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Navigating International Supply Chains - A Case Study Collection

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PREFACE

In an era of increasing dynamics and global complexity, the management of international logistics networks remains challenging. Ever-increasing customer requirements with regard to product variants, lead times, and others are forcing logistics managers to re-think strategies and logistics concepts on a regular basis.

With this in mind, future logistics managers will face a multitude of complex tasks and they will be required to develop efficient management concepts at short notice. University teaching – as well as further education – has the ability to prepare those logistics managers for future tasks by enabling them to transfer theoretical knowledge to practical problems. Therefore, case study-based approaches can contribute to more practice-oriented teaching and training. By introducing them to real life problems early – in class – instructors can proactively prepare students for future tasks.

The following case studies were developed by the Competence Center for International Logistics Networks at the Chair of Logistics at the Berlin University of Technology. The cases were conducted at leading manufacturing companies and logistics service providers all over the world, and cover a multitude of logistics challenges such as risk and volatility management, network planning, forecasting, cultural relationship management, and many others.

We would like to encourage instructors to apply these cases in class to contribute to the idea of practice-oriented education. Although we designed these case studies with university teachers in mind, managers can also benefit from reading these cases to see how other companies are solving problems that are most probably similar to the problems they themselves encounter.

We wish you an interesting read, and would be very happy to receive feedback on how these cases have been applied and solved in class. We also would like to thank the Kuehne Foundation for the financial support of all activities conducted by the Competence Center for International Logistics Networks.

With best regards,



Prof. Dr. Frank Straube

Dr. Benjamin Nitsche

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CONTENTS

Preface	II
Introduction and overview	IV
1. BearCo: A Case Study of an International Manufacturer of Bearings	1
2. Brake Systems: Unlimited: Managing Capacities in an Era of Shortage	9
3. SAG: Managing a Bottleneck to Avoid Supply Chain Breakdown	15
4. Prime Engines: Leveraging Potential in the Sourcing Process of an Automotive OEM	21
5. RoboElectrics: Dealing with Unreliable Customers in Asia-Pacific Markets	27
6. MOVE: Handling Volatile Customer Demand in the Chinese Market	33
7. EurasiaTrain: An alternative to transporting goods between Europe and China	41
8. Connect SE: International risk management of a global dealer for screws and other joining elements	47
9. RuSh: Managing International Logistics of Shoes through a Control Center	51
10. StandArts: Preparing a Fast-growing Fashion Network for the Challenges of the Globalized World	57
List of figures	62

INTRODUCTION AND OVERVIEW

To contribute to more practice-oriented teaching approaches, the Competence Center for International Logistics Networks at the Chair of Logistics at Berlin University of Technology conducted on-site case studies at leading manufacturing companies in the consumer goods, automotive, and machinery industries, as well as at logistics service providers. Over the course of 12 months, the team visited the study organizations on-site and jointly discussed recent challenges these companies had faced in their international logistics networks and how they had approached those challenges. To achieve this, we conducted interviews with 32 company representatives and transferred the findings to case studies that can be integrated into teaching and further education. To maintain the anonymity of participating companies, their names have been changed and company information has been adjusted.

After conducting the case studies, we can state that the diversity of problems modern logistics and supply chain managers have to solve is huge and requires skills at the interface of multiple disciplines ranging from economics, through technology management, to cultural and behavioral management. Although we did not prescribe the subjects for the challenges under discussion to the companies, there was hardly any thematic overlap. To underline the diversity of topics discussed, you can refer to the following list of cases and corresponding topics:

1. *BearCo*: A Case Study of an International Manufacturer of Bearings
 - > Topics: organizational alignment, supply chain transparency, lead time management, cultural management
2. *Brake Systems Unlimited*: Managing Capacities in an Era of Shortage
 - > Topics: capacity management, volatile customer demand, supply chain flexibility, behavioral management
3. *SAG*: Managing a Bottleneck to Avoid Supply Chain Breakdown
 - > Topics: risk management, total cost of ownership, relationship management, production planning
4. *Prime Engines*: Leveraging Potential in the Sourcing of an Automotive OEM
 - > Topics: international procurement, tender management, linear performance pricing, supplier negotiation
5. *RoboElectrics*: Dealing with Unreliable Customers in Asia-Pacific Markets
 - > Topics: warehouse automation, forecasting, delivery reliability, network planning, Belt and Road Initiative
6. *MOVE*: Handling Volatile Customer Demand in the Chinese Market
 - > Topics: volatile customer demand, forecasting, behavioral management, production planning

7. *EurasiaTrain*: An alternative for Transporting Goods between Europe and China
 - > Topics: intermodal transport, logistics service providers, network planning, infrastructure development, Belt and Road Initiative

8. *Connect SE*: International Risk Management of a Global Dealer for Screws and other Joining Elements
 - > Topics: distribution systems, e-commerce, product originality

9. *RuSh*: Managing International Logistics of Shoes Through a Control Center
 - > Topics: transport management, fourth party service providers, network optimization, global warehouse management, cultural management

10. *StandArts*: Preparing a Fast-growing Fashion Network for the Challenges of the Globalized World
 - > Topics: out/insourcing strategies, vertical integration, internal logistics organization, warehouse consolidation

The products associated with these cases are also diverse. Supply chains of brake and steering systems, bearings, automobiles, screws, shoes, and apparel are described and discussed in detail.

While conducting the cases, the authors utilized an online logistics planning tool called TUB Logistics Navigator, which has been developed by the Competence Center for International Logistics Networks. With the assistance of this tool, companies are enabled to visualize their supply chains, collect necessary data, analyze those supply chains, and improve them jointly with customers and suppliers in a co-creational process. Although the tool is designed for company purposes, we have shown that it can also assist in a structured process of conducting case studies, as the visualization functionality provides a valuable basis for discussion of the supply chains with company representatives. The TUB Logistics Navigator is free for use and can be found at: <https://navigator.logistik.tu-berlin.de/>

All the cases conducted for this book – as well as additional cases that were conducted in the past – can be accessed in the Good Practice Supply Chains section of the TUB Logistics Navigator. As future cases are conducted, they will also be found there. Additionally, in this era of digitalization, the team at the Competence Center for International Logistics Networks is seeking to develop e-learning approaches that will assist in teaching these cases.

BearCo: A Case Study of an International Manufacturer of Bearings

The following case study describes the supply chain structure of a German manufacturer of different kinds of bearings named *BearCo*. The case describes how *BearCo* serves thousands of customers through a global network of warehouses – and the shortcomings arising from that. It also includes examples of how the erratic behavior of individuals in the supply chain can cause devastating volatility along the whole supply chain.

Company Overview

BearCo is an international manufacturer of bearings. Those bearings range from small cylindrical roller bearings up to large-scale bearings for wind turbines. *BearCo* has multiple manufacturing sites and 150 warehouses worldwide, and with more than 50,000 employees they generate over 5 billion euros per year in revenue. Due to the product variety, *BearCo* handles 2000 suppliers all over the world. *BearCo* has a lot of experience working in China, where they started doing business decades ago. *BearCo* is a first-tier supplier for OEMs across different industries (e.g., the automotive and energy sectors), but also sells its products directly to the after-sales market.

Product Description

While *BearCo* offers a broad range of bearings, in this case study we will describe the supply chain of an average cylindrical roller bearing. It weighs around 100 grams and has a diameter of 5 cm. The final product is manufactured with a high depth of value-creation (about 60 %) at a plant in Germany and consists of seven core components: cup, cone, two cages, rolling elements, grease (lubricant), and packaging. The type of production is make-to-stock and the total product lead-time from receipt of raw material to customer delivery is 50 days (depending on customer location and mode of transport). The supply chain description that follows is based on sales over a recent three month period. In general, the manufactured bearings can be

distributed to any of the 150 warehouses worldwide in order to reach the customer.

The Supply Chain of Cylindrical Roller Bearings

The general supply chain strategy at *BearCo* is to manufacture a specific product type at one specific plant and distribute it to the designated region where the demand exists. The specific product we are looking at is manufactured in Germany.

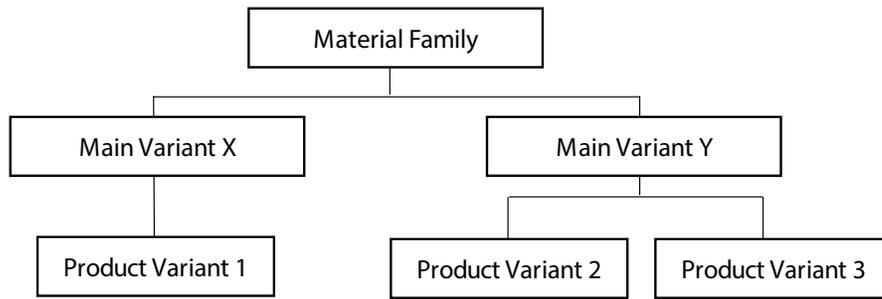
Upstream

BearCo has a high depth of value creation. The main component they purchase is steel, which they source from two different steel suppliers located in Italy (*SteelCorp*) and Sweden (*ManSteel*), with direct sourcing. Therefore, they follow a dual sourcing strategy. Furthermore, they have one supplier for packaging components in Germany (*WrapCo*) and one supplier for mineral oil (*Lubricanto*), also located in Germany.

Production

In order to deal with their high number of variants for the bearings, *BearCo* has established a classification strategy (see Figure 1 for details). Each of their products belongs to a specified material family. The next level contains the main variants (pre-assemblies), which can then be assembled into the different product variants. This customer order decoupling point separates – in relation to customer demand – decisions taken under uncertainty

Figure 1: *BearCo* Product Strategy



(push processes) from decisions taken under certainty (pull processes). This results in four main advantages:

- > Reduced overall inventory: Only a few generic components have to be kept in stock instead of many variants.
- > Increased flexibility: The generic components can be installed in a large number of end products.
- > Increased number of variants: Despite mass production, the generic components can be used in very different product variants.
- > Easier prediction: The demand for generic components can be predicted more accurately than for end products.

Downstream

Downstream, *BearCo* deals with a wide spectrum of customers. They supply small and large retailers as well as directly serving OEMs in different industries. In order to meet the needs of all customers, *BearCo* distinguishes its distribution channels. Small customers (mostly retailers) are all served through one central distribution center in Belgium, while larger customers (mostly OEMs) are directly provided with goods through a central distribution center in Germany, which is located at the production site. From there, *BearCo* supplies multiple other

BearCo warehouses. For intra-continental shipping (e.g., Germany to Belgium), the means of transport is by truck, while ships are used for intercontinental transport (e.g., Germany to Singapore).

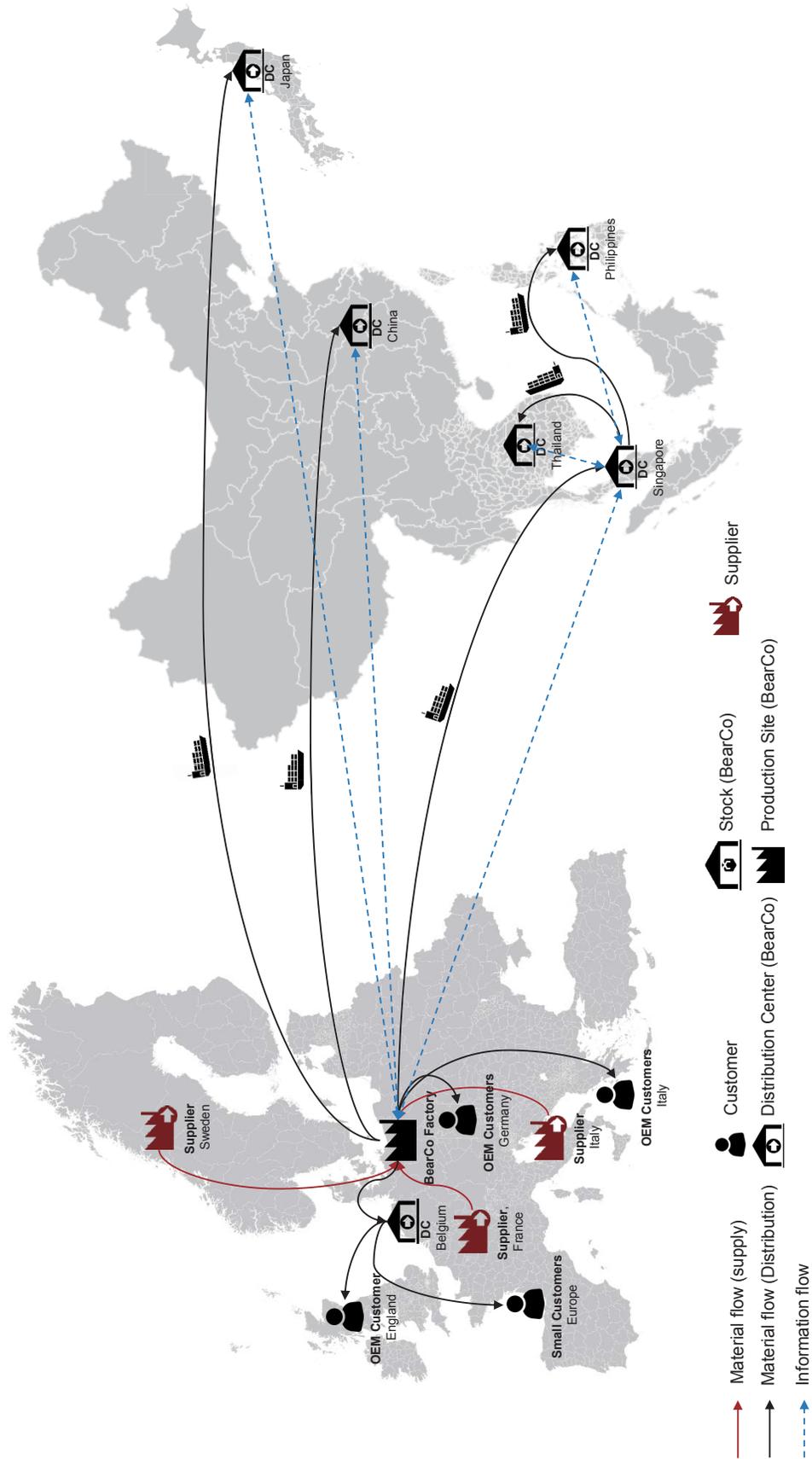
The supply chain headquarters in Germany has full information transparency over the major regional warehouses (currently, 20 out of 150 in total). Other information, such as customer demand at other warehouses, is only visible at the warehouses itself, mostly due to incompatible IT systems

Challenges in *BearCo*'s International Logistics Network

Intra-organizational misalignment

Conflicting targets among different departments and corporate functions lead to conflicting interests when it comes to defining safety stock levels of raw materials and finished goods in the globally distributed network of warehouses. On the one hand, corporate functions responsible for manufacturing want to ensure the highest availability of raw materials for every possible customer order. Logistics, on the other hand, has to increase speed and efficiency while reducing stock levels of raw materials and finished goods. Additionally, sales departments are spread globally and only responsible for their designated region, and therefore want to ensure availability of finished goods for every

Figure 2: BearCo Supply Chain



possible customer order. Making things more difficult, sales departments have to reserve production capacity as well as warehouse capacity well in advance, often before they know if their planned customer demand will be realized. Additionally, sales departments often agree quantities and flexibilities with customers, even though these have not been discussed with the logistics function: only later on does logistics realize that the sales department had agreed with the customer quantities, lead-times, and (especially) flexibilities in demand quantities that logistics was not able to meet. Consequently, with a desire to minimize customer disappointment, the corresponding purchasing, manufacturing, and logistics departments have been “firefighting” to ensure product availability for the customer – leading to higher costs on the supply side, possible increased transportation costs, as well as increased employee expenses.

Missing supply chain transparency

Although *BearCo* has to manage 150 globally dispersed warehouses, transparency about stock levels of all warehouses is not available. To be more specific, *BearCo* headquarters only has information on stock levels as well as customer orders for their most important regional warehouses, which account for about 20 out of 150 warehouses. Lowering global stock levels of finished goods becomes challenging without transparency. For example, if a customer in Thailand orders goods, the Thailand sales department checks availability at the Thailand warehouse and, in case of non-availability, an order is issued to the corresponding regional warehouse in Singapore. In case of non-availability at the Singapore regional warehouse, an order is issued to the corresponding manufacturing site (in this case, Germany). However, due to the absence of integration among a historically developed network of warehouses that operate with different IT systems, the manufacturing site in

Germany, along with the logistics department responsible for global shipments, is not aware of the real end customer of the order. Additionally, they do not know how many items of that order are issued to serve a real customer demand and how many are ordered to ensure availability for possible upcoming customer orders at the Thailand warehouse. The only information manufacturing and logistics in Germany has in their IT system is an order issued by the warehouse in Thailand. This effect cascades through a globally dispersed network, making it harder to reduce stock levels, increase forecasting quality, or to react to volatile customer demand.

Long and variable lead times

BearCo's supply chain network – described above – comprises a network of about 150 globally spread warehouses to serve customer demand. Due to the network's historically developed nature, the responsibility for stock levels is not centralized in one corporate function, although logistics is forced to reduce stock constantly. *BearCo* realized that, to increase plannability and reduce stock levels globally, lead times have to be shortened and smoothed, since they currently face long and variable lead times. To measure lead times in their network, *BearCo* distinguishes between transport lead time, order lead time, and warehouse lead time. Because they only produce one type of product at one manufacturing site in their manufacturing network, the transport lead times are comparatively long for distributing finished goods to their designated warehouses. Order and warehouse lead times have been very volatile in the past, depending on the warehouse location. This is because of the historically developed nature of the warehouse network, where responsibilities and processes changed multiple times over the decades. The lengths and variabilities of different types of lead times become even worse when the scenario occurs

(as described above) in which a product produced in Germany is shipped to the central warehouse in Germany first, followed by transport to the regional warehouse in Singapore, before finally reaching the warehouse in Thailand.

Erratic behavior of decision makers along the supply chain

About 300 people work for the sales department of *BearCo* in China, initiating several partially disconnected sales activities to increase Chinese customer demand. To reduce lead times for the customers, and consequently increase the marketability of the products, salespeople have, in the past, often ordered products far in advance, before a concrete customer order has been issued. This situation is even exacerbated by the circumstance that Chinese salespeople do not want to “lose face” with the customer, a well-established construct of Chinese culture. This means, for example, that once a salesperson has promised a certain quantity of goods with a certain lead time to a customer, he will not then, later, tell the customer that this quantity or lead time cannot be realized.

How this circumstance can induce high volatility along the whole supply chain can be observed in the following example, experienced in China. During the negotiation process with a high-value local customer, a Chinese salesperson promised very short lead times for an extraordinary amount of bearings for wind turbines. The salesperson became increasingly confident that he would successfully sell those bearings. Since the salesperson promised such a short lead time, he knew that he could only fulfill the order, and thus not lose face, if he was to order the product in advance from headquarters, before the contract was closed.

