Examples from Different Industries, Services, and Continents

2

Learning Objectives for This Chapter

- Examples of SCOM in manufacturing
- Examples of SCOM in services
- Examples of e-operations and supply chains

2.1 Examples of Operations and Supply Chains in Manufacturing

2.1.1 Nike: Sourcing Strategy in the Integrated Supply Chain

Since its establishment, Nike has evolved into a global enterprise providing trainers and sports garments to customers worldwide. Now the company has several brands, operates in 170 countries, employs 38,000 staff, and possesses 100 sales and 65 administrative offices across the world. Nike owns 700 retail stores and works with 900 contracted factories, which manufacture a wide variety of products for Nike. Nike's revenue in 2012 was $24.1 billion, cost of sales was $13.6 billion, and inventory was $3.4 billion.

A *sourcing strategy* is essential for Nike since the company's production and logistics strategy is based on *outsourcing* (see Fig. 2.1).

Find additional case-studies, Excel spreadsheet templates, and video streams in the *E-Supplement* to this book on www.global-supply-chain-management.de!

D. Ivanov et al., *Global Supply Chain and Operations Management*, Springer Texts in Business and Economics, https://doi.org/10.1007/978-3-319-94313-8_2

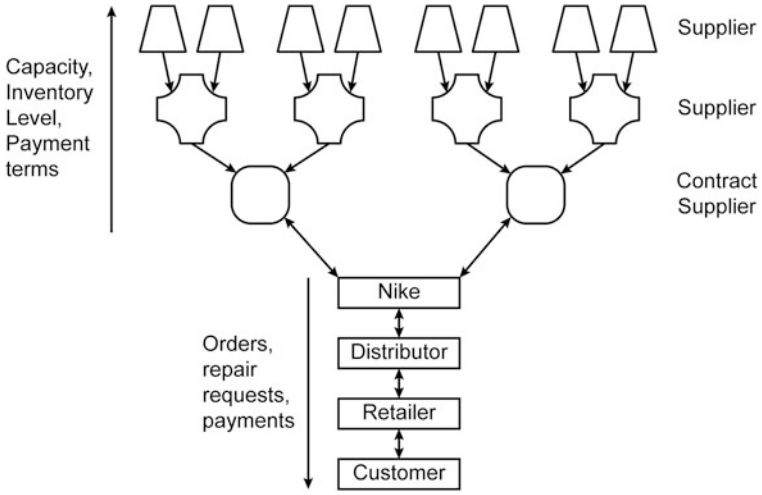

Fig. 2.1 Nike's supply chain

Nike executes a long-term sourcing consolidation strategy and is streamlining its SC operations. In 2007 Nike began assessing its contract manufacturing base and undertaking a multi-year strategy in order to:

- streamline the SC to focus on a number of contract manufacturing groups;
- build a strong and sustainable sourcing base for greater operational efficiencies and future growth;
- identify sub-contractors able to deliver best performance of products and innovation;
- align sub-contractors in terms of Nike's corporate responsibility principles.

Nike has been shifting from a risk-reduction focus—which devotes time and attention to the lowest factory performers—to a strategy that invests time and attention in strengthening relationships with the factories operating at the highest performance levels.

A new manufacturing index (MI) was implemented in 2012. It integrates scores from key performance areas into a single scoreboard rating that groups factories as Gold, Silver, Bronze, Yellow, or Red. Contract factories that are able to consistently exceed Nike's requirements in the areas, equally weighted, of quality, costs, delivery, and sustainability performance management, and that show consistent performance leadership in the industry will achieve a Silver rating in the MI. Contract factories that go beyond industry and demonstrate innovation and benchmark performance within the broader manufacturing landscape will achieve Gold. At a minimum, factories in Nike's SC will be expected to achieve and sustain a Bronze rating, indicating that the factory meets baseline standards and can self-govern through integrated systems and a lean approach.

The MI creates one overall score for each contract factory, enabling a consistent and comprehensive conversation about Nike's business with that factory. Nike develops incentives and sanctions based on the MI ratings. For example, Silver- and Gold-rated factories will be able to self-audit and calibrate with Nike staff and will have access to a range of Nike's technical assistance, leadership, and education resources, as well as possible innovation or community co-investment and priority consideration for orders.

Nike initiated several schemes to make its SC more sustainable and environmentally friendly. Nike has set up Sustainable Manufacturing & Sourcing-Sustainable—a new organizational structure within the company that has brought together labor compliance, health, safety, and environment, lean manufacturing, human resources management, climate and energy, and waste and water management.

In 2005, Nike disclosed its factory list. A SC map of Nike can be seen online at http://nikeinc.com/pages/manufacturing.

Discussion (see Chap. 5)

- What advantages and disadvantages do you see in the outsourcing strategy?
- Select and calculate at least two performance indicators to evaluate the inventory management performance at Nike!
- What do you think of the MI at Nike from the position of a contract manufacture?

2.1.2 Dangote Cement: Establishing Sophisticated Supply Chain Management in Africa

The African economy has undergone fundamental changes over the last decade. However, in most African countries, particularly the lower income countries, infrastructure emerges as a major constraint on business. The distribution network of Africa is comprised of waterways, airways, railways, roads, and pipelines.

With its operational headquarters in Lagos, Nigeria in West Africa, the Dangote Group is one of the most diversified business conglomerates in Africa with a reputation for excellent business practices and product quality. The group's activities encompass cement, sugar, food, and poly products manufacturing, sugar and salt refining, flour milling, and logistics port management.

