential use of agile methodology within supply chain management, particularly in the logistics or purchasing departments.

The initial section of the theory was focused on supply chain management, including a definition, an overview of its current trends, and an examination of the most common strategies employed. The concept of risk management was identified as a crucial aspect of company strategy, leading to a deeper investigation into this field. The presentation of risk strategies and tools for more effective risk management was a key objective. The chapter on supply chains was concluded with an examination of the trends that have influenced this field. These include globalisation, the emergence of ecological and sustainable approaches, and the growing popularity of technologies that have become increasingly prevalent due to the influence of new generations. The second part of the theory is dedicated to agile management. Principle and basic mindset of this understanding was introduced. Also, agile tools with new knowledge were presented. To conclude the theoretical chapter, a synthesis between the two topics was presented. Before implementing the agility into supply chain, the advantages of agility use rather than traditional methodology were listed. Important aspect of the new strategy are the obstacles connected with implementation and to better demonstrated the possible advantages of the implementation, three successful examples were named.

The practical part of the study was a case study methodology to investigate the real-world implementation of agile methodologies within the global enterprise. Initially, the company's approach to supply chain management was examined to gain a comprehensive understanding of their strategic framework. For the purposes of this thesis, a focus was placed on one of the company's plants, specifically on the logistics department, as this is where the majority of supply chain management activities are carried out. The supply chain for the plant was slightly different from the SC of the whole company. In order to gain a better overview of the logistic strategy, a risk matrix and its evaluation were created through a brainstorming activity. It was found that the logistic quality is an important aspect of logistics, which is highly dependent on cooperation with suppliers and also on the use of IT tools that secure and support company performance. In order to

demonstrate the possible use of agility, two processes were chosen as an example. Firstly, a completely new process was created with alignment to agile methodology, and secondly, the currently used process was broken down and rebuilt by the same methodology.

The objective of demonstrating the utilisation of agile methodologies within the context of supply chain management was successfully achieved through the utilisation of a case study, which presented a real-world example within the company. The incorporation of agility can facilitate the preparation of any company towards future challenges. The acquisition of new knowledge is a crucial ability for supply chains and agility, as demonstrated by the industry revolution 4.0. The principal finding of the thesis is that the supply chain provides an environment fitting for the creation and field testing of new knowledge. The agile management approach is currently highly fitting for this purpose

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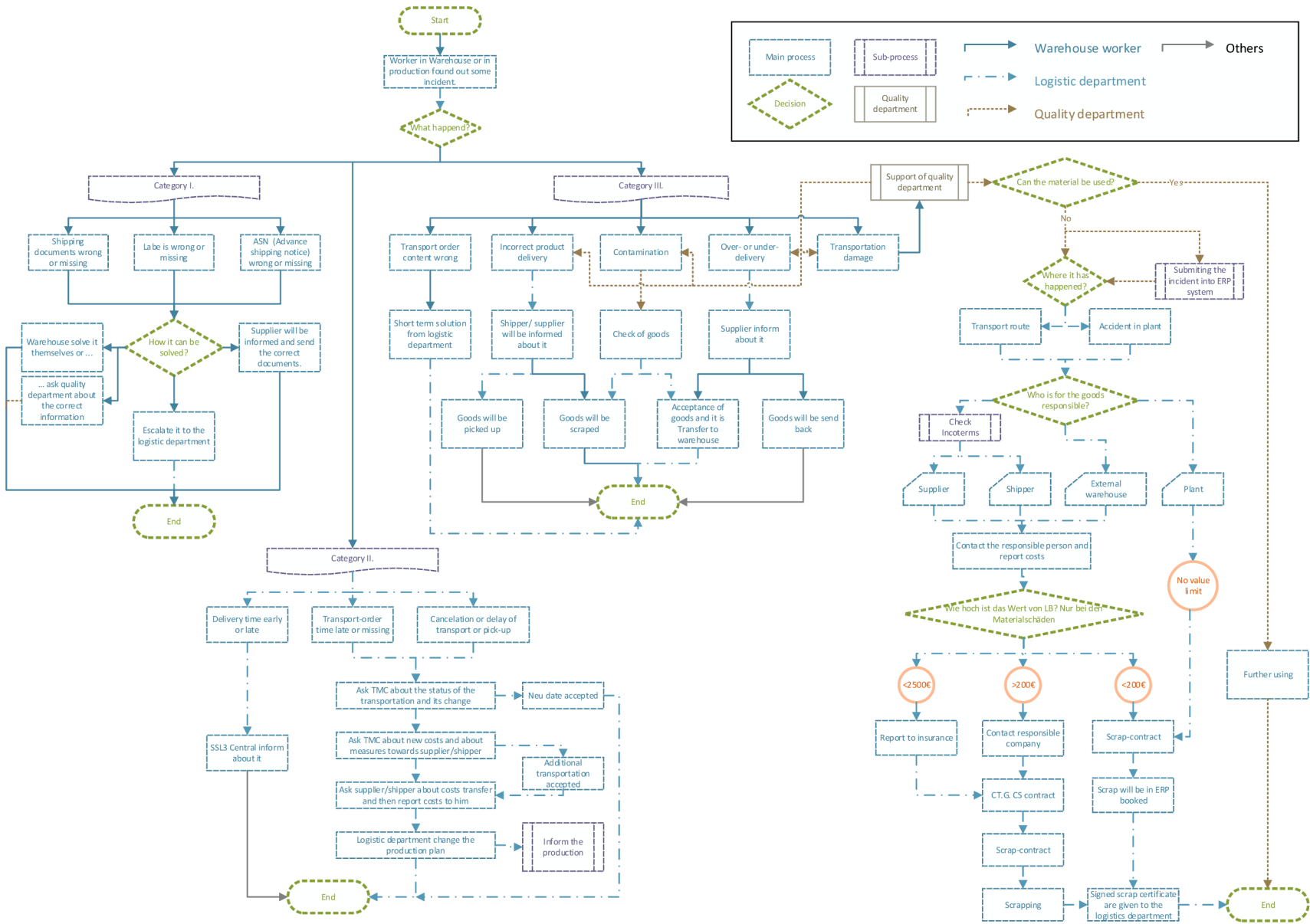WORLD BANK, 2023. *Supply Chain Management*; online. Washington D.C., USA: World Bank Group. Updated: 01/03/2023 [2023-03-01]. Available at: https://thedocs.worldbank.org/en/doc/1c3b517f003b53a2e2e170e93124be84-0290032023/original/World-Bank-Supply-Chain-Management-Guidance.pdf