Unfortunately, the contract was not concluded – but the bearings arrived at the Chinese warehouse. It took about six months to sell those bearings to other customers, leading to very high cost of stock. Additionally, following the very high order from the Chinese warehouse, logistics and production planning in Germany thought that this was the long-awaited breakthrough in the Chinese market and that from now on they would receive very high orders from China on a regular basis. Consequently, they adjusted their forecasts and production schedules accordingly to ensure greater capacity and higher production quantities in the long-term, also leading to very high stocks of raw material that lasted longer than desired.

Self-induced price variations

In the past, *BearCo* also induced high demand volatility through misaligned price variations for their own products. For example, the list price of the cylindrical roller bearings was increased by the sales department, effective from April 2017. By announcing this price increase to their customers at the beginning of 2017, *BearCo* induced an increased demand of about 20 % from January to April 2017. Since this price increase was not proactively communicated to the logistics and purchasing departments, the stock of that product decreased rapidly, leading to an out-of-stock situation. Consequently, purchasing had to organize additional raw material in the short term, leading to significantly higher cost on the supply side. After this demand peak, the new price became valid, followed by significantly lower demand in the months following the price change – leading to the assumption that *BearCo*'s customers issued orders that were higher than their actual demand in that period just to fill storage before the product became more expensive. These kinds of self-induced price variations, leading to volatility along the

supply chain, are a well-documented phenomenon in the bullwhip effect literature, but are still present in many modern supply chains.

High competition for raw materials at the supply side

Although *BearCo* is one of world's leading manufacturers of bearings, their bargaining power on the supply side, especially for their main raw material – steel – is comparatively low. This is because their demand for steel is relatively low compared to other industries (e.g., the construction industry). This leads to low priority at the supplier, higher prices, and higher lead times. This challenging situation on the supply side is further exacerbated in times of relative market shortage of steel, which has happened in the past.

Mitigation Strategies

To reduce the organizational misalignment caused by several conflicting interests of logistics, manufacturing, and sales departments, *BearCo* changed its internal structures and processes. More specifically, customer orders are now transferred directly to logistics, and designated demand chain managers have been introduced to ensure customer satisfaction by simultaneously balancing conflicting interests. Bundling demand chain responsibility in one corporate function also decreases the effects of self-induced price variations that are not well communicated throughout the company. Following this rearrangement, situations of self-induced short-term demand volatility that are difficult for logistics to cope with have been eradicated, since a rigorous end-to-end process for price changes has been implemented. Moreover, to mitigate the risk of a salesperson promising lead times and flexibilities that cannot be met by logistics, *BearCo* achieved ITAF 16949 and ISO 14001 certifications, standards that increase process quality to ensure customer satisfaction. Coincidentally,

those process standards assure the feasibility of certain customer requirements, leading to confidence that they can be met later on in the relationship.

Among the key challenges *BearCo* faces are very long and volatile lead times, especially in their demand side network of manufacturing sites and warehouse. The scope of action to reduce transport lead times in their global network is relatively narrow. Air freight for bearings is not an option in most cases due to their low value density and high transportation costs. In order to reduce transport lead times to China, one of their most important sales regions, *BearCo* tried to utilize the “New Silk Road” to ship finished goods, but encountered several challenges. For most of their products they discovered that the forces occurring during train transportation are too great and negatively impact product quality. Defect rates increased and they decided to not follow that path further since the development of train-specific transport packaging was considered as too time consuming, with an uncertain outcome.

However, the situation is different for order and warehouse lead times. During a large-scale lead time reduction and smoothing project, *BearCo* identified highly volatile order and warehousing lead times across different warehouses. Consequently, *BearCo* defined standardized order processing and warehouse handling processes that ensure shorter – but, more significantly, less volatile – lead times across their warehouses. The process standardization includes integration of multiple existing IT systems from different warehouses as part of increased stock transparency. Nevertheless, the roll-out of order processing and warehouse handling process standardization in a common operating system remains challenging and will be progressively implemented, starting with the larger warehouses. For very small warehouses, the profitability of this process change must be assessed case-by-case. Currently, *BearCo*

has managed to integrate about 20 out of their 150 warehouses. Additionally, to shorten the order commissioning process at the warehouses, *BearCo* is piloting a shift from the traditional man-to-goods process to an automated goods-to-man commissioning process utilizing automatically moving shelving at their central warehouse in Germany. This transition aims to improve commissioning process performance by up to 50 %.

To mitigate erratic behavior by decision makers along the supply chain, for example, those grounded in cultural characteristics, as seen above in the case of China, salespersons are obliged to allow the corresponding logistics function to challenge their orders. In the case of China, Chinese salespersons have to discuss their order with Chinese logistics personnel. *BearCo* reasoned that a direct communication with the German logistics function could lead to a cultural gap, leading to the same problem as described before. Therefore, to mitigate possible cultural misunderstandings, people with the same cultural background are examining the feasibility and meaningfulness of orders in their respective sales regions.

Guiding Questions

1. *BearCo*'s supply chain is suffering from conflicting goals of different departments. Find out what other companies are doing to mitigate or eradicate the effects of conflicting targets in their organization and come up with suitable recommendations for *BearCo*'s situation.
2. Erratic behavior of decision makers in the supply chain is a challenge for many companies. Try to figure out other examples of erratic behavior of decision makers and their effect on the supply chain. Are there different types of erratic behavior? What strategies do you suggest, in general, to deal with unintended behavior that induces problems along the supply chain?
3. One important aspect of reducing intra-organizational misalignment is a well-designed and implemented sales and operations planning (S&OP) process. What should an S&OP process look like in a global supply chain? Try to find examples of how other companies are dealing with this challenge. Which factors are crucial for a mature S&OP process?

Brake Systems: Unlimited: Managing Capacities in an Era of Shortage

Due to technological advancements over the past decades, the global demand for electronic sub-components such as transistors, wafers, and others has grown exponentially and outpaced the speed at which the manufacturers of those components can increase their capacity. This situation, combined with complex and time-consuming production processes of those components, leads to very long lead times that challenge millions of supply chains worldwide. The following case describes how a manufacturer of brake systems suffers from long lead times, and how irrationally behaving customers may be managed in an era of shortage.

Company Overview and Product Description

Brake Systems Unlimited (BSU) is one of the leading suppliers for different types of brake systems. Originally founded in Europe, *BSU* now has over 20,000 employees supplying customers all over the world, leading to an annual turnover of over 1 billion euros. Every modern brake system includes an electronic brake control unit (BCU) unit that itself consists of different sensors and control units. The BCU controls the brake force distribution on the wheels of the vehicle and, if necessary, the trailer. The following case describes the supply chain of BCUs at *BSU* and the challenges arising from it.

The Supply Chain of Electronic Brake Control Units

The *BSU* production network includes several production sites for different products all over the world. The final production and assembly of all BCUs for trucks and trailers takes place at a manufacturing site located in central Europe. This manufacturing site directly supplies some important truck and trailer OEMs; *BSU* warehouses in the USA and Japan; and also a central distribution center located in northern Germany. This distribution center consolidates different *BSU* products, components, and spare parts for globally dispersed customers and supplies BCUs and other parts directly to *BSU* warehouses in Brazil, South Africa, India, and China along with other, smaller

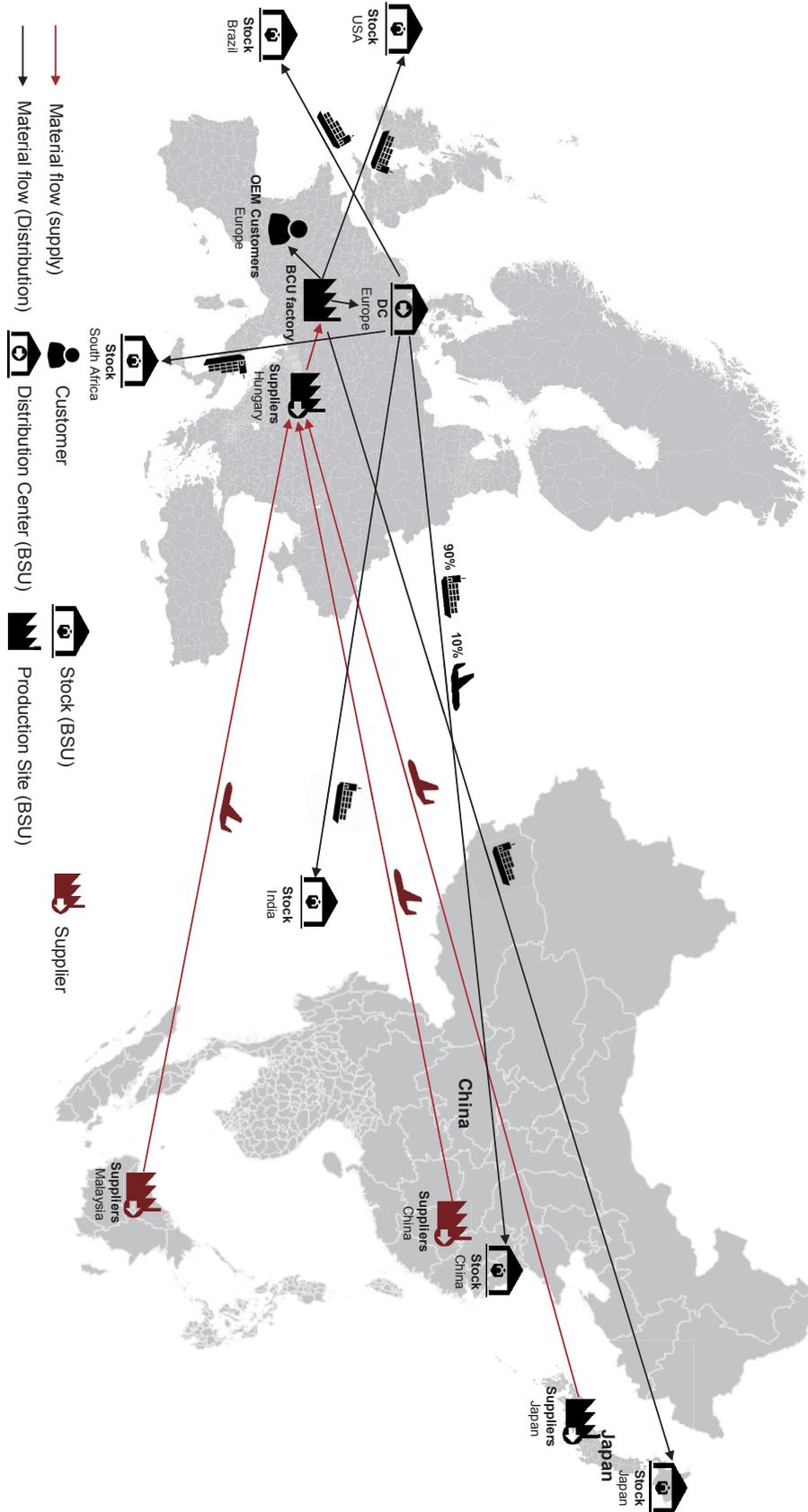
customers in Europe. Ninety percent of the volume from those warehouses is transported by ship and 10 % by air freight. Initially, the planned share of sea transport to those warehouses was higher, but the share of air transport had to be increased (with an associated increased cost) to compensate for time lost in the earlier stages of the supply chain.

One of the core reasons for those high special airfreight rates can be identified by looking into the supply side of ECUs. One of the core components of a BCU is the electronic control unit (ECU), supplied by one of two suppliers located in Hungary, each of which manufactures a different type of ECU. To produce ECUs, those Hungarian suppliers need different wafers, transistors, and other electronic elements that are supplied by sub-suppliers located in China, Japan, and parts of southeast Asia. Unfortunately, average lead times for wafers and transistors are about nine months, leading to an inflexible supply chain that is unable to react to short- and mid-term demand changes.

The Challenge of Increasing Demand in an Inflexible Supply Chain

As explained above, ECUs are supplied by two suppliers located in Hungary. Those ECUs consist, among other components, of different transistors and wafers. Due to accelerated technological advancement over the past decades, the global demand for those electronic

Figure 3: BSUs supply chain for electronic brake control units



elements has increased exponentially. This has led to the situation that demand for wafers and transistors exceeds global production capacity, leading to an era of shortage that can be observed in every technology-related industry.

This situation, combined with very long and complex production processes for those electronic elements in general, results in an average lead time of nine months between Hungarian suppliers and their sub-suppliers in Asia. Therefore, *BSU* is forced to provide a forecast to their Hungarian suppliers with binding volumes for the next nine months. It is easy to imagine the difficulty for *BSU* of forecasting their customers' demand for such a long period of time.

However, *BSU* recently experienced a dramatic demand increase for BCUs, including new customers worldwide, that exceeded their expectations. What might – at first glance – appear to be a great situation, in reality caused their Hungarian ECU suppliers huge capacity problems as they could not get enough material from their sub-suppliers to meet *BSU*'s demand. Due to this shortage of ECUs, *BSU* was unable to meet all customer demand, including new and existing customers. Instead of regularly supplying their customers with the volumes already agreed upon, *BSU* was not able to meet those quantities and allocated existing quantities among all customers according to their best available knowledge. This led to the situation that, very often, not even their customers' safety stocks could be served. Consequently, customers with existing contractual agreements demanded contractual penalties, making the situation even more complicated for *BSU*.

Additionally, the well-known “bullwhip effect” is dramatically visible in *BSU*'s supply chain. Their customers know about the shortage and that *BSU* is trying to spread limited volumes among all customers to

keep everybody partially satisfied. Consequently, customers order more than they actually need in order to gain importance and ultimately receive more of the limited quantities. This effect, known as shortage gaming, was recognized in the literature decades ago, but still challenges global companies. Due to this circumstance, it is extremely hard for *BSU* to figure out the real customer demand, which makes volume allocation even more difficult.

In order to deal with the shortage, *BSU* started to invest in additional capacity and renegotiated contractual agreements with existing suppliers. Although this took a lot of time, *BSU* managed to calm down a heated situation.

However, in this era of turbulence and shortage, *BSU* was about to close a contract with *jBUS*, one of the biggest Chinese bus manufacturers, which would have resulted in an enormous volume boost for the Chinese market. Although potential market volumes in China are large, previously *BSU* had only a small number of customers from China because the majority of buses, trucks, and trailers in China use outdated drum brakes. However, with increasing safety regulations and standards in China, the need for high quality, state-of-the-art disc brake systems is increasing, making China the most important market for *BSU* in the future. Additionally, China is seen as a potential early adopter of autonomous driving, and *BSU* wants to be at the forefront to become a leading supplier of brake systems in this segment. This being said, *jBUS* was about to become the “showcase customer” of *BSU* in the Chinese market, which should attract additional Chinese customers, making *BSU* one of the leading suppliers of brake systems in China.

Because of the importance of this contract with *jBUS*, the management board of *BSU* decided that *jBUS*

was to be supplied perfectly. Meanwhile, on their side, *jBUS* increased pressure by promising huge volumes and demanding relatively short lead times. In order to make this happen, *BSU* had to pre-produce large amounts of components and pile up huge stocks before the actual contractual agreement. To realize the *jBUS* demand, *BSU* had to re-negotiate agreements with existing customers that had been recently renegotiated, which took some time and led to disappointment at their customers.

After rearranging contracts, pre-producing components, and increasing stock levels in the supply chain, the long-awaited contractual agreement with *jBUS* still had not been finalized. Additionally, *jBUS* decided to decrease their volumes drastically. Although this took the negotiations back a step, this change of plans did not surprise *BSU*'s supply chain managers because, from the beginning of the negotiations, they feared that the demand volumes were not realistic based on estimations of *jBUS*'s production volumes. Nevertheless, stock levels had been raised that could not be lowered in the short-term.

BSU is confident that a contractual agreement will be established in the near future; but they are not sure about how to handle a volatile customer that increases demand at one point and cuts it down dramatically shortly after. In the case of *BSU*, this kind of volatility poses a particular threat because, with lead times of nine months for ECUs, the supply chain is not at all agile, and flexibility to react to short-term demand fluctuations can only be bought at a high price.

Looking for Ways to Deal with the Situation

One of the major challenges *BSU* has to face is the extremely long lead time, resulting in an inflexible supply chain that is unable to meet the increasing demand for

BCUs. Due to the aforementioned shortage, the increasing demand is of utmost difficulty. Moreover, it has to be stated that, although *BSU* is one of the leading brake system manufacturers, their total annual demand for electronic elements is low compared with those of tech companies, resulting in low bargaining power with wafer and transistor suppliers.

To obtain more wafers and transistors, long-term investments are necessary. However, long-term capacity investments are treated with caution. In particular, the tractor-trailer market suffered from the global financial crises, with sales volumes decreasing to 20 % of the value compared to the previous year, and, to date, the market has still not recovered and sales volumes are not yet at pre-2008 levels. Nevertheless, *BSU* started to increase capacities to deal with the increasing demand, but they are still struggling with the long lead times in their network and the effects that they cause.

In addition to this challenging circumstance, *BSU* has to deal with *jBUS*, a Chinese customer with an extremely volatile demand behavior that changes order quantities on a large scale. *BSU* employees admit that, normally, they would not have piled up stocks and started production without an existing contract with a customer, but the case with *jBUS* was special, since this customer seemed to be a promising cornerstone of the breakthrough into the Chinese market.

Although stock had been piled up even though the contract had not been finalized, *BSU* already decided to set up a "frozen zone" for *jBUS* once the agreement had been made in order to reduce short-term order changes. According to *BSU*, Chinese customers are more prone to volatile demand behavior than customers from other countries. To detect overestimated demand quantities from customers, *BSU* could seek to combine the demand quantities of Chinese customers

and compare them with *BSU*'s estimation of Chinese market developments and their market share. They are doing this successfully in Europe since they have enough customers in place to do such analyses; but, for China, their customer base is too small at present to draw reliable conclusions from this exercise.

Guiding Questions

1. Find out what a typical wafer supply chain looks like. Why are lead times for wafers as long as explained in this case?
2. Try to develop concepts that allow *BSU* to shorten lead times for wafers (and other electronic elements) or increase supply chain flexibility despite long lead times.
3. Due to this era of shortage, *BSU* customers are ordering more than they actually need. What can *BSU* do to figure out the actual customer demand or mitigate negative effects stemming from this shortage gaming?
4. Taking the scenario described into account, how should *BSU* deal with volatile customer demand behavior of Chinese customers in the future?

SAG: Managing a Bottleneck to Avoid Supply Chain Breakdown

SAG is a manufacturer of steering systems for the automotive industry. The following case describes how SAG manages its supply chain for electric motors. Due to safety reasons, SAG is not able to change its supplier and has to deal with any incorrect decisions made during the product development process. Consequently, SAG manages its supply chain down to the fourth tier, in order to mitigate volatility and disruptions caused by this second tier supplier.

Company Overview & Product Description

As a manufacturer of steering systems, SAG supplies the biggest automotive OEMs all over the world – ranging from low cost, high volume OEMs to high quality, premium OEMs. Due to their expertise and technological advancements, SAG also supplies first-tier automotive suppliers with components such as steering columns or other cold-forged parts. In total, across all products, SAG achieves a total revenue of over 2 billion euros per year. To be able to offer this wide product portfolio, SAG manages approximately 7,000 stock keeping units that come from around 500 direct suppliers.