The SC of Dangote Cement has the following structure (see Fig. 2.2):

Dangote Cement is a fully integrated cement company and has projects and operations in Nigeria and 14 other African countries. Dangote Cement's production capacity in Nigeria is comprised of three existing cement plants in Obajana, Ibese, and Gboko. Their combined production capacity is about 20 million tonnes per year. The Obajana Cement Plant (OCP) located in Kogi State is reputed to be one of the largest cement plants in the world.

The Dangote Group has experienced growth in the quality of its goods and services, focusing on cost leadership and the efficiency of its human capital. The group's core business focus is to provide local products and services that meet the

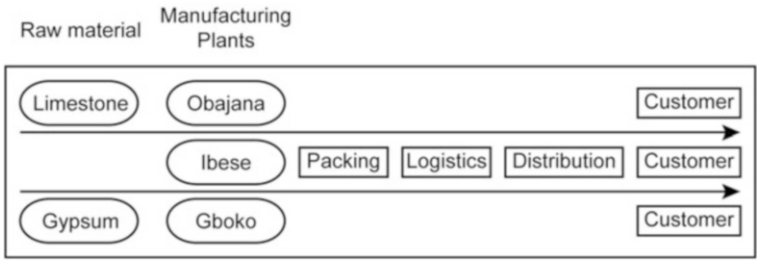

Fig. 2.2 Dangote cement's supply chain

basic needs of the population. Through the construction and operation of large-scale manufacturing facilities in Nigeria and across Africa, the group is focused on building local manufacturing capacity to generate employment and provide high-quality goods.

The raw materials required to produce cement (calcium carbonate, silica, alumina, and iron ore) are generally extracted from lime stock rock, chalk, clayey schist, or clay. Dangote Cement owns or has licenses for the quarries/deposits which are located near their manufacturing plants. Dangote Cement currently has operations in six African countries: Cote D'Ivoire, Guinea, Ghana, Liberia, Sierra Leone, and Togo. Dangote Cement's expanded African operations will include factories in South Africa, Senegal, Cameroon, Gabon, Benin, Ethiopia, Tanzania, Zambia, and the Republic of Congo. The company has deployed modern robotic laboratories in all its cement plants. These modern laboratories are operated by trained personnel and are provided with the latest technologies, practices, and standards.

2.1.2.1 Supply Chain Management

Dangote Cement has adopted a fully integrated SCM model. The SC is managed as a single entity, thus ensuring information flows throughout the entire system. Dangote Cement runs an integrated make-to-order model which requires tracking of customer demand in real time. This is the reason why Dangote adopted CPFR (collaborative planning forecasting, and replenishment): to balance demand and supply with the help of distributors and retailers. All members of the SC are involved and freely share planning, demand, forecasting, and inventory information among themselves. Collaboration is ensured in drawing up production, marketing and shipment plans. All processes, from raw materials extraction, through the value-adding processes to distribution channels, are interlinked within the organization.

2.1.2.2 Logistics Management

The biggest challenge for Dangote Cement, and for the industry, is to tackle logistics and distribution costs, as cement has to be moved to markets from production centers. Being one of the largest cement producers in Africa, the company uses the cost-efficient sea transportation to supply its Pan-African operations. Two dedicated

export water terminals located in Calabar and Lagosare are used for freighting cement from Nigeria through international transportation to their markets.

Road transportation is the most widely used form of transportation utilized by Dangote Cement. It is the only option for landlocked nations and the most viable in the majority of other African nations because of the poor rail infrastructure (the company is in active consultation with various governments for a possible revival of the railways to enable cheaper distribution costs).

Dangote Cement enjoys the benefit of an in-house transport fleet to ensure SC efficiency. The company owns a fleet of trucks and has a subsidiary called "Dantrans," which provides freight services with a fleet of over 3000 trucks under commercially competitive terms to members of the group to facilitate transport of raw materials from the sea ports to factories located inland, and for the distribution of finished goods. The fleet of trucks and haulage is monitored by trace and tracking (T&T) systems. Dangote Cement has its own depots and warehouses in several locations to serve various dealers, as well as corporate and institutional buyers.

The fleet is deployed strategically across Nigeria to ensure the company's cement has access to every corner of the country. To mitigate any disruption, regional transport hubs are backed by fully fledged workshops to take preventive action and deliver maintenance. The company implements scientific logistic solutions to find means of effective distribution.

2.1.2.3 Distribution Management

Cement transportation and storage is capital intensive because of the high volume to weight ratio of the product. Dangote Cement adopts a robust and pragmatic approach to ensure a smooth material flow throughout the distribution network. This is essential for meeting customer demands at all times while minimizing SC costs.

Dangote Cement first began its operations in Nigeria as an importer and built six terminals in Lagos and Port Harcourt. Soon after, Nigeria's cement sector became self-sufficient, and, as a result, two terminals that were built to import cement are now being used for export. In addition, new terminals in other neighboring countries have been built to expand the SC and distribute cement by road through the supply network and to the customer.

Dangote Cement has now invested in various strategic locations for depots across Nigeria to ensure quick supply. Dangote Cement owns and operates 67 warehouses and cement depots spread across various strategic locations in Nigeria to service the local market. They serve an ever growing list of authorized distributors who sell bagged cement to retailers and bulk users.