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List of Appendices

Appendix A Logistic complain process diagram

Start

Worker in Warehouse or in production found out some incident.

What happend?

Legend:
Main process — Sub-process — Warehouse worker — Others
Decision — Quality department — Logistic department — Quality department

Category I.

Shipping documents wrong or missing

Labe is wrong or missing

ASN (Advance shipping notice) wrong or missing

Warehouse solve it themselves or …

How it can be solved?

Supplier will be informed and send the correct documents.

… ask quality department about the correct information

Escalate it to the logistic department

End

Category II.

Delivery time early or late

Transport-order time late or missing

Cancelation or delay of transport or pick-up

SSL3 Central inform about it

Ask TMC about the status of the transportation and its change

Neu date accepted

Ask TMC about new costs and about measures towards supplier/shipper

Additional transportation accepted

Ask supplier/shipper about costs transfer and then report costs to him

Logistic department change the production plan

Inform the production

End

Category III.

Transport order content wrong

Incorrect product delivery

Contamination

Over- or under-delivery

Transportation damage

Short term solution from logistic department

Shipper/ supplier will be informed about it

Check of goods

Supplier inform about it

Goods will be picked up

Goods will be scraped

Acceptance of goods and it is Transfer to warehouse

Goods will be send back

End

Support of quality department

Can the material be used?

Yes

No

Where it has happened?

Submiting the incident into ERP system

Transport route

Accident in plant

Who is for the goods responsible?

Check Incoterms

Supplier

Shipper

External warehouse

Plant

Contact the responsible person and report costs

No value limit

Wie hoch ist das Wert von LB? Nur bei den Materialschäden

<2500€

>200€

<200€

Further using

Report to insurance

Contact responsible company

Scrap-contract

C.T.G. CS contract

Scrap will be in ERP booked

Scrap-contract

Scrapping

Signed scrap certificate are given to the logistics department

End

Appendix B Current process

Legend:
- Process beginning/ end
- Main activity
- Question
- Escalation
- Additional path

Monthly update

Suppliers' observation

SSL3 Report list of top 10

Suppliers feedback on performance

Situation explanation

More time occurrence; conduction of 8D report or PSS

Movement to the upper escalation level; repetition of the improvements talks

After 3rd repetition, supplier is moved to the 4th level

Decision on supplier status within the SC

Agreement on improving actions?

Yes / No

Were measures in 3 moths observed?

Yes / No

Applying of action plan

Escalation Level closed

End

One time

Initiating phase

Escalation process

2 weeks

14 weeks