The global manufacturing network of SAG consists of around 20 manufacturing sites, each of which manufactures steering systems and components for its respective region. Due to high value density and just-in-time requirements of automotive OEMs, SAG's manufacturing sites mostly have to be located where OEMs are building their manufacturing sites. Hence, manufacturing sites in central and eastern Europe, Mexico, Brazil, North America, and China are available to serve customer demand. Around 2003, SAG started doing business in China. Steadily increasing volumes in China led the company to establish five manufacturing sites in different parts of China – with others already planned – making China the most important sales market in the future.

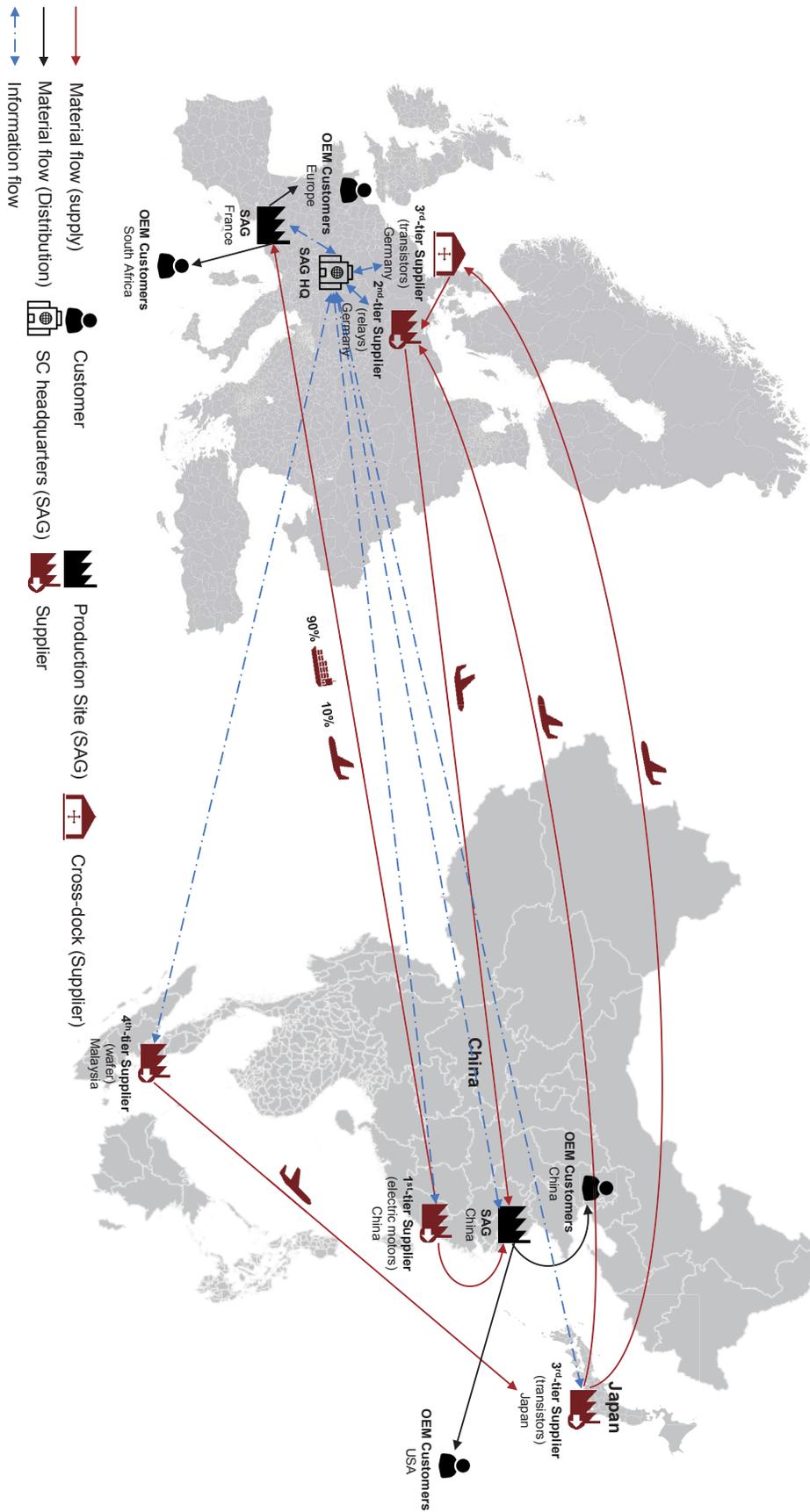
In the automotive industry, to assist the steering action, every modern steering system is equipped with a specific electric motor. In the following, the supply chain of one of SAG's steering systems is outlined – more specifically, the supply chain for major parts of this electric motor. The case will describe how a small bottleneck in the supply chain leads to devastating effects in the long run. This electric motor is sold around 1,000,000 times a year and has a lead time of around 160 days between start of production at the first tier and the customer delivery.

Searching for the Bottleneck in the Supply Chain of Electric Motors for Steering Systems

One type of SAG's steering systems is manufactured in France and China. While both steering systems are nearly the same, the plant in France supplies OEM customers in Europe and South Africa, while the Chinese plant produces steering systems for the domestic market as well as customers in the United States. Both plants are supplied with electric motors by a global first-tier supplier of the automotive industry named *SOUND*, whose plant for this electric motor is located in China. While the delivery of electric motors to SAG's Chinese plant is carried out by truck, the standard shipping mode to SAG's plant in France is sea freight.

During ramp-up of production for this steering system, deliveries from *SOUND* to SAG were on-time, with little

Figure 4: SAG's supply chain for electro motors for steering systems



or no sign of poor performance. However, after raising production volume to the level of series production, it only took a few months for SAG to realize that SOUND was not able to meet the required volumes in time. Many deliveries were delayed, forcing SAG to organize costly special freight deliveries by air to cover time that had been lost. Unfortunately, the situation became so bad that SAG had to ship up to 10 % of the volume via air freight – and, it goes without saying, those costs had not been planned for. And despite all these actions, SAG still experienced a large number of supply chain disruptions due to material shortages.

After discussing this matter, supply chain managers at SOUND insisted that they were not the cause of this problem. The second tier supplier – named *HoTech* – responsible for delivering a certain relay needed to produce the electric motor was failing to deliver the right amount of relays at the right time, making it impossible for SOUND to meet SAG's demand for electric motors. Moreover, SOUND managers stated that, when SAG awarded SOUND the contract for producing the electric motor, SAG had prescribed SOUND to choose *HoTech* as their supplier for this relay, because SAG and *HoTech* jointly developed the relay.

HoTech is a small family-owned business located in Germany with around 100 employees. Due to their expertise in relays, SAG had been confident that *HoTech* was the right supplier for, as well as right partner for the development of, this relay. After awarding SOUND with the contract for electric motors, they indeed prescribed *HoTech* as relay supplier and thought that SOUND managers would themselves establish a contract with *HoTech*. SOUND managers, on their side, thought that SAG had a contractual agreement with *HoTech* in place because they prescribed them as their 2nd tier supplier. This costly mistake consequently led to the situation that neither SAG nor SOUND was

able to pressure *HoTech* to improve their delivery performance due to service-level agreements.

To clarify the situation, SAG managers visited *HoTech* and explained to them that their non-performance threatened SAG's supply chain. However, *HoTech* on their side insisted that they were not fully responsible for delivery delays, since their relay requires certain transistors that are supplied by a supplier in Japan called *TFE*. According to *HoTech*, they were not getting enough transistors from *TFE* to produce the requested relays. Additionally, *HoTech* managers complained that they had no bargaining power against *TFE*, which is one of the global leaders in transistor manufacturing.

Until that point, SAG was not aware of the third-tier supplier, because normally *HoTech* was in charge of its handling. Nevertheless, SAG managers wanted to solve their issue and sat down with *TFE* managers in Japan. While discussing this matter, *TFE* managers rejected the blame because, from their point of view, *HoTech* provided poor forecasts and even on *TFE*'s supply side problems occurred that they claimed they could not be blamed for. According to *TFE*, their supplier for wafers – named *Wafex*, located in Malaysia, and also a large global enterprise – failed to provide the right amount of wafers at the right time. Consequently, *TFE*, from their point of view, was not able to perform adequately when both the demand and supply sides caused them trouble.

Still looking for ways out of the problem, SAG met with officials from *Wafex* in Malaysia. During this meeting, *Wafex* managers expressed that the forecasts they receive from *TFE* are too inaccurate to be met. According to information received from *Wafex*, *TFE* changes already placed order quantities shortly before the start of production, causing headaches at *Wafex*. Knowing the whole situation, SAG managers knew that, if they

were to confront *TFE* with this issue, they would pass the blame on to *HoTech* and the inaccurate forecasts *TFE* is receiving from them.

After weeks of discussions *SAG* managers had to evaluate all the data and information gathered during this process to find a way out of the problem. Although the blame was passed through the stages of the supply chain and problems occurred in each stage, *SAG* still had the impression that *HoTech* was a poor choice as a supplier, leading to a bottleneck in their supply chain. Nevertheless, they were willing to do everything necessary to improve the flow of electric motors to their manufacturing sites in order to serve OEM demand.

Managing the Bottleneck

After evaluating all information, the first idea that normally comes to mind is changing the supplier for relays and setting up a contract with a new, capable supplier. However, due to the restrictions of the automotive industry, changing *HoTech* as a supplier was nearly impossible. The steering system and all components belonging to it – including the electric motor – are seen as safety-relevant parts, which means that changing them requires a complex and time-consuming auditing and testing process even if a new supplier manufactures the exact same component. Normally, this process is undertaken during the product development process of the car. After passing all tests, major configurations of the car are mostly set for the next years until a new model is launched. Nevertheless, changing configurations is possible if needed, but requires capacities that the OEM does not normally have because changes of major components have not been planned for. Therefore, an OEM would only consider a change if there was a concrete safety-related issue with the component.

Since a supplier change was not an option, *SAG* wanted *HoTech* to come to a contractual agreement between *SOUND* and *HoTech*, on the one side, and *HoTech* and *TFE*, on the other side. The idea being that once a contractual agreement is found that outlines service levels, frozen zones, forecasting duties, etc., everyone in the chain knows what to do and sticks to the agreement. However, after discussing this matter intensively on all sides, *HoTech* declined a contractual agreement. As a small family-owned business, *HoTech* feared that they would perish between the two global players, *SOUND* and *TFE*, if they enforced penalties agreed upon in the contract just once. Moreover, *HoTech* managers knew about the situation mentioned above, that a supplier change was not possible and *SAG* had to stick to them. Although *SAG* discussed all possible options with *HoTech* managers, no agreement was reached.

To save their supply chain and avoid disappointed OEM customers, *SAG* undertook several initiatives on all sides, starting with the second- and third-tier suppliers, *TFE* and *Wafex*. Unfortunately, it must be said that, although *SAG* is one of the most important global suppliers for steering systems, when it comes to supply of electronic components such as transistors and wafers, their bargaining power is relatively low, since the total volumes needed are far below those of large enterprises in the electronics industry. Therefore, sheer bargaining power did not help to persuade *Wafex* and *TFE* to improve their planning and delivery processes. To save the transistor supply to *HoTech*, *SAG* bought production capacity at *Wafex* and *TFE*, and also assisted them in their forecasting and production planning processes. *SAG* also reorganized shipping arrangements. Transistors coming from *TFE* were normally transported via air freight first to a cross-dock in Germany that serves different European customers of *TFE*. Instead,

SAG arranged for these to be transported directly via air freight to an airport next to *HoTech*, saving a few days in the delivery process.

After clearing several issues on the supply side of *HoTech* as well as supporting *HoTech* in its forecasting, SAG managed to achieve a stable delivery of transistors to *HoTech*. Nevertheless, the supply of electric motors to SAG sites was still not consistent. It became obvious that *HoTech* had several production and quality-related issues on their own side, which they did not reveal at the beginning of discussions. Again, to clear the dust, SAG sent several of their own experts to *HoTech* to help them with improving their processes. After several months of audits, improvement workshops, and external consultation, the fronts between SAG and *HoTech* had hardened to the point that SAG managers were not even allowed to enter the facilities of *HoTech*.

Following all the initiatives undertaken by SAG at all stages of the supply chain, the material flow has been improved to a certain extent. But it never came close to the situation of steady supply of electric motors. Managing the forecasting and production planning processes up to the fourth tier of the supply chain is still necessary to avoid a supply chain breakdown, although SAG still experiences around 20 supply chain disruptions annually that cause availability issues for the customer.

Guiding Questions

An extensive total cost of ownership analysis was not executed by SAG during the supplier selection process of their second-tier supplier for relays. Consequently, in selecting *HoTech*, important criteria were not considered, leading to a devastating scenario. The aim should be to develop proposals about the criteria you would use – based on current knowledge – as the basis for making appropriate supplier decisions in the future.

Instructor note: An introduction to the concept of a total cost of ownership analysis is highly recommended.

If a second-tier supplier for relays had to be selected again in the future, what total cost of ownership criteria would you use to select that supplier to proactively prevent a problem like the one outlined above?

1. Which total cost of ownership approach would you choose? (Dollar-based vs. value-based)
2. Which data would you use for the selected criteria, and how would you measure them?
3. As you have seen, the decision to use the current supplier for relays has led to several unexpected supply chain issues. The aim now is to use what you have learned to develop proposals for how appropriate implementation of risk management at SAG could prevent similar issues in future.
4. The problem described in the case study exists – and cannot be solved easily. How would you deal with this problem, using your knowledge of risk management?
5. Which measures would you try to implement, in order to deal with the situation?

Prime Engines: Leveraging Potential in the Sourcing Process of an Automotive OEM

This case study describes the supply chain of *Prime Engines*, an original equipment manufacturer (OEM) in the automotive industry in the niche of high quality sports and luxury cars. Due to developments in recent decades, the automotive industry is characterized by a huge supplier network and rather low degree of value-added in *Prime Engines*' German factories. The networks are globally dispersed, which, in some cases, leads to long lead times and high complexity in the case of unforeseen events.

Company Overview

Prime Engines was established in the early years of the 20th century and from the beginning of its history focused on developing and manufacturing high quality sports cars in different vehicle classes. Its product portfolio ranges from coupes to limousines and sports utility vehicles (SUVs). Typical of the highly consolidated automotive industry, in 2012 *Prime Engines* became part of a larger corporate group, *Eco Car*, which also holds major shares in companies manufacturing private cars, trucks and motorcycles. *Prime Engines*' headquarters and production facility are located in central Europe. It generates revenue of €40 billion and employs 20,000 people, while selling 300,000 cars per year.

Product Description

As the sports car as a whole is too complex, it is not feasible to elaborate and illustrate the whole supply chain. Therefore, this case study will focus on a key component of the final car: the dashboard. This is a display or instrument panel with indicators and operating control units to operate the car. Although it may seem to be a simple component at first glance, this component is highly complex and safety relevant for the passengers.

The main parts of the dashboard are digital instruments, the head-up display, and switches for lighting and heating. The dashboard is completed by many

things that have only a secondary role in the operation of the vehicle. Commonly present are loudspeakers and air vents, car air conditioning system, navigation system, an ashtray, 12-volt sockets, airbags, a glove compartment and other shelves, as well as beverage can holders.

Every car manufactured by *Prime Engines* contains exactly one dashboard. As the dashboard is highly customizable, *Prime Engines* offers 200 different version across its product portfolio.

The Supply Chain

Although this case study focuses on one sub-component of the sports car, the supply chain for a dashboard is still very complex and globally dispersed. The tier-1 suppliers stem from three main industries:

1. Electronics
2. Textile
3. Plastics.

Prime Engines sources in three global markets and therefore receives goods from 30 different suppliers in China, eastern Europe, and western Europe in order to source the 80–100 parts for each dashboard. The total number of parts per dashboard depends on the product configuration of the customer. All tier-1 goods

are sourced in all regions, so there is no regional focus on a specific region for specific goods. The overseas products are shipped to a port in northern Germany and from there delivered to a third party logistics provider (3PL). Products from eastern and western Europe are collected by the same 3PL using trucks. Besides gathering the sub-products for the dashboard, this 3PL organizes the just-in-time delivery to the production site for *Prime Engines*.

The production itself is then organized as a pre-assembly line to the main assembly line of the car. This means that the dashboard is fully assembled before being built into the car as a complete unit. As mentioned before, the process is complex due to the make-to-order process of 300,000 units/year and the high level of modularity (200 different versions). Due to those facts, *Prime Engines* decided to organize production with a just-in-time principle similar to the main car assembly process. Those two processes (main car assembly and dashboard assembly) need to be highly coordinated to ensure a high reliability of the production sequence. Every car produced is manufactured based on a concrete customer order according to the make-to-order principle.