The company maintains close relations with all dealers, offering attractive returns on cement sales as well as supporting dealers with prompt supplies through its dedicated haulage or through third-party transportation. Dangote Cement has recently launched a special drive to enroll new dealers and distributors with simplified online, direct enrollment processes to further strengthen its distribution network. A vendor-managed inventory (VMI) system is used to maintain adequate cement inventory at all times on behalf of Dangote Cement under the terms of a contractual agreement with the authorized distributors. Retailers in turn purchase

cement in bulk from the authorized distributors and sell in retail quantities to low-level end users.

Dangote Cement recently extended its ability to deliver cement directly to customers by investing in additional trucks and a call center to deal with customer orders. Such a distribution model helps the company increase its market share by providing more options for customers and with value-added services.

2.1.2.4 Sustainability Management

Cement manufacturing causes environmental impacts at all stages. These include emissions of airborne pollution in the form of dust, gases, noise, and vibration from operating machinery and blasting in quarries, and damage to the countryside from quarrying. Equipment to reduce dust emissions during quarrying and the manufacturing of cement are widely used. More equipment for trapping and separating exhaust gases are coming into increased use. Environmental protection also includes the re-integration of quarries into the countryside after they have been closed down by returning them to nature or re-cultivating them. Some of the company's sustainability measures include: usage of filters for minimal dust emission; usage of fossil fuel in order to reduce emissions of greenhouse gases; usage of natural gas for power generation; dust-free manufacturing by covering raw material and process conveyers; usage of covered conveyer belts from lime stone mines to plant in order to minimize vehicle movement; usage of environmentally friendly polypropylene bags for packing; utilization of rain water to keep plant cool; and a water treatment plant for water reuse.

Discussion

- What problems might Dangote Cement experience in the future concerning its SC?
- Why might its self owned transportation fleet be an advantage for Dangote Cement? Can you see any risks in having a self owned transportation fleet?
- Describe Dangote Cement's production, logistics, and distribution networks!
- How does Dangote Cement's main product influence its production, logistics, and distribution strategies?
- What do you think about the introduction of direct shipments to customers?

2.1.3 Toyota: Supply Chain Disruption Management

A special focus of SCOM at Toyota is risk and disruption management. Many parts of the Toyota's SC are located in areas that are likely to be hit by an earthquake. As such, the risk that Toyota's SC might suffer from those disasters is rising, and the damage could severely impact production and other activities. Given this context, it is essential to assume that Toyota, with its restricted resources, would suffer greatly from such a disaster and so should make preparations to affect early recovery. For these reasons, Toyota is reassessing its business continuity plan. The foremost

premise of Toyota's business continuity plan is to work on preparedness before and recovery after disaster happens.

As a part of the *preparedness*, Toyota addressed the difficulty of "energy, information and transport network fragmentation" once disasters occur, and developed a hybrid car for the Miyagi Prefectural Police, installed with external power provision systems. In addition to providing good fuel efficiency and environmental performance in normal operations, during disasters these cars can be driven on fuel or electricity, and even have a power supply function that allows electricity to be drawn from the car.

Toyota's help in *disaster recovery* is illustrated by its sending workers to its disaster affected production sites where they can be engaged in numerous activities, such as restoring facilities and distributing disaster relief supplies. Worker volunteers from the Toyota Corporation continue to help with restoration efforts for individuals in areas hit hardest by the latest disaster. Toyota additionally provides material support: trucks with relief supplies from the Toyota Corporation which are gathered at two local production sites.

Learning from previous experiences, Toyota has prepared a nationwide framework that utilizes the warehouses and logistics network throughout Japan for sending relief supplies to disaster affected areas. In addition to stocking emergency supplies at the 34 distributors nationwide, Toyota has also built a framework for sending relief supplies to the disaster affected distributors. Taking into consideration possible problems such as motor fuel shortages, this framework is important for delivering quick and reliable support to disaster affected sites.

The risk management committee at Toyota organizes meetings twice a year to identify risks that may affect business activities and to take preventative actions against the negative impacts of those risks. The committee members include the global chief risk officer (CRC), regional CRSs, and all senior managers and chief officers. They work to manage and prevent the major risks in the regions and report on any immediate and serious disruptions.

2.1.4 Tesla Gigafactory

The *Tesla Gigafactory* is a major development project of the U.S. electric car manufacturer Tesla, which cooperates with strategic partners such as Panasonic. The Gigafactory will serve Tesla's strategic long term goal of producing sufficient numbers of lithium-ion batteries, which are required to produce larger fleets of electric vehicles in the future and to overhaul the automotive industry with sustainable energy generation. By 2018, the Gigafactory will reach full capacity, producing more batteries in one year than were produced in 2013 globally (Tesla 2017).

The Gigafactory will be located in Nevada, and construction work began in June 2014 (Tesla 2017). In the beginning of 2017, Tesla's Gigafactory started producing the first batteries, even though only 30% of the entire project was finalized at that point. The Gigafactory will cover an area of 530,000 m^2, which makes it the biggest manufacturing building worldwide. Working at full capacity, the Gigafactory will be

able to annually produce battery capacity of 35 gigawatt-hours (GWh), which is sufficient to power 1.5 million Tesla Model 3s. Besides producing lithium-ion batteries, Tesla also plans to produce electric engines and transmission components at the Gigafactory. The roof of the Gigafactory will be covered by a 70 MW solar plant with the goal of achieving net zero energy. As many as 10,000 people will work at the Gigafactory, while another 20,000–30,000 new jobs will be created in the related fields of suppliers and service providers (Auto Motor Sport 2017; Manager magazin 2017).

On the whole, the costs for the Gigafactory project amount to 5 billion U.S Dollars. But Tesla expects profitable improvements from that investment. The Gigafactory will be able to produce batteries for significantly lower costs using economies of scale, innovative manufacturing, reduction of waste, and the simple optimization of locating most manufacturing processes under one roof. Because of these benefits, Tesla expects to drive down the per kilowatt hour (kWh) cost of a battery pack by more than 30% (Auto Motor Sport 2017; Tesla 2017). Tesla boss Elon Musk refers to the current development project as *Gigafactory 1*, indicating that there will be additional Gigafactory projects following in the future, the next potentially in Europe (Manager magazin 2017).

Discussion

- Why is Tesla starting this large-scale project?
- What needs to be thought of when choosing an appropriate location for such a project?
- What needs to be considered in terms of Facility Planning?
- What challenges and potential problems for such a Gigafactory exist?

2.2 Examples of Operations and Supply Chains in Services

2.2.1 SCOM in Restaurants: Case Study Starbucks Corporation

The Starbucks Corporation, founded in 1971, is one of the world's largest coffee house chains, with more than 17,240 coffee shops in over 50 countries. Starbucks' product portfolio consists of food items, as well as coffee specialties, tea, and other refreshing drinks. Starbucks Corporation also offers roasted beans and several merchandise products. However, Starbucks' main product is coffee. Therefore, and because of Starbucks' large and complex global supply SC, this case focuses only on the coffee bean. In particular the company's production and sourcing strategy and its transportation network are considered.

Like most restaurants, Starbucks uses the production strategy "Make-to-Stock," which means production is performed in expectation of a customer order. Reasons for choosing this strategy include scale effects which result in lower transportation

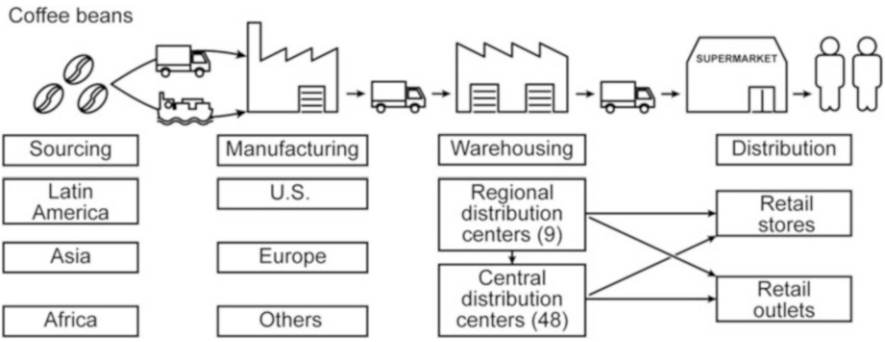

Fig. 2.3 Starbucks's SC

and manufacturing costs and higher flexibility compared to other production strategies. To decrease the lead time of coffee deliveries and to further decrease transportation costs, Starbucks aims to manufacture in the region where the coffee is sold. To regionalize coffee manufacturing, Starbucks owns five coffee roasting plants, four of them located in the United States and the fifth in the Netherlands. In addition to its company-owned coffee roasting plants, Starbucks works with 24 contract manufacturers in the United States, Canada, Europe, Asia, and Latin America.

Starbucks has spread its production across a wide territory. Nevertheless transportation, logistics, and distribution are still the biggest parts of Starbucks' operating expenses. The existence of an efficient and effective single, global logistics system is essential for the company. Figure 2.3 shows the SC of the Starbucks Corporation.

The company has a multiple sourcing concept. The suppliers of the coffee beans are mainly located in Latin America, Asia, and Africa. To ensure ethical sourcing of the high quality coffee beans, Starbucks uses Coffee and Farmer Equity (CAFE) practices. CAFE is a set of guidelines which evaluates the social, economic, and environmental aspects of coffee production. This allows Starbucks to address sustainability issues which have become very important in SCM.

Starbucks uses ships and trucks for transportation. The Starbucks Corporation normally delivers the unroasted beans in ocean containers to the United States and Europe. From the port of entry, the goods are trucked to a storage site close to one of the coffee roasting plants. Once the beans are roasted and packaged, the coffee is delivered to regional distribution centers by trucks. In total, Starbucks runs nine regional distribution centers, five in the United States, two in Europe, and two in Asia. Each of the distribution centers covers 200,000 to 300,000 square feet. Other goods needed for running a coffee shop are also stored there. From the distribution centers, the products are delivered either directly to the store or to central distribution centers, which are smaller warehouses. In total, the Starbucks Corporation has 48 central warehouses worldwide. From there the coffee beans and other products are frequently trucked to retail stores and retail outlets.

Discussion (See Chap. 8)

1. What kind of production strategy does the Starbucks Corporation use and why?
2. What kind of sourcing strategy is Starbucks using in terms of numbers of suppliers and geography?
3. Which mode of transportation does Starbucks use?
4. What kind of transportation network does Starbucks use—direct shipping or via distribution centers?