The final cars are then distributed to local dealers across the globe. European dealers get the deliveries directly from the production facility via truck. Overseas dealers get their products via ships and trucks through a distribution center in northern Germany. Other manufacturers often use CKD (Completely Knocked Down) or SKD (Semi Knocked Down), methods where the fully-assembled car is knocked down into components in the origin country and then re-assembled in the destination country, to save on taxes and customs duties when shipping the cars to other continents. As *Prime Engines'* order quantities are not as high as other manufacturers due to their premium segment, CKD factories in overseas markets are uneconomic. Furthermore,

Prime Engines offers each customer the opportunity to pick up their car directly from the factory, combined with other bookable events such as visiting the shop floor or trying out their new car on a race track. The share of the total production volume of *Prime Engines* is spread across the different regions as follows:

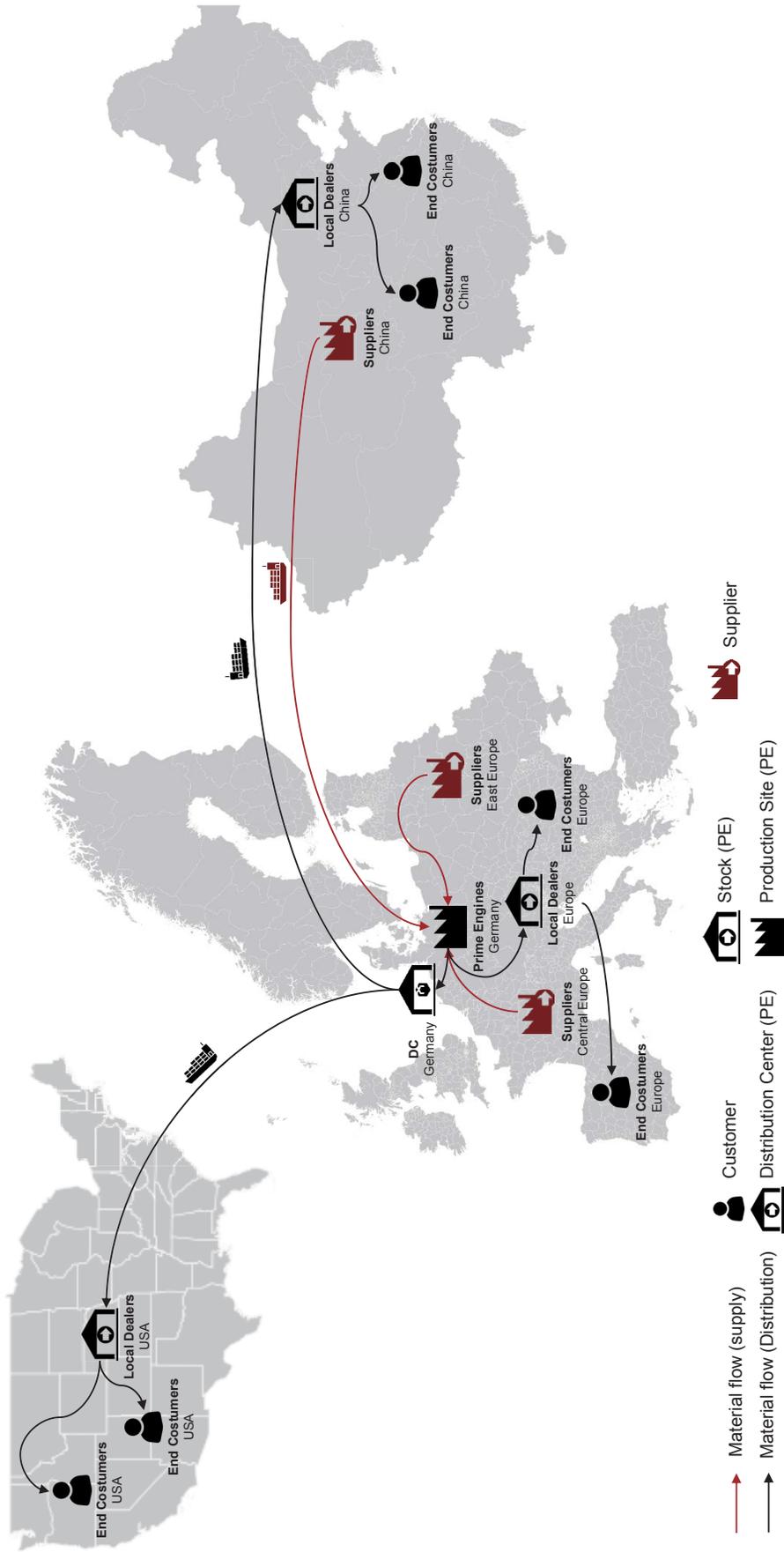
- USA 30 %
- China 25 %
- Central Europe 25 %
- Rest of Europe 15 %
- Rest of the world 5 %.

Challenges in *Prime Engines'* International Logistics Network

Risk management

The current sourcing system has been shown to be vulnerable in some cases. *Prime Engines* was hit by a total failure of its supply infrastructure in 2017 when a supplier's electronics facility in China burned to the ground. This resulted in high production delays as other electronics supplier were not capable of producing the missing parts due to a lack of either capacity or capability. *Prime Engines* tried to solve the problem by producing vehicles without dashboards and temporarily storing them on rented space and, as far as possible, storing the incomplete pre-assembled dashboards. These vehicles were then brought into production after solving the problem. A significant challenge was then to assign the pre-assembled dashboards to the respective customer-specific vehicles, as no reliable IT solution was available due to the rented storage space. After two weeks, *Prime Engines* was able to compensate for the supplier's loss of production through a short-term investment in the capacity of a supplier of *Eco Car*, their parent company. In total, production shifted by around 8,000 vehicles.

Figure 5: Prime Engines supply chain



LSP management

The decision to use a 3PL as an essential link between its suppliers and *Prime Engines*' production was made due to the flexibility required when it comes to manpower demand and because of the rising cost pressure in the industry, making it reasonable to leverage the potential of a specified service provider. However, 3PL's performance is decreasing with increasing customer demand and *Prime Engines* wants to look into possible insourcing of logistics activities in the future.

Evaluation of tenders

Prime Engines is currently updating to a new generation of dashboards. Therefore, the supplier contracts need to be renegotiated. Past negotiations were solely based on qualitatively pressurizing the suppliers with the high market power of *Prime Engines* and its mother company, *Eco Car*. Due to the market tendency to shift power to suppliers because of high integration in product development and the high need for integrating the business processes, especially for just-in-time delivery, *Prime Engines* wants to improve its negotiating position through data-based arguments. The procurement department is currently examining possible analytics methods. Negotiations on LCD displays in the dashboards will begin shortly. The value of these negotiations amounts to over 600 million euros. Due to the high annual demand for dashboards, even small savings at the individual part level would lead to high overall savings. In total, ten suppliers applied for the tender, of which four were selected after applying the internal exclusion criteria. Due to existing procedural connections, it would be advantageous from the perspective of *Prime Engines* to remain with the current supplier, but, nevertheless, to significantly depress its prices.

Guiding Questions

1. Elaborate possibilities for reorganizing the global sourcing cluster in order to be more efficient and reliable. *Prime Engines* aims, above all, to reduce delivery costs, bundle transport as far as possible, and continue to reduce the default risk (see example above). Please elaborate options regarding local/global sourcing and single/dual/multi-sourcing.
2. As the new generation of *Prime Engines* dashboard is about to be developed, they are calling for tenders for the plastic materials of their switches in the dashboard and want to reduce the current suppliers' prices. In order to do so, they want to apply Linear Performance Pricing (LPP).
 - a. Explain the LPP-method in general.
 - b. Discuss advantages and disadvantages of this method.
 - c. Apply the LPP-method and calculate the best price straight ($f(x) = m \cdot x + b$) based on the following received data points (weight & price):

Part #	Weight [g]	Price [€]
A1	10	0,30
A2	20	0,80
A3	30	0,70
B1	20	0,50
B2	10	0,75
C1	50	0,65
C2	10	0,85
C3	30	1,15
C4	90	0,7
D1	20	1,00
D2	70	1,05
E1	50	1,10
E2	40	0,9

- d. Based on your results, calculate the best price that should be negotiated for part C3 weighing 30g.
- e. Assuming part C3 is used 3 times in each of Prime Engines' dashboards, what are the yearly savings based on your results?
- f. Research further methods that could be used in the purchasing department of an automotive OEM in preparation for a supplier negotiation. Please place a special focus on data analytics methods.

RoboElectrics: Dealing with Unreliable Customers in Asia-Pacific Markets

The following case study describes the supply chain structure of *RoboElectrics*. *RoboElectrics* is a Chinese subsidiary of a German manufacturing company of the same name. Both companies are part of a corporate group that is led by the German parent. This case study describes the supply chain, and supply chain challenges, of the E-Switch-578, an electronic component that is used in a number of rather different high tech circuits. A number of automotive manufacturers depend on the E-Switch-578 for crucial automotive safety features. Due to this, *RoboElectrics*' automotive industry customers occasionally place rushed express orders. In addition, market-leading high tech automation robots are controlled by circuits that rely heavily on the E-Switch-578. The ever-growing demands of this rapidly growing industry have led to a number of challenges. *RoboElectrics*' small parts warehouse operates at almost full capacity to meet the continuous production demands, while the rapid growth in the automation industry combined with the long E-Switch-578 lead time causes a high degree of uncertainty. Furthermore, *RoboElectrics* is dealing with delivery delay requests from customers who want to pick up their orders days or even weeks later than agreed upon. This case study is based on interviews conducted at the headquarters of the subsidiary with the responsible supply chain managers.

Company Overview

RoboElectrics is a subsidiary of one of the dominant players in the field of electronic components for the automotive industry and for high tech automation systems. *RoboElectrics* was founded over 20 years ago and is currently responsible for distribution, final assembly and aftersales support in the North Asia region. This region contains mainland China, Korea, and Taiwan. Korea and Taiwan both have their own sales offices, which are supported by the headquarters located in mainland China. The warehouse for the whole North Asia region is located at the headquarters. The subsidiary is responsible for roughly 10 % of the yearly 700 million euro revenue generated by the corporate group. Roughly 10 % of the 3,500 employees working for the corporate group are employed by the subsidiary. Worldwide, the corporate group sells almost 2 million units of different product variants each year. *RoboElectrics* has two customer groups, the first comprising electronic component resellers while the second consists of OEMs. Due to the growing

demand for automation technology, in the past year *RoboElectrics* signed a number of special contracts with the biggest high tech automation OEM.

Product Description

The E-Switch-578 is a so-called frequency converter, which generates a frequency and amplitude changeable, alternating voltage for the electricity supply of machines such as three-phase motors. A prime example for frequency converters is their use in automotive power steering systems.

The E-Switch-578 is a highly customizable component that has 250 variants. Depending on the variant there are between 12 and 18 different subcomponents built into the E-Switch-578. The component was first produced and sold during the late 1980s. A more modular successor version of the E-Switch-578 was introduced by *RoboElectrics* during the late 1990s, but the original E-Switch-578 remains more popular. Last year the Chinese subsidiary sold over 20,000 units of the E-Switch-578. The depth of value-creation of the

E-Switch-578 is rather high at roughly 50 %. Due to the many different variances of the E-Switch-578, *RoboElectrics* applies the make-to-order approach. *RoboElectrics* generated a revenue of roughly 10 million Euro last year by selling the E-Switch-578.

The Supply Chain

This section describes *RoboElectrics* supply chain regarding its upstream and downstream material flows as well the production itself.

Upstream

There are seven upstream component/sub-component parts. The different manufacturing steps that are carried out upstream are shown in Figure 6.

RoboElectrics utilizes 14 direct suppliers when manufacturing the E-Switch-578. The suppliers of the sub-components can be grouped into two categories:

1. Suppliers that are part of the corporate group; a high number of subcomponents are supplied

through specialized hubs and plants located in Europe.

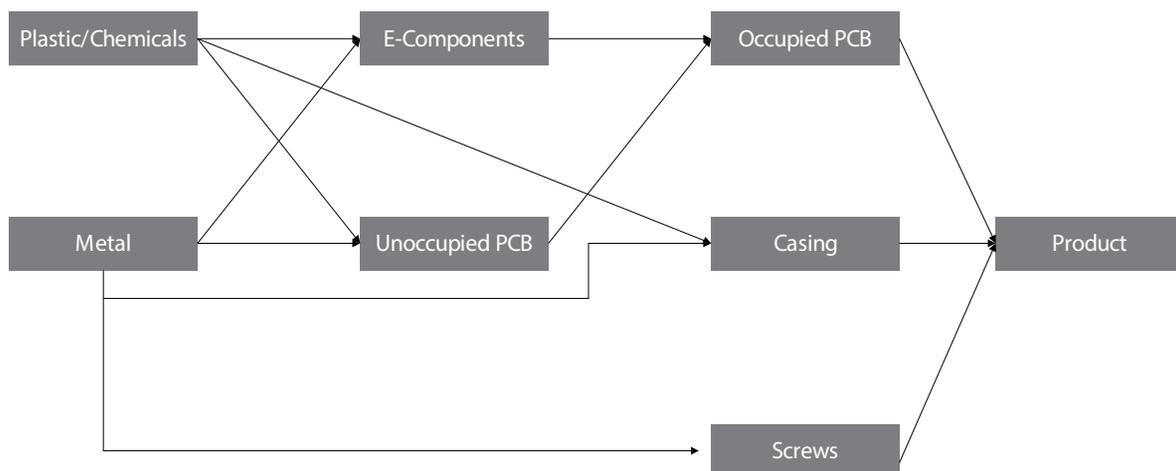
2. Suppliers that operate in Asia; most Asian suppliers operate in eastern China.

Inbound deliveries are stored in a warehouse located at the subsidiary's headquarters. The subcomponents stored in this warehouse guarantee production for up to three months. The average delivery reliability of suppliers stands at 85 %, with a ratio of rejected items per month of 0.40 % and a volatility of 10 %.

Production

Each year *RoboElectrics* produces roughly 20,000 units of the E-Switch-578 on the headquarters assembly line. Since *RoboElectrics* sells a high number of specialized variants, the company applies the make-to-order approach, producing only units that have been ordered by a customer. The 20,000 E-Switch-578s that are produced each year are manufactured during two shifts on every day of the week. During especially busy seasons additional shifts are sometimes inevitable. Roughly 40 units are produced during a shift.

Figure 6: Components for the E-switch



The total product lead-time, from raw material to customer delivery, is roughly 180 days. Due to the rather long product lead-time, the lead-time variability is over 30 days. In exceptional cases, *RoboElectrics* offers an express production cycle in addition to its normal production cycle. The express production cycle offers delivery within 24 hours.

Downstream

The downstream supply chain is dominated by two main customer groups:

1. Automotive OEMs
2. Automation companies.

Each customer group is responsible for roughly 45 % of the total revenue. *RoboElectrics*' customers are located in mainland China, Korea, and Taiwan.

Each unit is comprehensively tested after it has been produced. Finished units are stored in the warehouse at the headquarters. Usually, logistics services providers pick up the products at the warehouse and transport them to the customers.

RoboElectrics offers its customers a variety of after-market services, with service departments in different locations across the North Asia region.

Challenges in *RoboElectrics*' International Logistics Network

RoboElectrics faces a number of challenges when producing and distributing the E-Switch-578. In particular, during the last couple of years, the success and almost exponential growth of some of the customers of *RoboElectrics* have led to a number of challenges. Production and efficiency need to be increased, while current production needs to continue operating. Since

the E-Switch-578 is part of a number of crucial circuits, last minute rush orders occasionally happen.

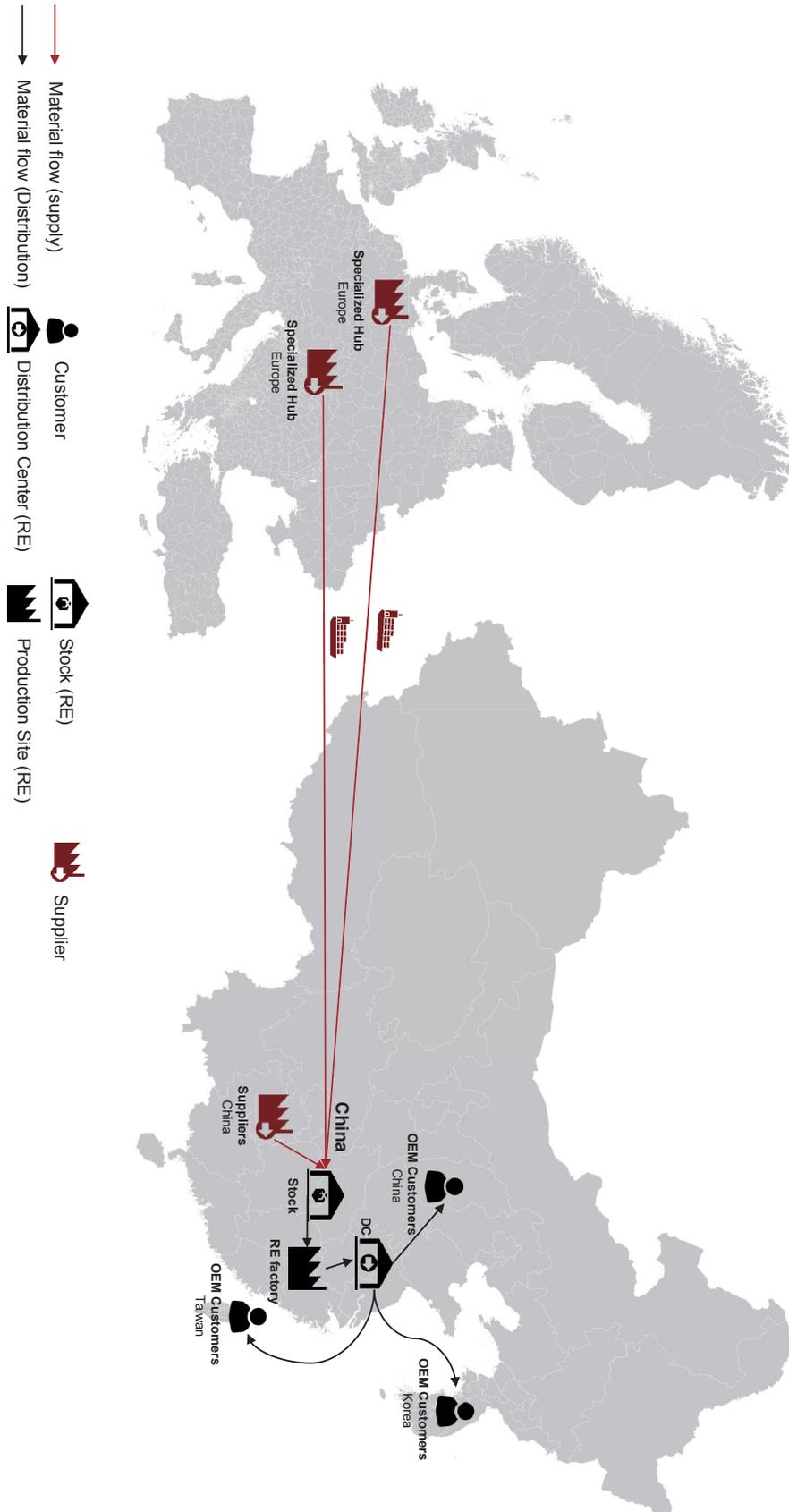
Delivery delay requests by the customers

Because of the long product lead time, customers often request last minute delivery delays and therefore ask *RoboElectrics* to store the ordered items for them. The requested delays are usually just a couple of days, but there have been cases where the customer requested a delay of a couple of weeks, or even months. Since *RoboElectrics* is a customer-focused company, customer requests for delayed delivery are usually granted without passing the additional expense on to the customer. Roughly 50 % of the orders are subject to a delivery delay request. The customers' reasons for doing so are not known by *RoboElectrics*. During the last year *RoboElectrics* had to rent additional warehousing space. Although the bargaining power of *RoboElectrics* is rather low in relation to their customers, as these are usually large, high-volume OEM companies, *RoboElectrics* want to tackle this issue at the distribution end of their supply chain. Therefore they are planning to introduce a better forecasting system, for which they see two options:

1. Improve internal forecasting systems with the data they currently have (future customer orders, production capacity, past customer order with the corresponding delay requests, etc.);
2. Implement an integrated forecasting system with real-time data exchange with their customers.

Obviously, the second option would be much more precise, but also more costly and complex to implement as additional costs for their customers are likely to be passed back to *RoboElectrics*.

Figure 7: RoboElectrics' supply chain for the E-switch



Aside from the better forecasting currently under discussion, another option is setting the right incentives for their customers to pick up the orders on time.

Automation of the warehouse

RoboElectrics is currently planning the full automation of their production supply warehouse. Since the components *RoboElectrics* is producing are in high demand, it is not possible to stop internal operations for a long period of time and production must be assured during the process of fully automating the small parts warehouse. As a result, *RoboElectrics* is looking for a strategy that allows the automation of the warehouse while it is running at full capacity. One possibility they are considering is to reduce their stock level for the duration of the reconstruction of the warehouse to save capacity for the automation of the warehouse while production is running. This means they would need to dramatically decrease delivery times for the parts they source from Europe.