2.2.2 Operations Management at Airport Madrid/Barajas

Airport Madrid/Barajas is among the largest in Europe in terms of the volume of passengers and aircraft operations. As all airports do, Madrid/Barajas divides its process range in two different areas:

- Airside, where activities related to aircraft operations happen, such as approach, taxiing, and turnaround (fueling, push-back, etc.);
- Landside, the area next to terminal activities (parking, bus stations, etc.) The terminal is the most important component of the landside.

The airport's operational center must coordinate not only airlines and air traffic control (ATC), but all other sub-actors involved in the process such as passengers, government and security, handling companies, luggage, technicians, etc. In the case of Madrid/Barajas, all of those actors, sub-actors, and stakeholders are controlled and coordinated through the airport management center (AMC) with the real-time philosophy of modern airports.

The effectiveness of an airport is directly related to the number of start and landing operations performed per time period. But what happens if the arriving aircrafts do not get a taxiway clearance from the control tower, or there is no available gate to park at, or there are no available handling agents to load or unload the baggage? The AMC must therefore coordinate every single operation that occurs at the Madrid/Barajas airport, planning every movement and quickly solving any unexpected problems or conflicts.

A particular challenge of operations management at airports is that operations processes are highly influenced by uncertain external factors. The most relevant is the weather. Before the AMC was created, operations management was established to act according to certain standards, but when conditions varied (weather, aircraft delays, inoperative apron, stands, gates etc.), the system wasn't able to respond effectively.

As a consequence, airport managers agreed to change the way all actors were coordinated, commanded, and controlled. This led to the AMC adopting a real-time philosophy. The AMC is the centralized unit of an airport's operations created to manage all of its daily activities. Implementation became a big challenge and the most important step ever, in terms of operations management, was carried out in

Madrid/Barajas. The objectives of the AMC are as follows: to offer a general view of an airport's functioning at any time; to provide a unique point of contact for operators, agents, and the airport's divisions; to support the integrated management of the systems; and to supervise the levels of service to optimize resources and reduce the costs of operations.

The implementation of the AMC considered new subdivisions in terms of operations management, and made them all work together in a well-coordinated manner in the same physical space. The AMC became the unit where four different subdivisions of the airport's operations management (Aircraft Operations, Security, Passenger Services, and Infrastructure) interact quickly and effectively in any expected or unexpected situation with the help of information technologies like video-walls, infrared cameras, PDAs, and communication devices.

The following case describes briefly how the AMC operates in the event of a snow forecast, which usually happens in Madrid/Barajas at least twice every winter, and for which any airport should be prepared.

The plan of action is divided into six different phases:

Phase 1: Pre-activation
When an airport's METEO forecasts a 40% or more probability of snow, it contacts the AMC, and delivers an urgent message. The operations manager takes the lead and starts to coordinate all the means needed to prepare the airport for the upcoming situation. The manager on duty decides with the coordinator which plan to activate, and the way to proceed. This phase consists of localizing and informing stakeholders, technicians, and drivers to warn them about the situation and the activation of the plan.

Phase 2: Positioning
In this phase the manager on duty will give instructions to the coordinator of the AMC to allocate all the means requested in the first phase in their set-points at least 2 h before the snow is forecast.

Phase 3: Pre-acting
This phase will be activated 1 h prior to the snow forecast. In coordination with the air traffic manager, the operations manager instructs the AMC coordinator to inform all relevant parties and coordinate the so-called pre-acting phase. The technicians will start preparing the runways and spreading specific products over runways and the taxiways. These products will make the snow melt. This will be carried out within 30 min, half an hour before it starts to snow.

Phase 4: Evaluation
In coordination with ATC (tower), the AMC starts coordinating the collection of information about the state of the airfield through the technicians, pilots, and airfield operators. If the coefficient of friction on the runway is low, the service executive will give instructions to activate the fifth phase.

Phase 5: Clearing Runways and Taxiways
If the manager on duty decides to act concerning the low coefficient of friction, he will be in constant contact with ATC. The procedure will be as usual.

Phase 6: Cancelling
The manager on duty, together with the AMC coordinators, will evaluate the circumstances and proceed to cancellation. The information will be disseminated to the rest of the agents involved.

Future development of the AMC is directed towards a collaborative decision making system, which is an operations system that allows stakeholders to enter and receive real-time information that each one of them needs to operate more efficiently. The actors involved are ATC, aircraft operators, handling companies, airport operations, and control flow management unit (CFMU). ATC gets information from the CFMU. Once ATC knows when exactly the aircraft will be landing, they will communicate to handling companies and airport operations to be able to more efficiently manage the services provided to the aircraft.

Discussion

- Which activities comprise airport operations management?
- What are the challenges of the airport operations management?
- Which role does information coordination play in airport operations management?

2.2.3 Time-Critical Supply Chains: Disaster Management and Humanitarian Logistics

Commonly, logistics is associated with the business field. However, in recent years particular efforts have been directed at investigating severe *SC disruptions*, which can be caused, for example, by natural disasters, political conflicts, terrorism, maritime piracy, economic crises, destruction of information systems, or transport infrastructure failures. In this setting, humanitarian logistics has become more and more important. We can categorize natural disasters and man-made disasters, such as wars and terrorist attacks.

Disaster/humanitarian logistics is a relatively new field which has only recently received more attention. This is due to increasing political conflicts along with the accelerating strength of natural disasters. The main challenge of humanitarian logistics is the coordination of activities in a destroyed environment. This can become extremely complex since almost all parameters are unknown up to the point of the disaster start and even after the event. Not knowing the type or amount of goods needed or the actual shipment location makes humanitarian logistics a particularly challenging field.

Each year more than 500 catastrophes of different kinds occur worldwide. The UN Humanitarian Response Depots (UNHRD), which is a UN organization under

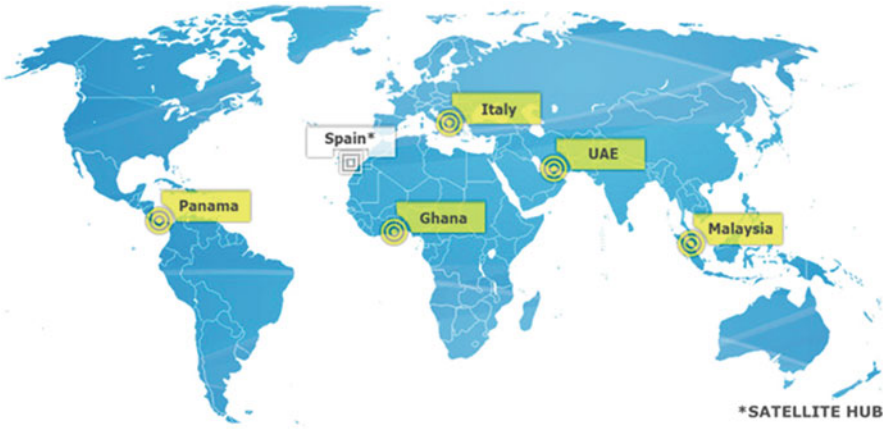

Fig. 2.4 Global supply emergency network for humanitarian logistics (source: World Food Program)

the head of the World Food Program, reacts quickly when disasters occur. Usually, the most necessary supplies are food and water. The organization has developed a concept whereby emergency supplies are stored in five hubs worldwide: in Ghana, UAE, Malaysia, Panama, and Italy (see Fig. 2.4). The hubs also contain medical kits, shelter items, and IT equipment. Through this network, the UNHRD is able to start supplying goods to every country in the world within 1–2 days.

The effectiveness of the emergency aid response relies on logistics speed and efficiency: logistics is key to humanitarian relief operations. Time is the most important factor as it influences how many lives can be saved. It is necessary to be prepared at all times. The disaster management cycle has four stages (Altay and Green 2006):

- *Mitigation* is a role played by the government, where the host government is responsible for putting protocols in place and taking action to reduce the probability of disasters.
- *Preparedness* refers to the various operations that occur before a disaster strikes. Here the physical network is designed, and information and communication technology (ICT) systems are developed together with bases of collaborators.
- *Response* is the various operations that are instantly implemented after a disaster occurs. First, all collaborators get involved; second, in the shortest time possible they try to restore basic services and delivery of goods to the highest possible number of beneficiaries. Collaboration and coordination among the players are crucial.
- *Reconstruction* is the operations in the aftermath of a disaster. It involves rehabilitation and has the aim of addressing problems from a long-term perspective, since the after-effects of the disaster can continue for decades.

When a disaster does occur, the local government needs to request the World Food Program's help. First, food supplies are sent out immediately. Following this, employees are sent to disaster areas to access information about demands for goods. They also evaluate the best means of transporting the goods to the affected area. Next, the emergency operation is planned and budgeted. To receive financial aid, the World Food Program requests funds from countries worldwide. Most funds are then received out of government expenditure. A team of logistics experts develops transport routes for all the required goods to the area where the disaster occurred using all possible transportation means. Particular importance is assigned to reorganizing the ICT as it will help further operations through improved information flow. The World Food Program has an IT team which is specially trained to set up information infrastructure within 1 day.

In November 2013, one of the strongest typhoons recorded, "Haiyan," hit the Philippines. It killed thousands and destroyed such infrastructure as roads, ports, and hospitals. Many logistic problems were encountered from the beginning:

- most of the roads, airport and harbours were destroyed;
- weather conditions after the typhoon were still bad (rain, strong winds, etc.);
- no electricity was available, due to lack of fuel for generators, which also led to mobilization problems;
- acute shortages of food and water and lack of medical supplies or proper hospital facilities were observed.

The World Food Program was working closely with local government to provide as much help as possible. As soon as the typhoon hit, the organization supplied "high energy biscuits" and rice. Moreover, logistics and telecommunication support were also provided by the World Food Program. The goods financed by international donations were distributed via hubs in Cebu, Tacloban, Roxas, Ormoc, and Guiuan in the Philippines.

However, not only non-profit organizations take responsibility for humanitarian aid. DHL, which is a German logistics company, also engaged in activities in the Philippines in 2013. In cooperation with the UN, the company built up a global network of disaster response teams (DRT). These teams consisted of volunteers employed at DHL and they are particularly trained for disaster situations. They are divided into three areas worldwide so as to be able to access all regions quickly. In the case of typhoon "Haiyan," the team supported the accessibility of the airport and increased throughput times so that goods could reach the victims faster. The DRT's greatest strength is their knowledge about logistics and how to solve crisis situations. Since building up in 2005, the teams have been successfully able to support victims of disasters more than 20 times.

For the future, the UN seeks to improve prevention. Naturally, it is impossible to reduce all risks to a minimum level, but improving prevention measures is still an option. A 10-year plan called the Hyogo Framework for Action (HFA) is designed to reduce risks of natural disasters.