Guiding Questions

Which actions should be taken into account for optimizing the internal forecasting systems?

1. What other actions can you think of to optimize the process, aside from improving the forecasting? Take into account that the products *RoboElectrics* is selling are customer specific but are always based on standardized modules.
2. How should *RoboElectrics* deal with customers demanding delivery delays in the future and what incentives should be set in order to ensure reliability regarding the pickup of orders?
3. Investigate what kinds of approaches can be applied to automate an existing warehouse without

interrupting the operation. What are the main points that need to be considered? How should the process look? Are there parts of the warehouse that should be automated prior to others?

4. During the reconstruction of the warehouse, *RoboElectrics* is considering lowering their stock level, which would imply they would also have to increase their delivery frequency. One option they are considering is to use the New Silk Road by train for the goods from Europe as this could be a cost/time-efficient way to transport material from Europe to China.
 - a. What is the Chinese “One Belt, One Road” initiative and what are its three main goals?
 - b. What are the average delivery times for transports from Europe to China by:
 - i. Ship
 - ii. Plane
 - iii. Train
 - iv. What is the ratio of costs compared to each other (per TEU)?
5. Assess the possibility of using the New Silk Road for transport from Europe under the following assumptions:
 - *RoboElectrics* gets high quality electronic components from Europe
 - They would need weekly deliveries to their production facilities
 - Demand is about 20 TEU / week.
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MOVE: Handling Volatile Customer Demand in the Chinese Market

The following case describes the supply chain for clutches for the Chinese market manufactured by *MOVE*, one of the major suppliers in the automotive industry. In China in particular, *MOVE* experiences a very high degree of demand volatility from Chinese OEMs that either increase demand at short notice or drastically reduce previously forecast quantities. Due to an inflexible supply chain with very high transportation and supplier lead times, *MOVE* must find ways of dealing with these circumstances.

Company Overview and Product Description

MOVE is one of the leading suppliers in the automotive industry. Due to their large product portfolio (chassis components, dampers, clutches, bearings, steering components, and many more) it can be assumed that a large proportion of new cars registered worldwide contain one or more components manufactured by *MOVE*. To be at the forefront in all major markets, *MOVE* has over 100 facilities worldwide, including dozens of manufacturing sites.

The following case study relates to a double clutch that is manufactured for the Chinese market. The clutch itself is a complex product that consists of over 100 different components sourced in different parts of the world.

The Supply Chain of Clutches for the Chinese Market

The clutch is manufactured at a *MOVE* manufacturing site in China. For supply security, *MOVE* plans for all components necessary for manufacturing to arrive two weeks before the start of production, and to ensure flexibility and stable production *MOVE* follows a local content strategy that seeks to increase the ratio of components sourced in the region of the manufacturing site. Already, 46 % of components are sourced in China, accounting for 57 % of the total cost of the product. Nevertheless, sourcing from abroad is still

necessary, with most overseas-sourced components manufactured in Germany (48 % of all components, 38 % of total cost). The majority of these are sourced from German suppliers that deliver directly via ship to *MOVE*'s manufacturing site in China. Moreover, some components also come direct from one of *MOVE*'s German manufacturing sites that processes two components coming from a Hungarian supplier. Additionally, a few components are sourced in Great Britain (4 % of all components, 2 % of total cost) and South Korea (1 % of all components, 4 % of total cost).

The standard shipping mode for components coming from overseas is via ship, leading to very long transportation times. Transportation alone from suppliers in Germany or Great Britain to the manufacturing site in China takes up to 10 weeks, including transportation inland and all necessary export and import processes. Transport time from South Korea tends to be much shorter, with average transportation times of two weeks, while domestic transportation from Chinese suppliers via truck to the designated Chinese manufacturing site of *MOVE* takes up to one week.

Due to short-term order changes by Chinese OEM customers, *MOVE* managers are often forced to look for faster but more costly means of transportation for materials sent from European suppliers to China. Therefore, they could use airfreight for very urgent deliveries, leading to transportation times between 2

days and 2 weeks, depending on flight schedules and cost considerations. Moreover, on several occasions *MOVE* also tried to utilize train transportation from Europe to China, leading to transportation times of 6 to 8 weeks. However, *MOVE* faces several issues in trying to use the so-called “New Silk Road” via train from Europe to Germany. Transportation times are less reliable than promoted, for a number of reasons. Railway lines belonging to the former Soviet Union use different track widths from lines in Europe or China. Therefore, time-consuming track changes must be carried out at heavily overloaded terminals in Malaszewicze (Poland)/Brest (Belarus); Dostyk (Kazakhstan)/Alashankou (China); or Zabaikalsk (Russia)/Manzhouli (China). Capacity problems lead to the situation that trains sometimes have to wait for several days before transiting the chosen terminal, making the arrival time of a train hard to calculate. Additionally, necessary documents for customs clearance have to be perfect, otherwise transportation times are even worse. Further, *MOVE* cannot share a container with others because the whole container is stuck if the customs documents of other parties are not adequate.

However, long transportation time is not the only issue that makes *MOVE*'s supply chain inflexible. In addition, supplier lead times for the majority of steel-related components are relatively long. Independent of whether the components are coming from Germany, Great Britain, South Korea or China, the period between ordering a component at a supplier and the supplier having it ready for shipment is between 12 and 18 weeks. Although suppliers should have a safety stock of the average demand of one week and suppliers should also be able to cope with demand increases of 25 % per week, such transportation and supplier lead times result in a very inflexible supply chain that has problems meeting high demand fluctuations.

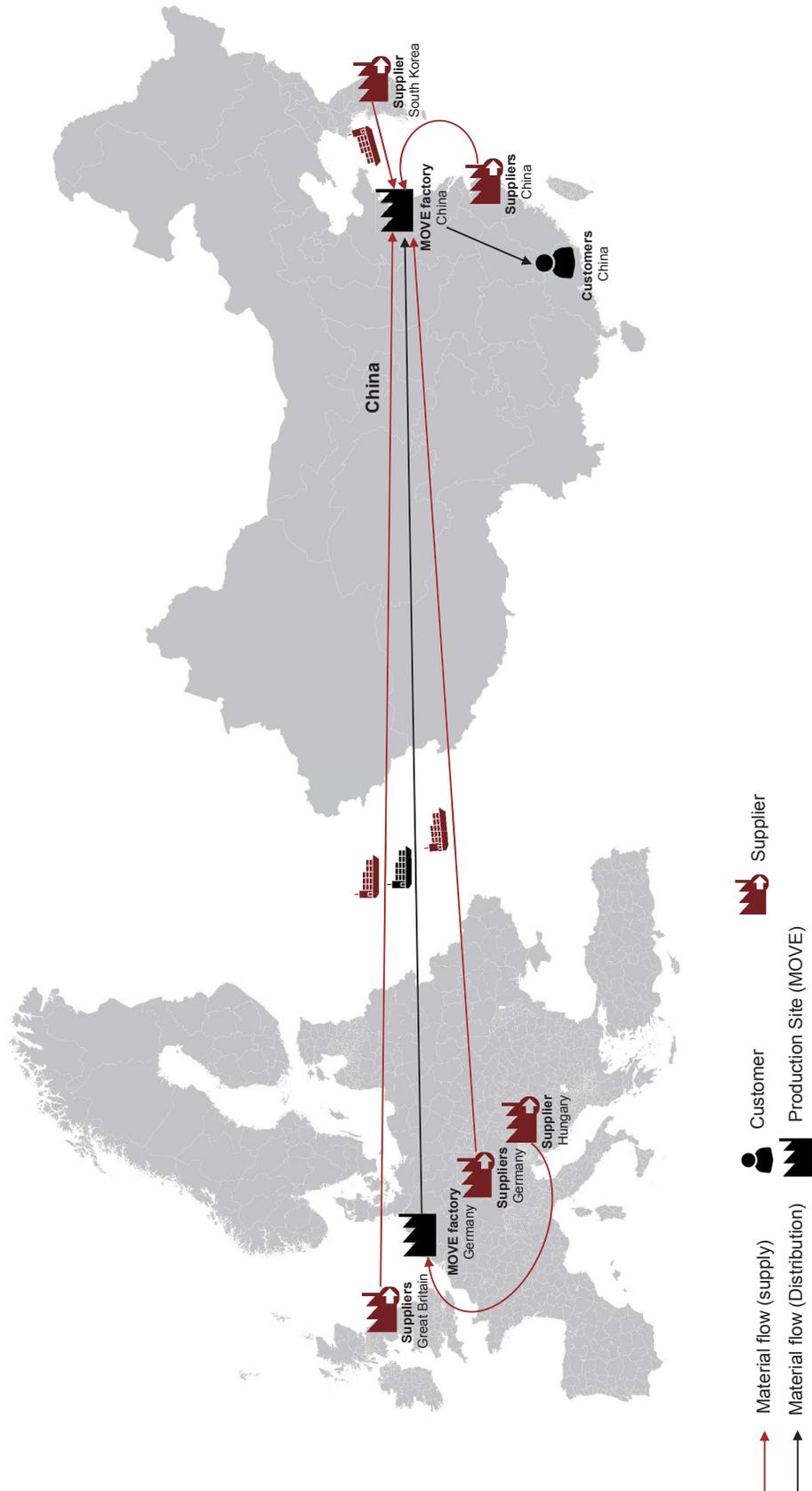
To give their suppliers a chance to cope with the demand, and in line with industry practice, *MOVE* is compelled to provide its suppliers with forecasts. Those forecasts are binding up to eight weeks in advance with dedicated frozen zones in place. Unfortunately, *MOVE* does not always receive binding forecasts from their OEM customers, which is especially the case for China, where their customers grant themselves the right to increase or decrease quantities in the short term.

The Challenge of Volatile Customer Demand Forecasts

Forecasting demand in the automotive industry is becoming more and more challenging. The case of China, in particular, is even more challenging since demand in the automotive sector is strongly influenced by government regulations. For example, in 2018, customer demand in the Chinese automotive industry decreased drastically. To support the industry, the Chinese government installed a tax benefit program for customers willing to buy a new car. Unfortunately (from *MOVE*'s point of view) the Chinese government did not announce this program well in advance, as would have been the case in Europe – it was valid from the day of the announcement and nobody knows how long the program will last. However, with the help of this program, customer demand increased, but remains highly volatile. For OEMs and their suppliers this is a very challenging scenario, because nobody knows for how long quantities sales will remain high or even increase, but they have to be prepared. Therefore, all OEMs, and consequently their suppliers, increased their forecasts for the subsequent periods. Nevertheless, everybody knows that an era of demand increase can always be followed by a demand collapse.

According to *MOVE* managers, this already volatile situation is further exacerbated by the extremely volatile demand behavior of the Chinese OEM itself, which

Figure 8: MOVE's supply chain for clutches for the Chinese market



promises its customers more than it can cope with, promises that are passed on through the automotive supply chain. This behavior of wanting to promise everything to their end-customers is caused in a large part by the specifics of the Chinese customer, whose car buying behavior is different from that known from other major markets. If an end-customer wants to buy a new car in Europe, he knows that he has to wait between two and six months before getting his personalized car delivered. The case for China is different. The Chinese customer goes to a car salesman and wants to take his new car home directly. This causes challenges for the salesman, because he has to know the real customer demand in advance and does not want to disappoint a potential customer if he does not have a certain car in stock. This often leads to an overestimation of the real customer demand.

The following representative example expresses the typical demand behavior of a Chinese OEM that *MOVE* experiences on a regular basis. The table and graph below outline an excerpt of cumulative demand forecast quantities for this Chinese OEM between week 16 and week 44 of calendar year 2018. To understand how the figure has to be read, an exemplary look at the last line of the figure is necessary. This outlines the cumulative forecast quantities provided by the Chinese OEM for the clutches manufactured by *MOVE* in China. On April 17, 2018 (week 16 of 2018) a forecast was provided. Up to this date, 117,999 pcs. of clutches have been requested and, according to the forecast, up to week 17 of 2018 (one week later), a cumulative quantity of 123,499 pcs. will be needed, meaning that 5,500 pcs. are requested for week 17.

Consequently, according to the forecast provided on April 17, 2018 (week 16), a cumulative quantity of 198,499 pcs. will have been requested up to week 34 of 2018. This corresponds to a weekly demand of about

4,500 pcs., including highs of 12,000 pcs. requested for week 28 of 2018 and periods of zero demand (weeks 29 to 32). Taking into account the aforementioned supply chain structure with supplier lead times between 12 and 18 weeks and transportation times of one to ten weeks (depending on mode of transportation and location of supplier), it becomes obvious that *MOVE* must, to a certain extent, rely on the forecasts provided by their customers due to the inflexible supply chain structure. To ensure the quantities requested by their Chinese OEM customer, *MOVE* has to plan according to the forecast provided to them.

However, when analyzing the next forecast – provided by the Chinese OEM just one and a half weeks later, on April 26, 2018 (calendar week 17) – it can be observed that the OEM drastically changed forecast quantities. Comparing the cumulative forecasting quantities for week 28 of the two forecasts (provided on April 17 and April 26), it can be seen that the cumulative forecast quantity up to week 28 decreased by 29,000 pcs., which is a significant amount considering the average weekly demand of 4,500 pcs. Nevertheless, according to the forecast provided on April 26, the OEM proclaims that most orders are merely postponed, and, for week 34, the difference between the two forecasts is “only” 7,000 pcs.

MOVE managers stated that they experience this kind of behavior on a regular basis in the Chinese market, and on April 26, 2018, it should already have been clear that the forecast quantities would decrease further. Future weeks proved them right. Several orders were first postponed and later canceled at short notice. This is underlined by analyzing the forecast provided to *MOVE* on July 26, 2018 (week 30 of 2018). The realized cumulative quantity up to week 30 was at just 151,379 pcs. instead of the 188,499 pcs. as forecast on April 17, 2018. According to the forecast provided

on July 26, 2018, the cumulative order quantity up to week 44 will be at 165,739 pcs. – which is lower than the cumulative forecast quantity for week 27, as originally requested via the forecast of April 17, 2018.

As already observed, due to long transportation and supplier lead times, *MOVE* has to plan and initiate orders according to the forecasts provided by their customers. The consequence of this particular case is that a large number of components are already ordered and in the supply line when demand is cut. Therefore, huge amounts of stock pile up at the manufacturing site in China, with very high uncertainty about when they are going to be needed. If customer demand behavior had been the other way around and quantities were raised at short notice, costly special freight deliveries would have been necessary, which was not the case.

Although this is just an example of one Chinese customer, managers stated that it was the same with other customers in the Chinese market. For *MOVE*, this led to the challenge of trying to estimate the real customer demand long before the Chinese OEM customers know their real demand.

How to Manage Demand Volatility?

According to *MOVE*, the easiest way to dampen the behavior described above would be to establish frozen zones. Within predefined time windows, customers would only be allowed to change order quantities to a certain extent. However, according to *MOVE*, their Chinese customers refuse to accept frozen zone – and, unfortunately for them, *MOVE* is not allowed to change order quantities on its own supply side within a zone of four to eight weeks, depending on the supplier.

MOVE managers are aware that accurate forecasts are the core of efficient supply chain operations because

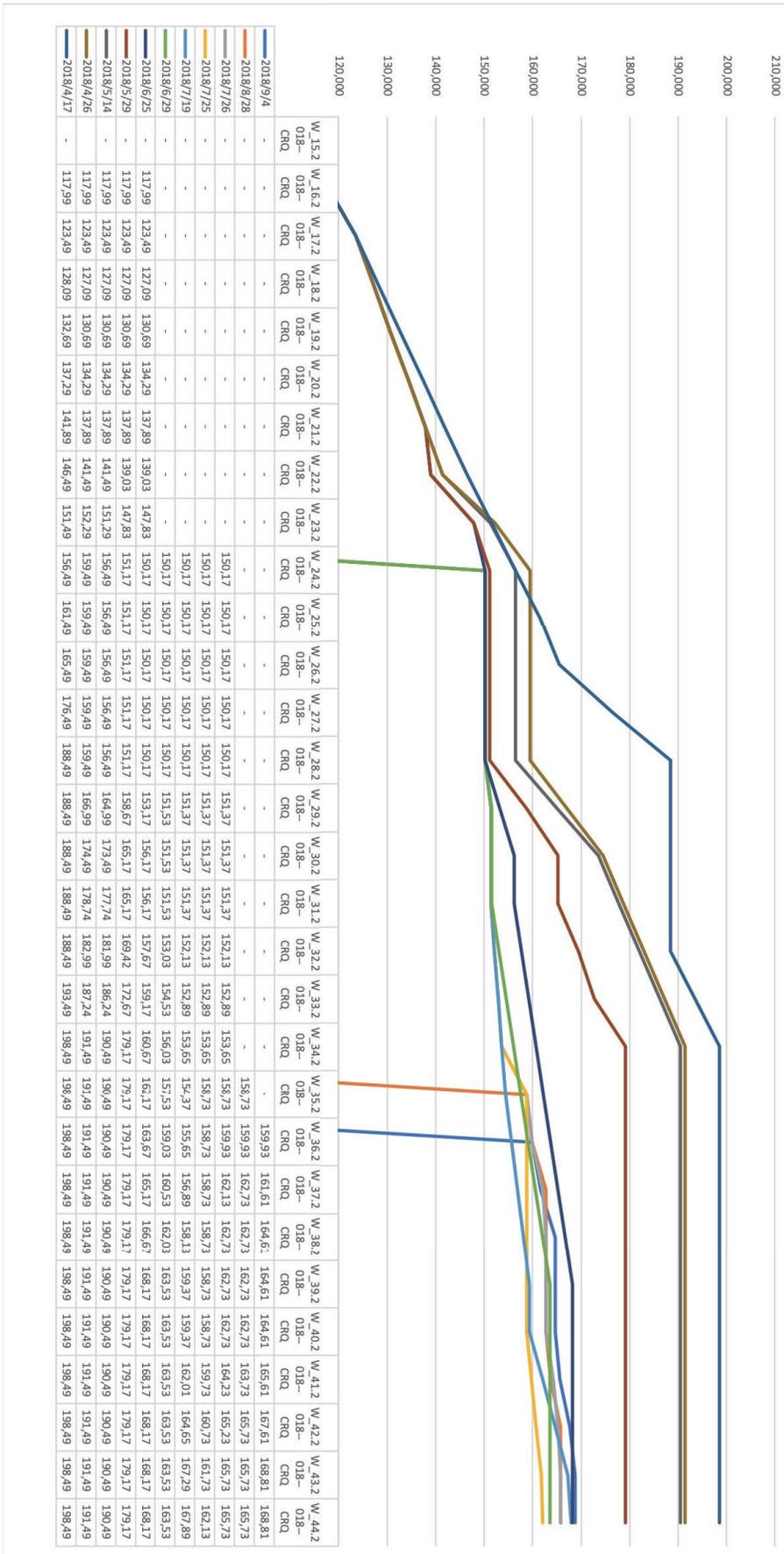
they directly impact stock levels and customer satisfaction. Hence, forecasting is understood as a core management discipline instead of an unpopular task that somebody has to do, but does not want to be held accountable for.

To improve forecasting quality, *MOVE* thoroughly checks and analyzes forecasts provided by their customers to react to any discrepancies well in advance. If necessary, forecasts are adjusted before transferring them to the supply side if there are signs that something seems to be wrong with a forecast (depending on the supplier and product type). Sometimes, customers forecast weekly demand three times higher than the weekly average for three consecutive weeks. In such cases, alarm bells have to go off and it has to be checked if this can be true. Nevertheless, the adjustments have to be made conscientiously and must not be based on the gut feeling of individuals. This checking and re-evaluation is still a challenge for *MOVE*. One approach that is currently implemented is to cumulate the customer demand forecasts of all Chinese customers and compare them with *MOVE*'s overall market forecast for the Chinese automotive market to identify well in advance if everyone is overestimating the real demand.

Additionally, *MOVE* managers are sent to their customers to discuss the reasons behind certain demand behaviors. *MOVE* managers stated that, in some cases, customers avoid particular demand behaviors if their supplier shows them the effect this behavior has on their supply chain. However, this was not the case in the aforementioned example.

In case of reckless demand behavior, *MOVE* could enforce compensation payments, but this does not happen very often. Rather, the costs incurred are included in the next price negotiation. A contract that

Figure 9: Cumulative forecasting quantities provided by one Chinese OEM customer



includes flexible prices, depending on the volumes actually realized, has, to date, always been rejected by Chinese customers.

Although it was not the case in the example above, in general, air freight is often necessary in order to react quickly to unanticipated increases in demand. In order to improve response time, *MOVE* has implemented an automated special freight approval workflow, which allows shipments with a price tag below 20,000 euros to be automatically approved and triggered. Shipments that are more expensive, however, still have to be approved by all necessary levels of the corporate hierarchy. Nonetheless, this system can automatically approve up to 1,600 special freight requests across the enterprise, which of course represents a significant reduction in effort.

Guiding Questions

1. What does a typical forecasting process throughout the different departments of a company look like?
2. What different types of forecasting methods do you find in the literature? What are the pros and cons of the presented methods?
3. It has been stated that *MOVE* understands forecasting as a core management discipline rather than an unpopular task that somebody has to do. Nevertheless, no overall whole management concept is in place. Based on a literature review and best-practice investigation in different industries, try to propose a forecasting management concept that includes necessary roles, processes, approaches, and other techniques to ensure successful forecasting management. It should also be suitable to mitigate customer behavior, as outlined above, or its effects.

EurasiaTrain: An Alternative to Transporting Goods between Europe and China

The overarching subject of the following case study is China's Belt and Road Initiative (BRI). One of the goals of the BRI is the promotion of overland transport between China and Europe. Global Supply Chain Support (GSCS) is one of the leading worldwide logistics service providers. The corporate structure of GSCS is built up from many different business units, one of which is responsible for offering logistics services on the overland transport route between China and Europe. The following case study describes the services this business unit offers and the environment in which these services are offered. Additionally, the case describes a number of the challenges – bottlenecks, the volatile environment, and strict rules and regulations – the business unit faces when offering these services.

Company Overview & Product Portfolio

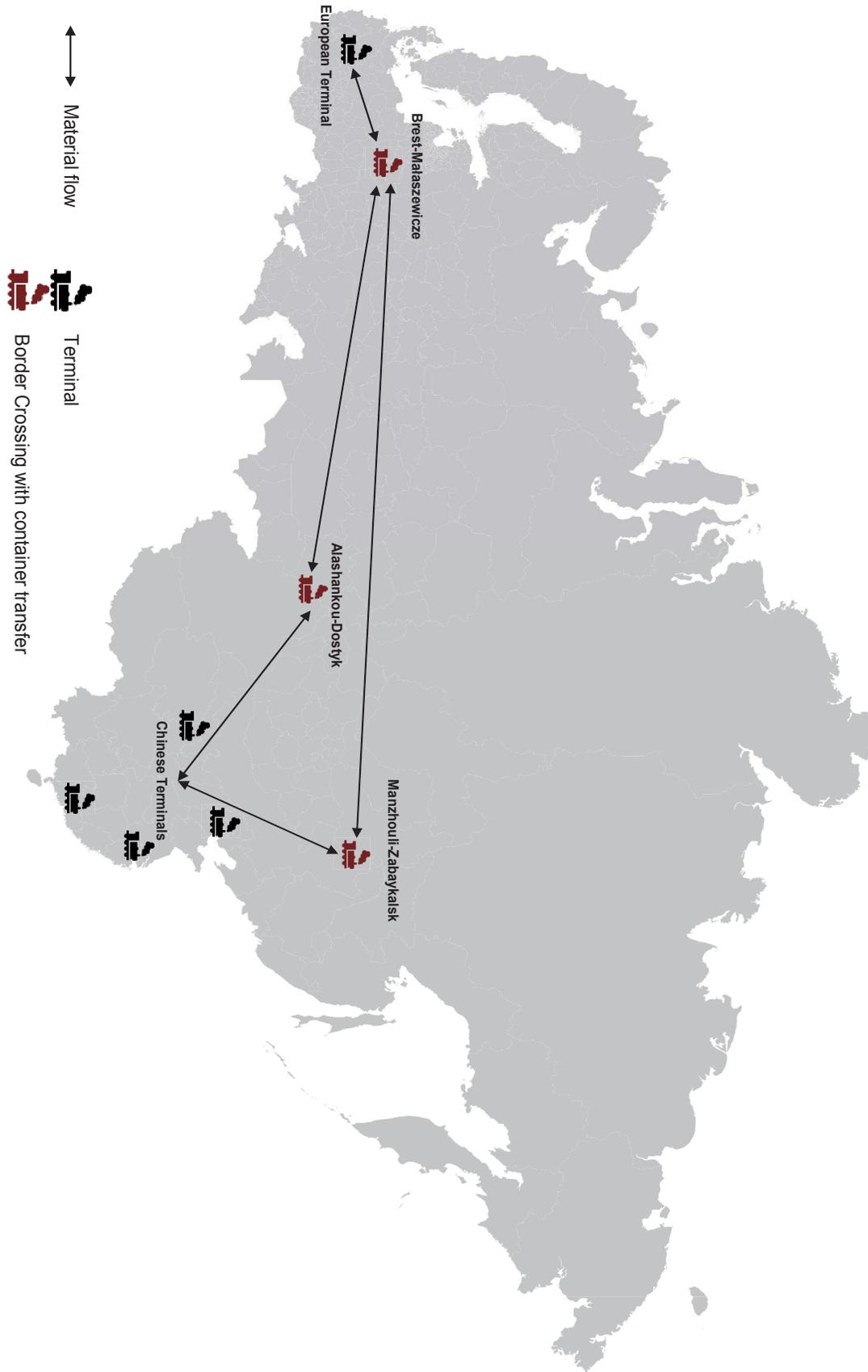
EurasiaTrain is one of many business units within GSCS. The headquarters of *EurasiaTrain* is located in Germany and the following case study is based on the operations of this business unit. Within GSCS, business units are responsible either for either a region or for a product. *EurasiaTrain* is responsible for the management of the different logistics services that GSCS offers along the overland transport route between China and Europe. In order to manage those services, *EurasiaTrain* works closely with a number of other GSCS business units – usually business units that are responsible for a specific region along the overland transport route between China and Europe. Due to the logistics services offered, the closest cooperation occurs with the business units that operate within China and that are responsible for a specific region within the country.

The overland transport of goods between China and Europe is usually carried out by railroad. Trains usually pull freight cars that carry two 20' or one 40' container. In addition to the basic railroad transport of goods along the overland transportation route between China and Europe, GSCS offers a number of services. These include, among other things, real time tracking and monitoring of goods using modern sensor and telecommunications technology, additional security for

the transport of high value goods, and support regarding the different rules, regulations and customs that enterprises face when transporting products along the overland transport route between China and Europe.

GSCS offers three distinct types of container transport for both 20ft and 40ft containers on the overland transport route between China and Europe. The default type is called Complete Load (CL). CL is usually used by large enterprises that are easily able to fill an entire container at a specific facility (warehouse or factory). The other type, also typically utilized by large enterprises, is called Consolidation Container (CC). CC is rather similar to CL, the difference being that GSCS consolidates goods from multiple different facilities operated by the same enterprise into one container before transport. The third type of container transport is called Shared Container (SC). SC is offered to enterprises that do not require a complete container to transport their goods. Enterprises that decide to book SC agree to share the container with one or more other enterprises. Each enterprise that decides to book one of the three container transport types is then offered a choice between two distinct railroad routes between China and Europe. The first route is referred to as the south corridor route and the second route is referred to as the north corridor route (see Figure 10).

Figure 10: The overland transport route between China and Europe with the border crossings



This rather broad product portfolio of logistics services is not always easy to manage, especially since the transport capacity along the overland transport route between China and Europe is still rather low, therefore turning a profit is a challenge that requires a very particular set of skills.

The next part of this case study will explain in more detail the environment in which the services are offered.

The Structure of the Overland Transport Route between China and Europe

There are many different aspects that influence the overland transport route between China and Europe. To better explain the situation, the description of the overland transportation route has been divided into two distinct parts. The first part will describe the situation within China, and the second part will describe the situation between China and Europe. Usually, transport between the customer facility and the railway terminal that serves as the start or end of the railway connection between China and Europe is outsourced to the local GSCS business unit. In order to keep the description of the distribution network as clear and simple as possible, the description of the distribution network within this case study will start and end at a railway terminal.

The lead time for the transport of a container on the overland transport route between terminals in China and terminals in Europe varies greatly. The envisioned lead time for the fastest route between the average Chinese Terminal and the average European terminal is 8 days, with the best lead time achieved up to now at 12 days – although this was only achieved once. When the route was not running at full capacity, a lead time of 14–16 days was common. Currently, with the route running at full capacity, a lead time of 22–25 days is typical. The limited available capacity is one

major reason for the varying lead times. From both routes combined, between 10 and 20 trains each carrying 41 containers arrive at the GSCS logistics hubs in Europe every day.

Within China

Within China there are multiple different railway terminals that can be utilized as start or end points. As of today, shipping a container on the overland transport route between China and Europe costs roughly 10,000 to 12,000 USD. Due to this high cost, transporting goods via the overland transport route is rather infeasible from a business viewpoint. To combat this, local governments within China subsidize their local railway terminals. By applying for these subsidies, a container might be shipped between China and Europe for as little as 5,000 USD. Due to the trade imbalance between Europe and China, container shipments from Europe to China are subsidized more extensively compared to shipments from China to Europe.

Within China, freight trains are permitted to pull up to 41 freight cars. Due to Chinese regulations, GSCS does not offer railway logistics services for hazardous goods. In China, the use of the railway is managed using a ranking system in which military use has the highest priority, civilian use and food transport have mid-tier priority, and freight has the lowest priority.

The railway system of China has been built up utilizing the European track gauge, also often called standard gauge. Railroad infrastructure that is constructed as part of a BRI project is also usually constructed on this gauge. However, the railroad infrastructure in Russia and most former Soviet Republics, including Kazakhstan, was built up utilizing the slightly broader Russian track gauge. Due to the different gauges, the train and its freight cars cannot continue traveling on the route.

The containers have to be transferred to trains that are compatible with the other system before the journey can continue. The transfer of containers between the two systems occurs at the Alashankou-Dostyk border crossing (between China and Kazakhstan) for the south corridor route and at the Manzhouli-Zabaykalsk border crossing (between China and Russia) for the north corridor route. The different local railway terminals within China are usually better connected to either the border crossing utilized by the south corridor route or the border crossing utilized by the north corridor route. The subsidies between the different railway terminals within China can vary greatly. As a result of the connectivity to a specific route and the difference in subsidies, the railway terminal closest to a customer facility, might not always be the most rational option.

Between China and Europe

Even though freight trains that start or end at the China–Kazakhstan or at the China–Russia border crossing would be permitted to pull up to 50 freight cars within Russia/Kazakhstan, the trains usually continue to pull 41 freight cars on this part of the journey. Rules for the subsidies granted along with numerous other rules and regulations generally demand that the composition of the freight train at the initial departure terminal is the same as the composition at the final destination terminal. In addition, due to international sanctions between Russia and the European Union, GSCS does not offer railway logistics services for food products on the overland transport route between China and Europe.

The expansion of the electrical grid into this desolate area is rather expensive and so far limited, and black-outs could occur during the harshest and coldest periods of the year. For this and other reasons, diesel locomotives are utilized for this part of the journey. Tracking a train is also more complicated on this part

of the journey than on other parts. If the customer does not book real time tracking and monitoring, tracking is accomplished by contacting local employees at checkpoints and fuel dispensaries along the route. Towards the end of this part of the journey, the south corridor and north corridor routes converge. As already stated, the railroad infrastructure in most former Soviet republics (for instance, the Baltic States, Belarus, and Ukraine) utilizes the Russian track gauge. In most of Europe, the railway system has been built up utilizing the European (standard) gauge, therefore, in order to continue the journey into Europe, another container transfer is necessary. (An exception is Finland, part of the Russian Empire until 1917, which utilizes the original Russian track gauge. The difference between the original Russian track gauge and the current Russian track gauge is mere millimeters, making the difference from an operational viewpoint inconsequential.)

Both the south corridor and north corridor routes converged before the Brest-Małaszewicze border crossing between Belarus and Poland, therefore container transfer occurs at this point. Within Europe, freight trains are once again permitted to pull up to 41 freight cars.

International Logistics Network Challenges & Possible Mitigation Strategies

Bottlenecks and capacity

As previously described, the envisioned lead time for the transport of a container over the overland transport route between China and Europe is 8 days, the best lead time achieved is 12 days, and a realistic lead time is currently 23 days. Border crossings form the major reason for the differences in lead times. At all the border crossings, except those within the European Union, customs checks might occur. In addition to customs checks, border crossings where containers need to be transferred between trains that operate on different

gauge systems form bottlenecks. Lifting each container, moving it and lowering it again takes a lot of time. In the worst case, a train might wait at a border crossing for up to 4 days for container transfer. The border crossing at Brest-Małaszewicze, in particular, is infamous for the congestion that can occur. Further infrastructure investments and alternative routes to provide additional border crossings including container transfer, or even without container transfer, are necessary.

Competing railway terminals and limited time subsidies

Within China, the different railway terminals compete with each other. Typically, the local government provides a lump sum for the complete year to the management of the terminal, and it is up to them to use this to organize subsidies. At the same time, the management of the terminal is required to meet certain quotas. This system has led to a number of complex challenges that need to be managed by GSCS employees. Subsidies are usually only available for short periods of time and the customers of GSCS expect and require certainty for a longer period of time. In order to be competitive, GSCS offers annual contracts, which means that GSCS takes a big risk with every contract they sign. The subsidy systems of the different railway terminals are usually not transparent, making long term planning even harder. The mismanagement of the available subsidy money has led to terminals that use up all the available subsidy money before reaching the end of the year. In order to meet the quotas, some terminals have taken deals that have potential negative impact on the operations of GSCS. For example, in order to meet the quota, a recently opened terminal took a product deal without considering the extensive regulations required for that product. In particular, management of the terminal failed to consider regulations that required extensive import checks on this product when taking the deal. Without

employing extra personal, the ensuing chaos impacted the European operation of the terminal. The competition between the terminals in China creates a large amount of volatility. In the short term, GSCS might benefit from competition between the terminals, but, at the same time, the certainty and stability required for sustainable growth and to minimize risks is not available.

Strict rules and regulations

Whenever something is wrong with one of the freight cars, the complete freight train is stopped. An exception exists at the border crossings where containers are transferred between trains that run on different gauge systems, where, if an error exists on one freight car, it does not have a direct impact on the rest of the train and the other freight cars. Nevertheless, if there is an error relating to one enterprise's goods in a shared (SC) freight car, it will have an impact on the goods of the other enterprises whose goods are transported in the same SC freight car. Since errors in the paperwork or with customs could cause huge problems, it is mandatory to book support regarding the different rules, regulations, and customs when ordering the SC container transport type.

Similarly, there are many strict rules that all participants need to adhere to for good reasons. The container loading SOP for rail transportation needs to be followed, with the containers allowed to carry up to 1500 kg/m². Freight transport by train can be rather turbulent. If the goods within a container are not stored properly, or if a mass over 1500kg/m² is loaded, bumps, shocks, and similar impacts can cause huge damage. Containers, and even freight cars, could break. Such incidents have happened in the past, especially at start and final destination terminals in China (during marshalling operations) and at border crossings with container transfer.

Guiding Questions

As previously described, one of the biggest issues regarding the capacity of the overland transport route between China and Europe is the infamous bottleneck at Brest-Małaszewicze. One of the mitigation strategies is the establishment of alternative routes. Describe a number of alternative routes. Assume for this task that the south corridor route and the north corridor converge in the vicinity of Moscow. Use Moscow as a start point for an alternative route to the GSCS logistics hub in Hamburg, for an alternative route to the GSCS logistics hub in Duisburg, and for an alternative route to the GSCS logistics hub in Vienna. Feel free to utilize transport carriers besides trains for your route. Describe alternative routes that could be established right away and describe routes that might be established after additional infrastructure investments have been completed. To accomplish this, look up existing infrastructure and investigate future infrastructure investment plans. Make sure to minimize the number of potential customs checks (e.g., take the European Customs Union into your considerations) and try to incorporate maximal one-gauge system switch (minimal switching) in your alternative routes.

1. The subsidies from local railway terminals are often only available for up to 3 months. In order to be competitive, GSCS needs to guarantee a fixed price for 12 months. Which strategies could GSCS managers implement to guarantee a fixed price for 12 months? How can the risks be minimized?
2. Due to the trade imbalance between Europe and China, empty containers occasionally need to be transported from Europe to China. The Chinese railway terminals subsidizes the transport of containers from Europe to China more extensively than the transport of containers from China to Europe.

The environmental impact of shipping a container by sea compared to shipping a container by train between China and Europe is much higher. Even with the subsidies, shipping an empty container by sea is cheaper than shipping an empty container by train.

- a. Which further incentives could be used to increase the number of empty containers that are transported back to China by train and reduce the number of empty containers that are transported back to China by sea freight?
 - b. Look up the average number of containers that a big container ship can carry on the route from Europe to China. Compare this amount with the number of containers a train is able to pull. If we assume that we only transport empty containers, how many trains would it take to reduce the number of ships by one? How much more efficient does the transport by train need to be in order to make sure the environmental impact would be lower? How many days of running at full capacity sending back empty containers would it take to reduce the number of ships by one?
 - c. In order to improve the environmental footprint of the transport of goods between China and Europe, you have been asked to come up with strategies that would allow the transport of goods using electric locomotives instead of diesel locomotives. Are there any modern, maintainable, and economically sound technologies or strategies that would allow the transport of goods on this route without relying on fossil fuel?
3. Look up investments that China, or Chinese companies, have made on the European continent in the context of the BRI project. What kind of investments are being made? In which areas of Europe have the investments been made? What kind of impact do you expect from those investments?