Discussion:

- What is the difference between business and humanitarian logistics?
- Which four stages are included in the disaster management cycle?
- Where can you see limitations of humanitarian logistics?
- What organizations are stakeholders in humanitarian logistics?

2.2.4 Operations Issues in Car Sharing

The business model of car sharing appears to be relatively new. However, its origins can be found in Zurich, Switzerland, in 1948. Similar to car sharing today, in a "Sefage" (Selbstfahrergemeinschaft) people could use one car together without having to buy one of their own. Recently, changing preferences in passenger transport, particularly in bigger cities, have boosted the demand for car sharing. According to estimations of Navigant Research, global car-sharing revenue will grow to $6.2 billion in 2020, up from $1 billion in 2013 (Clark 2014). The advantages of car sharing are numerous, but high flexibility at a low cost as compared to possessing a car is probably the main reason why people increasingly choose car sharing. Business customers also benefit since they can use car sharing as an add-on for the company car fleet. Additionally, travel costs for employees can be reduced by using car sharing instead of taxis. But there is even more to car sharing. It decreases the total amount of cars in the city, which means less traffic volume and more parking spaces. Pollution has also decreased, especially since more and more car sharing providers offer hybrid or completely electric driven vehicles.

There are *two types of car sharing*: station-bound and free-floating. Station bound is the older version where the car is received and returned at the rental station. Most of the time, it is now possible to return the car to a different station if it belongs to the rental company. Free-floating is non station-bound, meaning the car can be rented and left anywhere within a particular area. Charges are accrued either per minute and/or per kilometer. This option of car sharing is more appropriate for short distances.

Car sharing providers face challenges in operations management concerning demand, capacity, location, and cost planning. Usually, car sharing is an additional business field for rental service providers or car manufacturers. For example, DriveNow is a subsidiary owned by BMW and SIXT. Car2Go was founded by Daimler and Europcar. These companies already have expert knowledge in demand forecasting and capacity planning, which makes it easier to evaluate the number of cars needed at different locations. The challenge faced in this field is to meet demand at peak-times and in different areas of the city.

For particular occasions, such as a big football game, it may happen that many vehicles are used to drive to one particular location. Accordingly, there may be a misallocation of cars within an area. It is easy for car sharing providers to track these actions via GPS. To solve the problem, employees can be hired to spread the vehicles throughout the city. This option can be quite expensive, as employees need to be

transported to the cars themselves too. A cheaper option is to offer benefits for customers such as free miles, bonus points, or other discounts.

Cost planning can also constitute an issue for operations management. Most car sharing companies attempt to attract customers by offering free parking everywhere. Once a parking ticket is received the rental company pays the fee. Whereas charges for parking without a ticket used to be rather cheap, authorities have reacted by increasing the prices. Charging fees constitutes a variable cost that may be difficult to forecast.

Discussion:

- Which challenges of operations management are met by car sharing companies?
- What role does information technology play in car sharing?
- What do you think of sustainability issues regarding the car sharing concept?
- Compare station-bound and free-floating from an operations management perspective regarding the costs, time, quality, and management complexity.

2.2.5 REWE: Expanding the Logistics Network

With a turnover of more than 49.7 billion euros, more than 8000 supermarkets, a fleet of almost 2000 trucks which make 965,000 trips annually, covering a distance of 162 million kilometers and both collecting goods from suppliers and delivering them to stores. With 327,600 employees (2013), the REWE Group is one of the leading travel and tourism companies in Europe.

In 2008, extensive logistics modernization began in the company. The objectives included an increase in warehouse productivity by 15% per square meter, higher demand forecast accuracy, inventory reduction, and higher product availability rates as well as transportation cost reduction and sustainability.

At present, the company operates about 30 distribution centers (DC) in Germany. In 2011, a new DC in Oranienburg near Berlin was built for 60 million euros with an area of 52,500 m^2. The criteria for location selection were to shorten transportation routes and maximize efficiency across the network. About 325 employees in Oranienburg ensure the replenishment of REWE supermarkets with more than 12,000 SKU (stock keeping units). One hundred trucks deliver products to 330 supermarkets from Sassnitz und Jüterbog daily.

Discussion (See Chaps. 7 and 8)

- What are the objectives of the logistics redesign at REWE? What trade-offs can you see?
- Which types of distribution networks do you know? Which type is implemented at REWE?
- What could be the reasons for looking for a new warehouse location near Berlin? Which selection criteria were important for the company?

- Which methods and/or models would you recommend to apply to facility location planning?
- Describe, based on the example of this case study, the basic steps in facility selection decisions!

2.3 Examples of e-Operations and Supply Chains

2.3.1 Fab.com

In this case study a business-to-consumer (B2C) e-commerce application of operations management is considered. As an example we look at Fab.com, one of the fastest growing B2C start-ups, and see why and how the company decided to transit from a flash sale to an inventory-based model.

We can learn in this case study:

1. how to determine the optimal location for a warehouse;
2. how to understand the trade-off "service level vs. costs";
3. how to determine a distribution strategy and what the trade-offs are between the number of warehouses and logistics costs;
4. which costs should be included in the facility location analysis;
5. how to improve and measure inventory management performance;
6. which information technologies exist to support SCOM decisions;
7. how to develop strategic collaboration with suppliers.