Connect SE: International Risk Management of a Global Dealer for Screws and Other Joining Elements

Entering new markets comes with its challenges. *Connect SE*, a wholesale organization for screws and other fastener products, fights on two fronts: they want to grow in the US market, and they want to establish a webshop to grab market share in the online business. Furthermore, *Connect SE* suffers because of counterfeit products from Asia flooding its markets all over world. This Case Study deals with those challenges and tries to discover the corresponding mitigation strategies.

Company Overview & Product Portfolio

Connect SE is a global wholesale organization founded in 1907 with a focus on screws and fastener products. The company is headquartered in Northern Europe. *Connect SE* has approximately 600 employees in Europe and another 100 in China. A total of 800 million euros in sales are generated globally.

Connect SE's product portfolio is characterized by a high degree of standardization and a wide variety of variants. The 20,000 different products are each available in 10 to 40 different surface materials (brass, copper, aluminum, zinc, and many other coatings).

The production process of the products is usually very simple (cold extrusion or forging). Although there may well be qualitative product differences, this simple method of production means that the market offering is defined by a high level of standardization and substitutability.

The products are used in a variety of industries. Basically, every company that produces machinery or electronics depends on screws or other fastener products. While the smallest screw manufactured measures only 1 mm (M1), the largest product series has a diameter of 200 mm (M200).

Production and Distribution Network

As *Connect SE* is only a wholesale organization, they do not own any production facilities. In order to source their products, they have a large supplier network in China.

Two hundred suppliers manufacture on behalf of *Connect SE*. These are often so-called 'branded products,' which are manufactured in the same or similar manner for other wholesalers and are branded specifically for each wholesale brand. These are transported by sea to Europe, from where they are distributed worldwide (see Figure 11). The delivery time from placing the order to arrival in Northern Europe is 6–7 months. In order to be able to guarantee their customers high product availability, *Connect SE* relies on a large central warehouse at its location in Northern Europe. *Connect SE* guarantees their European customers a delivery time of two days for 99% of their product portfolio. The share of the total sales volume of *Connect SE* is spread across the different global regions as shown in Figure 12.

Challenges in *Connect SE*'s International Logistics Network & Possible Mitigation Strategies

Counterfeit Products

Due to the simple product structure, the hurdles for counterfeit products are sometimes very low. At first

Figure 11: The global distribution network of *Connect SE*

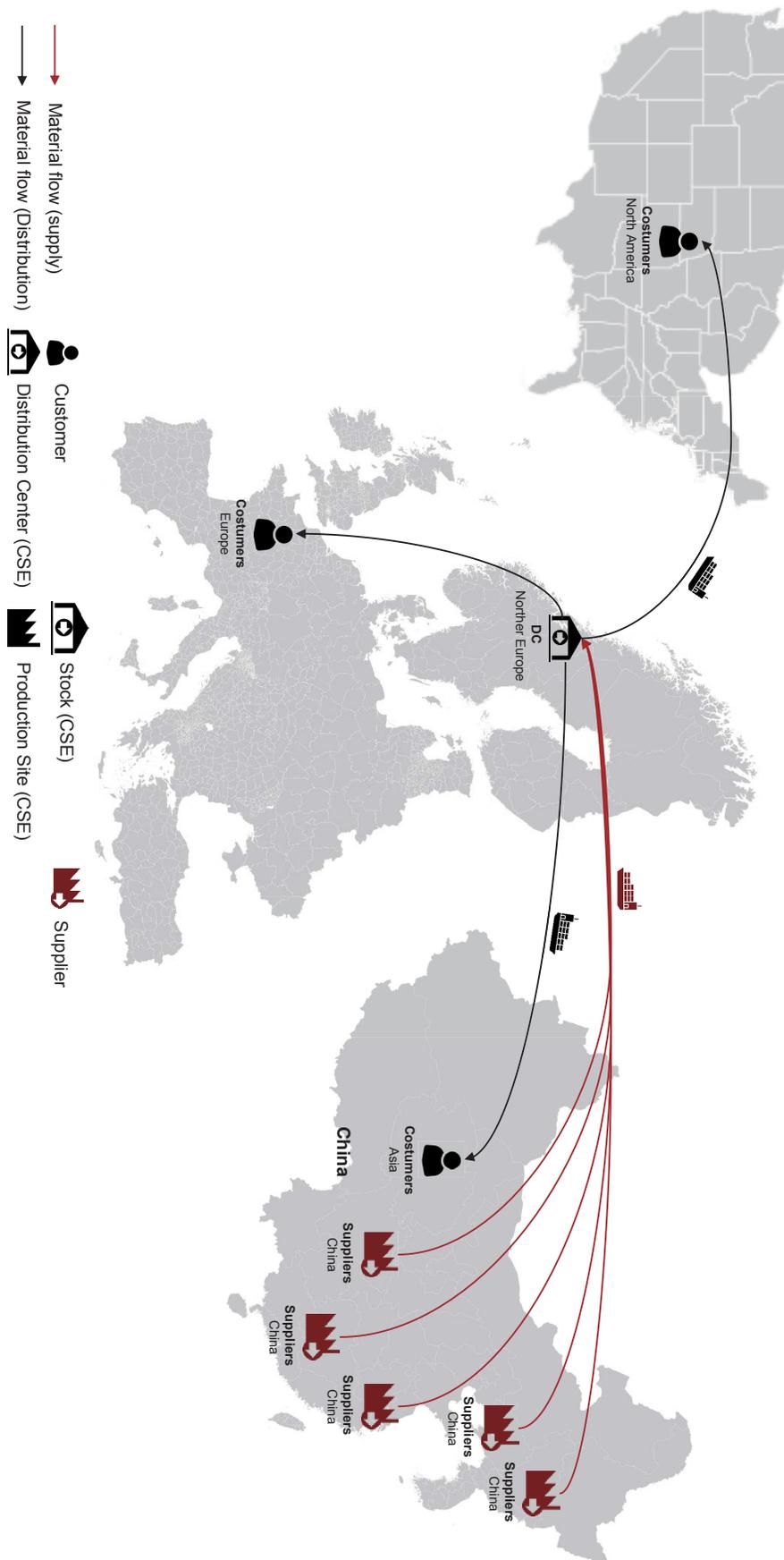
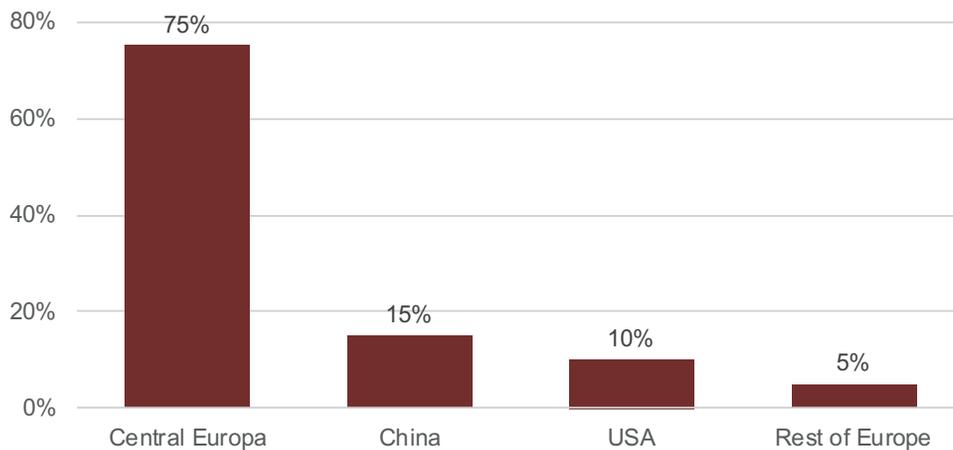


Figure 12: Distribution of sales volume



glance, these counterfeit products often appear to be identical to official *Connect SE* products, but, in some cases, they exhibit major differences in quality and security.

Basically, two problems can be identified:

- 1) Counterfeit products in the own supply chain of *Connect SE*: Customers are supplied directly by *Connect SE* with inferior parts.
- 2) Counterfeit products steal market share: Potential customers are supplied with inferior parts from other sources in the belief that they are buying original parts (e.g., from an online retailer).

The first case occurs almost exclusively between production at the supplier and loading onto the cargo ships. The second case is much more frequent and has grown steadily in recent years as online business has increased. In order to uncover counterfeit products as far as possible before they come onto the market, *Connect SE* pursues four strategies:

- 1) Close cooperation with customs authorities in China, the country of origin, and in ports in Northern Europe;

- 2) Random sample inspection of incoming goods for product originality and quality;
- 3) Network screening for suspicious vendors and comparison with a database of certified vendors;
- 4) Customer service to enable the reporting of suspicious merchants and products.

Market Expansion USA

After entering the US market in 2015, *Connect SE* was able to grow continuously in this market (currently, *Connect SE*'s share of total sales in the USA is 10%). The delivery promise (delivery time in Europe: two days after receiving the order) will be more difficult to keep, as only the warehouse in Northern Europe is currently available for worldwide shipment and therefore everything would have to be sent by air. Deliveries in the USA are currently limited to long-term contracts with direct industrial partners, so that it is possible to ship cheaply in bulk or to fly in an emergency. However, the goal is to enter the more volatile after-sale and retail markets. Projections for this show that a warehouse structure in the USA can make sense above a certain order volume. The solution is to initially lease storage

capacity from 3PLs and build up its own infrastructure in the long term. The possible solutions are as follows:

- 1) Central warehouse in the USA analogous to Europe;
- 2) Distributed distribution network with regional warehouses.
- 3) *Connect SE* currently prefers the first option. As the Chinese Market is not as time critical, this market is still going to be supplied from Europe.

Webshop

In order to be able to serve market segments that are currently served by individual and online merchants who sell official *Connect SE* products, the company plans to host its own online shop. Up to 80% of the existing product range is to be displayed in this online shop. Orders within Europe are to be delivered as usual within two working days. *Connect SE* is currently unaware of the extent to which the possibly small and high-frequency orders from the online shop will change the logistics requirements, which are currently designed for large order quantities. This means that a separation of high-volume packages is currently not possible with the implemented processes.

Questions

1. Elaborate three technologies that might help either to reduce counterfeit products or to make it easier for the customer to identify an original from a counterfeit product after purchase.
2. What are the main advantages and disadvantages for centralized and decentralized distribution systems in the following scenarios:
 - a. Sales only in Europe?
 - b. Sales in Europe, China and USA?
 - c. How are companies with similar requirements solving this issue?
3. Elaborate different delivery options to get the products to *Connect SE*'s customers for:
 - a. One centralized distribution center;
 - b. Regional warehouses in all American states.
4. What are the main differences between logistics networks for:
 - a. Wholesale / OEM business, and
 - b. E-commerce business directly to single customers?
 - c. How would the warehouse have to be redesigned to meet the requirements of the additional e-commerce business and the small deliveries that occur with it? For your answer, research how this has been implemented by other companies.

RuSh: Managing International Logistics of Shoes through a Control Center

Originally founded in Japan, today *RuSh* sells all kinds of shoes all over the world. Due to the historically grown nature of their supply chain, the management of inbound material flows from *RuSh*'s suppliers to their own distribution centers is complex and includes many redundancies in functions. Currently, over 50 people all over the world are responsible for managing this inbound flow – but, to remain competitive, *RuSh* needs to cut logistics cost. To achieve this tough task, *RuSh* analyzed different opportunities, but one fourth-party logistics (4PL) approach that was presented to them caught their interest. This case describes the supply chain network of a global shoe manufacturer and how the Control Center approach introduced by *LWW*, one of the most important Western logistics service providers, can assist logistics management at *RuSh*. Additionally, the case will describe how a big Western logistics service provider is struggling to establish itself in the Japanese market due to huge cultural barriers.

Company Overview and Product Description

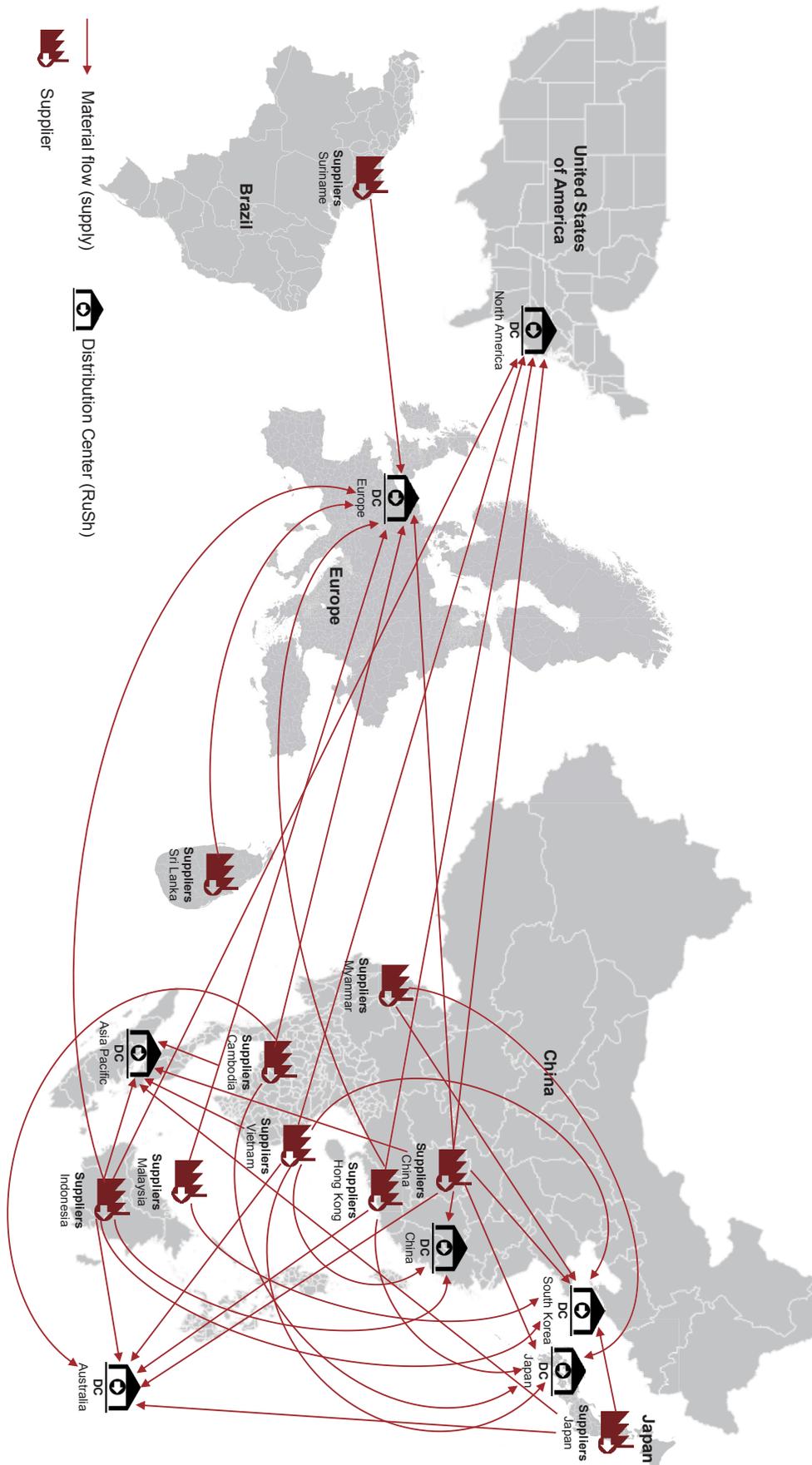
RuSh is a global manufacturer of shoes and sports apparel. The product portfolio of shoes ranges from running, through lifestyle, to business shoes. *RuSh* was founded in Japan and the headquarters is still located there. Nevertheless, because of extensive growth, today *RuSh* sells shoes all over the world, with distribution centers in all major sales regions. From there, shoes are sold through different sales channels. Traditionally, shoes were mostly sent to retailers and wholesalers, but *RuSh* managed to establish a broad network of hundreds of own-brand *RuSh* stores to provide the full brand experience directly to the customer. Additionally, *RuSh* sells shoes directly to customers through their own webshop. Steady growth and the manifestation of a strong brand image increased global reach over recent decades, leading to an annual revenue of over 1 bn euro achieved by over 5,000 employees all over the world. Although *RuSh* is a globally operating enterprise with employees all over the world, the company's corporate culture is still very much Japanese, as is the case with many well-known Japanese brands. This is also reflected in *RuSh*'s partner network, as they mostly rely on big Japanese logistics

service providers with a similar company culture. This is particularly important for Western companies that want to work with *RuSh*, as will be described in more detail later.

The Challenge of Managing the Inbound Material Flow at *RuSh*

Just like most of its competitors, *RuSh* does not produce shoes itself. Production is outsourced to suppliers mostly located in low labor cost countries that act as contract manufacturers, which remains common practice in the shoes and apparel industry. Those suppliers are also responsible for sourcing necessary materials for production. Usually, *RuSh* does not know their 2nd and 3rd tier suppliers. Because of the broad product portfolio and global reach of *RuSh*, a multitude of suppliers all over the world have to be managed. As outlined in Figure 13, those suppliers are located in Cambodia, China, Hong Kong, Indonesia, Japan, Malaysia, Myanmar, Sri Lanka, Suriname, and Vietnam. Volume-wise, the most important supplier regions are Vietnam and Indonesia, followed by China and Cambodia. Combined volumes of Vietnamese and Indonesian suppliers make up around 75% of the total purchasing volume of *RuSh*.

Figure 13: The supply chain of inbound flows of shoes at RuSh



After production, shoes are packed ready for sale and prepared for bulk shipment to distribution centers in their designated sales region. *RuSh* operates distribution centers in all major sales regions by itself, specifically for the Asia Pacific region, Australia, China, Europe, Japan, North America, and South Korea. Europe is the most important sales region, followed by the United States and Japan. The inbound material flow from suppliers to the warehouses is planned and coordinated by *RuSh*, but the core transport is done by qualified logistics service providers/forwarders. The main transport mode is sea freight, although shoes can be shipped via air freight in urgent cases. Distribution centers are responsible for shipping shoes to retailers, wholesalers, and *RuSh* stores as well as doing the order fulfillment of webshop orders. Those webshop orders are shipped directly from the distribution centers by qualified courier-end express service providers.

Due to a historically grown network of suppliers all over the world, the management of transport from suppliers to the designated distribution centers is challenging and needs many resources. Currently, *RuSh* has 55 people located all over the world, mostly at the regional distribution centers, who manage this inbound flow. Management activities include scheduling transport, issuing transport orders to forwarders, consolidating shipments, evaluating the urgency of shipments and potentially shifting to air freight, customs clearance, and others.

This historically grown network includes many inefficiencies and redundancies and a very high number of different actors that are difficult to orchestrate. Although it is obvious that inefficiencies are present, there is no approach in place to measure supply chain actors' performance and identify inefficiencies accordingly. Nevertheless, top management has decided to cut this function down to 19 people in the long term and

will integrate the remaining people into other business functions where a qualified workforce is needed.

Moreover, *RuSh* does not have overall visibility across all shipments, forwarders, and suppliers because systems operated by regional distribution centers are not well integrated. This remains a challenge when trying to coordinate an international network of inbound transportation more efficiently. Additionally, the fact that the people responsible for managing inbound flows are localized at the designated distribution centers leads to challenges in addition to the functional redundancies already mentioned. Optimization of financials and transport flows is done taking a local view instead of a global approach, leading to silo improvements and overlapping efforts.

How to Manage International Inbound Logistics?

As explained above, *RuSh* has been looking for ways to optimize its inbound transport flows by cutting costs, synchronizing all internal and external actors, creating visibility, and measuring supply chain performance. Therefore, they analyzed different internal approaches, like centralizing this management function in one internal department, as well as outsourcing the management of inbound flows. While talking to different consultancy companies and logistics service providers, one approach caught *RuSh*'s interest.

LWW, one of the leading global logistics service providers with thousands of employees and facilities all over the world, offered a fourth-party logistics provider (4PL) concept to *RuSh* – what *LWW* calls a Control Center. Through this approach, *LWW* would be able to manage the whole inbound transportation flow of goods to the *RuSh* distribution centers as a centralized, neutral fourth party. In the case of *RuSh*, this would include, among

others, order management (forecasting, placing of shipping orders, consolidation of orders, shipment and load planning), transport management (confirmation and tracking of shipments, documentation of statuses), exception management (special air freight in case of urgency), invoice management, reporting, and performance management of involved parties. Through this approach, *LWW* would seek to integrate all parties involved in this part of the supply chain, such as vendors, air freight carriers, port terminals, customs agents, and many more. Although *LWW*, as one of world's leading logistics service providers, operates transport themselves, it would, through this Control Center approach, serve as a neutral unit when it comes to placing shipping orders. This means that *RuSh* would not be tied to transport organized and operated by *LWW* and will also use other service providers, securing them the best price and performance. Theoretically, *LWW* would be able to manage all transport flows along the supply chain, including outbound flows and others, as they do successfully for multiple customers all over the world. But *RuSh* did not request this. Outsourcing all transport management related functions to a service provider seemed to be too big a step for them.

LWW stated that the objectives and savings targeted by *RuSh* are realistic and manageable through *LWW*'s approach. Apart from cost savings, *RuSh* would get full visibility of inbound flows, regular reports, and performance benchmarks on a regular basis. In addition, through the data generated, combined with data from other customers, *LWW* promised to regularly identify supply chain optimization potential through different kinds of data analytics. Due to the historically grown nature of their supply chain network, *RuSh*'s management is confident that the optimization potential is huge. Due to a gain sharing approach that would be set up between *LWW* and *RuSh*, continuous improvement and

ongoing cost savings in addition to the initial savings arising from outsourcing this function would be ensured. In this case, *LWW* promised to assign 80% of the cost savings generated by additional optimization to *RuSh*, while 20% of the generated cost savings would remain with *LWW* in order to provide an incentive for continuous improvement.

All in all, the Control Center approach by *LWW* was very promising from *RuSh*'s point of view, but *RuSh*'s management was not sure whether it was the right approach, or whether the change in the company was easy to implement.

Taking a Foothold in a Completely Different Market: *LWW*'s point of view

LWW, as one of world's leading logistics service providers, operates headquarters in all important sales regions. Although they were founded in Europe, *LWW* is a culturally diverse company with a lot of experience in operating in tough markets all around the globe. However, according to *LWW* managers, the Japanese market is totally different from everything they have experienced in the past. Apart from Japan, *LWW* has a well-developed image as a reliable and globally recognized logistics service provider and customers often proactively approach them for solutions. In particular, the Control Center approach has been successfully implemented worldwide and is recognized by customers as a reliable 4PL concept.

Nevertheless, this is not the case with Japan. In Japan, the growth in market share is progressing slowly. Although Japan is the third biggest economy globally with brands that are successful all over the world, those globally operating Japanese companies are often closely tied to Japanese service providers, making it very hard for Western logistics service providers to

access the Japanese market. *LWW* managers explained that, in contrast to other parts of the world, access to customers is very difficult, and foreigners and non-native speakers are not let into their customers' "inner circles." Business meetings are often held in the Japanese language, as the Japanese managers do not want to suffer any loss of face when speaking English. But language is not the only issue. Although five out of nine *LWW* board members in Japan are Japanese, the pure fact that *LWW* is not a traditional Japanese company makes it difficult to get access to the right people within the company. This is also reflected in the recruiting process. Japanese talents want to go to the big Japanese companies rather than to the big Western companies, making it difficult for *LWW* to get access to the best people.

Even if *LWW* managers get the chance to pitch their ideas, the process is very slow and hierarchical. Different hierarchy levels have to be passed through in multiple meetings before talking to the board members. Japanese companies mostly tend to be very risk-averse. That being said, the whole board, which often consists of up to 50 people, has to be convinced before a contract is awarded. Taking the risk-averseness into account, promoting more innovative approaches such as the Control Center is even more challenging, and *LWW* must be prepared for lengthy negotiations. Comparable negotiations in Europe would take around six months to reach an agreement. In Japan, *LWW* needs around 18 months.

However, coming to an agreement with *RuSh* was of very high importance for *LWW* to obtain an important foothold in the Japanese market, especially for the Control Center approach. If *LWW* were to land a contract from a big Japanese company, *LWW* would have a showcase to gain the trust of other potential Japanese customers as well.

Guiding Questions

1. Use a representative example to illustrate how many and which actors can be involved in the international movement of goods. In doing so, also show the challenge of integrating these actors, including the existing target systems of those actors.
2. Please distinguish the different logistics service models from each other (1PL, 2PL, 3PL, and 4PL).
3. Please perform a market analysis of 4PL approaches of various logistics service providers that are common in practice. Highlight the similarities and contrasts between the approaches of the companies and carry out a SWOT analysis for each approach.
4. Would you advise *RuSh* to implement the approach proposed by *LWW*? What challenges do you see in an implementation from *RuSh*'s point of view, and how would you advise proactively approaching those challenges?
5. As you have learned, it is difficult for *LWW* to establish itself in the Japanese market. What approaches do you see for *LWW* to handle this cultural issue? Can you find best practice examples where large Western service companies have successfully established themselves in the Japanese market? What have these companies done differently?

StandArts: Preparing a Fast-growing Fashion Network for the Challenges of the Globalized World

This case study describes the company *StandArts*, which in recent decades has achieved high growth in the international apparel market with standardized, functional clothing sold at good quality and low prices. In order to develop further market share, the company's management is considering entering the 'fast fashion' segment – with constantly changing seasons and high market volatility. This poses major challenges for logistics in particular, and requires a strategic analysis of competitors.

Company Overview and Product Description

StandArts is a global fashion group headquartered in Southeast Asia. Initially selling only in Asia, *StandArts* has also conquered the European and North American markets in recent years and is at the forefront of the industry in terms of sales volume. Due to the rapid growth, however, the logistics network could not be adapted quickly enough to the new requirements and now presents the supply chain with new challenges.

StandArts' current product portfolio includes only basic clothing – i.e., apart from the classic seasonal change in the range from summer to winter clothing, there are no adjustments to the product range. However, these standard articles are very functional and are of extraordinarily high quality compared to the competition, at very low prices. This is why *StandArts* has managed to rapidly generate market share in the global apparel market. This approach enables standardized procurement, production, and distribution. In order to open up new market segments, however, there are plans to take over a competitor with a more differentiated product portfolio.

Supply Chain of Shoes

The supply chain for each of *StandArts'* products is pretty similar. They have a partner network of 150 suppliers in China, Vietnam, and Japan that produce the final clothing. The part of the supplier chain from the

raw materials up to these suppliers is not managed by *StandArts*. This procedure is common in the fashion industry. *StandArts* controls the logistics chain from the shipping point from the supplier until the delivery to shops or customer homes.

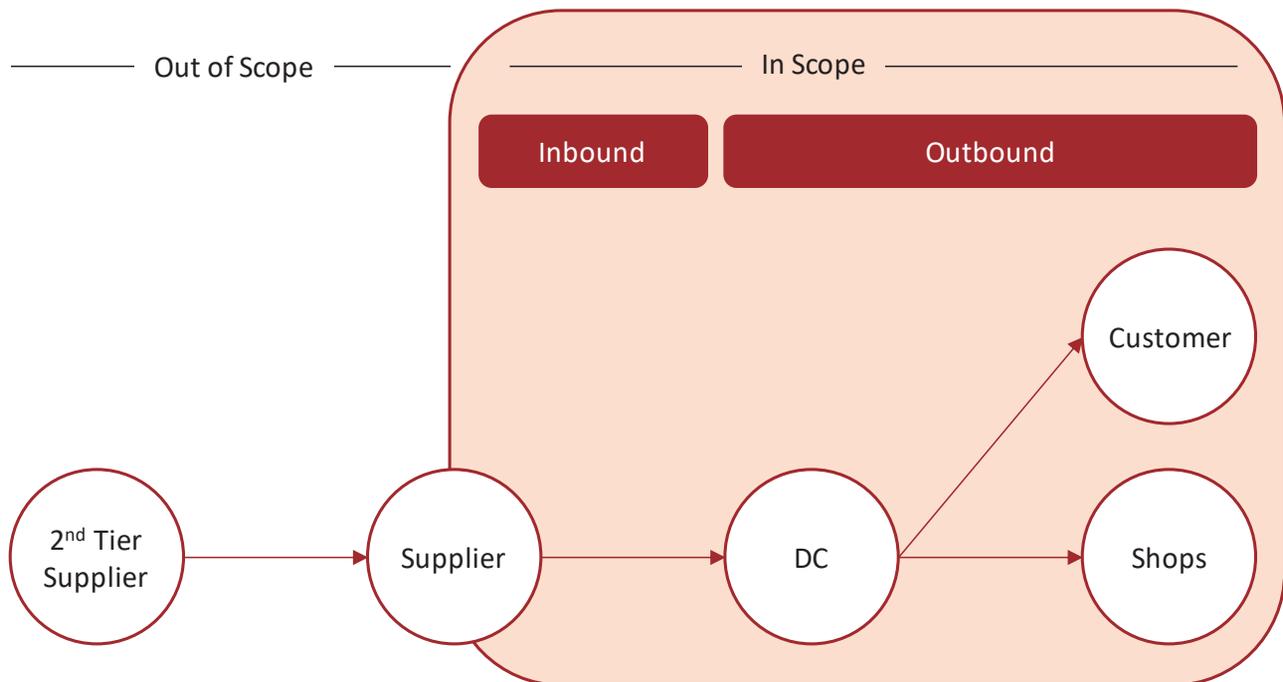
The main tasks of the supply chain management department of *StandArts* therefore include:

- > inbound logistics and
- > outbound logistics.

Inbound logistics includes the flows from supplier to distribution centers (DCs) and warehouses. Outbound logistics includes the flows from DC to Shops and from DC via e-commerce distribution center (EC) to Customer (see Figure 14).

Currently, *StandArts* delivers its goods to over 2000 stores in 25 markets worldwide (including China, Japan, the US, and Germany, see Figure 15). Due to the high standardization of the product range, the seldom changing selection, and the associated good forecasting possibilities, the products can be shipped cost-efficiently by sea freight to the markets. Local e-commerce distribution centers also ensure a rapid flow of goods to the end customer when orders are placed on the Internet.

Figure 14: Scope of *StandArts* SCM activities



How to adapt supply chain structures to new market requirements

New Market Entry

The apparel industry tends to have more collections than just the ‘classic’ seasonal collections. The majority of competitors still plan months in advance for the clothes and collections they will bring to the stores. However, as described below, one competitor stands out by being able to offer significantly more collections in the stores due to enormously fast product development cycles. *StandArts* is therefore considering expanding its portfolio and orienting itself towards competitors who are characterized by weekly changing collections in the shops.

The market leader in this sector is a globally active company headquartered in Europe. Its supply chain differs fundamentally from that of *StandArts*. Running its own factories and maintaining high vertical integration deep into the supply chain enable flexible product development. Cycles of two weeks between identification

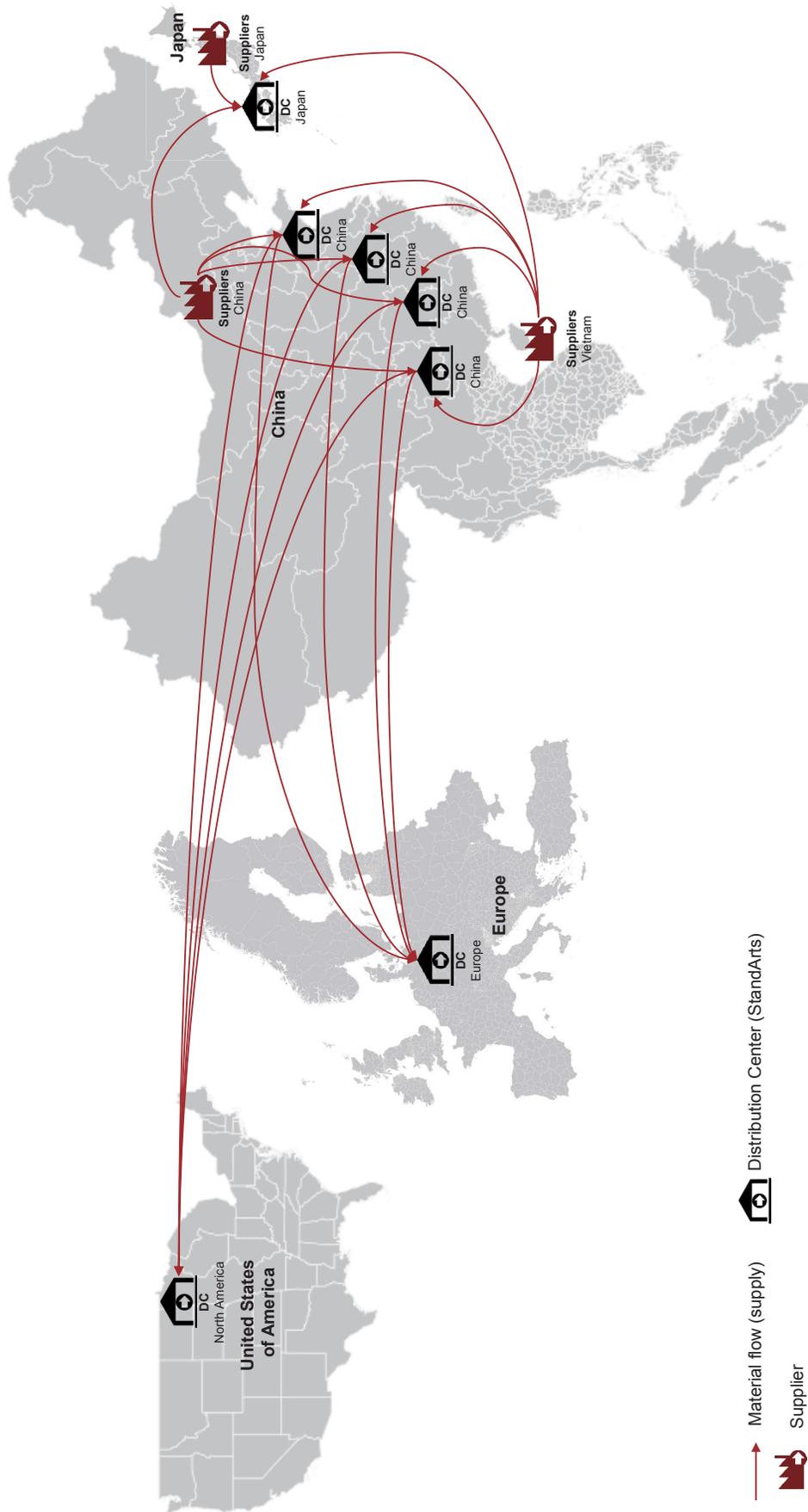
of trends, production, and delivery of finished clothing to stores can be realized. *StandArts* is therefore thinking about the right market entry strategy to get into the fast fashion business. They definitely want to retain the core brand with standardized clothing and will continue to focus on their traditional business activities in the future. Nevertheless, management is faced with the question of what needs to be changed from a logistical point of view and whether it would be advisable – under the circumstances described – to enter the fast fashion business.

Logistics Structure

In the context of considering entering fast fashion, concerns arose as to whether the system would need a redesign even if the business model remained the same.

Due to rapid growth in recent years, the focus of business activities has been mainly on the sales structure. Logistics and its associated processes was only regarded as a marginal issue, but is now increasingly the

Figure 15: StandArts Supply Chain



focus of activities. Due to the historically rapid growth in demand, unstructured storage facilities were leased in the various sales regions without having the 'big picture' in mind. As a result of this sales-driven structure, *StandArts* mainly relies on many distributed warehouse locations and high stock levels. In Japan alone, the company owns more than 20 warehouses across the country. While high stock levels mean that goods can easily be brought to the end customer when demand is high, the warehouse locations cause increasingly high fixed costs. The aim is therefore to consolidate the warehouse locations in coming years and to develop an efficient logistics network for distribution logistics. The core issues that management wants to address include the personnel capacity that will become available, and how this can be handled in a socially acceptable manner; necessary process changes; and the best practices of other companies.

Guiding Questions

1. Fast Fashion

- a. Read the Case 'Rapid-Fire Fulfillment' in Ferdows et al. (2004) to gain more insight into the fast fashion business (hbr.org/2004/11/rapid-fire-fulfillment).
- b. What opportunities are there for market entry into fast fashion?
- c. Which changes are necessary in *StandArts*' network to prepare for entering the fast fashion business for each market entry strategy?
- d. What are the challenges to be overcome, and how would you overcome them?
- e. As a result of your research, what is your recommendation for *StandArts*? Should they enter the fast fashion business? If so, how should this be done?

2. Warehouse Consolidation

- f. What are best practices for the distribution system of global fashion retailers?
- g. What are the best practices for warehouse consolidation projects? Which challenges occur?

LIST OF FIGURES

Figure 1: <i>BearCo</i> Product Strategy	2
Figure 2: <i>BearCo</i> Supply Chain	3
Figure 3: <i>BSUs</i> supply chain for electronic brake control units	10
Figure 4: <i>SAG</i> 's supply chain for electro motors for steering systems	16
Figure 5: <i>Prime Engines</i> supply chain	23
Figure 6: Components for the E-switch	28
Figure 7: <i>RoboElectrics</i> ' supply chain for the E-switch	30
Figure 8: <i>MOVE</i> 's supply chain for clutches for the Chinese market	35
Figure 9: Cumulative forecasting quantities provided by one Chinese OEM customer	38
Figure 10: The overland transport route between China and Europe with the border crossings	42
Figure 11: The global distribution network of <i>Connect SE</i>	48
Figure 12: Distribution of sales volume	49
Figure 13: The supply chain of inbound flows of shoes at <i>RuSh</i>	52
Figure 14: Scope of <i>StandArts</i> SCM activities	58
Figure 15: <i>StandArts</i> Supply Chain	59

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