2.3.1.1 General Description

Fab.com started as a design-oriented e-commerce website selling fine design at affordable prices. Fab.com launched in June 2011, and has grown to serve two million registered users in less than 7 months; by December 2012, it had grown to serve over 10 million members and became one of the fastest growing e-commerce start-ups in the US, and even globally. The core of the business is a concept that was realized by a small design team and improved daily through careful analysis of user data. The vision is to create a one-stop online store for well-designed goods. But as Fab grew exponentially, it faced serious on-time delivery and customer service issues.

Fab started and operated with its novel concept and marketing strategy, achieving customer-centric guidelines, and taking full advantage of the internet. A well-designed website, a user-friendly portal platform, a powerful backstage data processing system, and accurate and efficient handling of daily customers resulted in rapid growth of registered members and revenue.

Mobile Commerce (M-Commerce) is a major focus for Fab. Customers with smartphones purchase products twice as often as those who visit the website, and tablet visitors purchase four times as often as web visitors. One-third of Fab's visitors are from these mobile devices and the company expects this number to rise to as much as 50% in a year.

Social networking is also important for Fab. CEO Jason Goldberg himself keeps a blog to announce or showcase anything about Fab. He is also quite active in interacting directly with customers' comments or feedback. Moreover, of the company's two million members, more than half came from sharing with friends. Fab was a partner in Facebook's Open Graph expansion, so that when people purchase on Fab, their purchases appear on their friends' Facebook feeds.

2.3.1.2 Problems with Which Fab Struggled

Due to an initial strategy aimed to eliminate inventory risk, Fab decided not to buy any products until customers purchased an item online. To meet members' curious minds, Fab's ten buyers scour the world for products that fit Fab's unique aesthetic. This created a situation where Fab could promise only a long delivery time of 16 days. The customer service team was becoming overloaded with complaints. Customers wanted high-quality products delivered fast, since getting unique products delivered to them fast is far more important to them than only getting unique products.

Fab itself has found from their data history that a unique product delivered swiftly increases Fab's customer satisfaction, the likelihood of repeat purchases, and the propensity to promote Fab to one's friends fourfold over a similar product that takes longer to ship. Customers also requested better product descriptions and better product imagery.

Furthermore, Fab had been relying on so-called flash sales, where a limited amount of merchandise is sold in a short period of time. This requires shoppers to buy goods within a certain length of time. Such a concept was hard to operate on a large scale: running a flash-sales website is more time-consuming and requires extra hours of work to ensure efficiency and good customer service simultaneously. As the business grew, Fab realized they had the following issues:

1. Long delivery times caused low customer service satisfaction.
2. There was a shortage of favorable goods.
3. Labor costs were high.
4. As a small scale company, it had its limits and limitations.

2.3.1.3 Solutions

Earlier in 2013, the company shifted from a flash-sale site to an "online lifestyle shop" operated by a new inventory-based system with the following features.

Inventory-Based Management

Fab started to lease a warehouse, built its own SC, and purchased inventory. Now, products come into Fab's New Jersey warehouse and remain there until the sale ends, usually between three and 30 days. If a customer orders an item which is in stock, (around 75% of what Fab sells) it ships within 2 hours. That's a huge change from the 16 days it typically took Fab to ship before. By 2013, Fab had expanded its footprint of warehouses to more than 500,000 ft^2 across three locations, two in New Jersey and one in Eindhoven, the Netherlands.

Established Supplier Base
Fab relies on and supports original designers and makers, working with more than 20,000 product designers. Fab has its own supplier evaluation criteria list in accordance with its business concept. Fab collaborates with the designers directly by providing a platform where they can showcase and sell their goods. Alternatively, the collaboration is based on licensing new designs and manufacturing products on the designers' behalf or as authorized derivations and reproductions of their work. Thus, on one hand, it helps designers globally scale up their businesses. On the other hand, it secures Fab's supplier base.

Advance Information Technology
As Fab started focusing on an inventory-based business model, they designed processes and invested significantly in technology and engineering staff to help the company scale efficiently and reduce operating costs. Managing a global business forces a company to strengthen its SC. Fab elaborated on sourcing and planning as it consolidated merchandising, marketing, and operations into a single unit in New York. Fab transited its business model from flash sales to a more scalable, inventory planning model in order to secure a greater consumer base and profitability. With a business model that can be managed with innovative technology and fewer people, Fab is developing its in-house engineering talent and investing in technical systems that will power their growth and scalability.

Fab also design systems to help the website to effectively and efficiently respond to customer issues, whether it is offering easy returns and quickly getting a replacement product shipped, or automatically crediting customers when prices drop. Fab now counts more than 110 employees in the product development and engineering organization.

Fab's key technology investments include:

- an inventory management system that provides visibility and control across all facilities;
- a promotions framework that bubbles up the most compelling offers;
- innovative tools to help customers discover and find what's new;
- a personalization engine that provides personalized product recommendations and thus a more relevant shopping experience;
- a new and improved mobile shopping experience that enhances its leadership position in M-commerce.

Improvement in Logistics
As logistics is thought to be a base requirement for any retailer, Amazon is heading towards same-day service. On 2013s "Cyber Monday," they even used drones to ensure 30 min deliveries. eBay has a 1 h pickup from local retailers. Fab also focuses on building processes that optimize their transportation costs, as well as designing innovative inventory controls to efficiently move products between facilities. Fab

has chosen warehouse locations that minimize shipping costs and reduce shipping times and have outfitted those facilities with their own technical systems. The result is that delivery times have dropped from 16 days to 3 days on average.

The logistics system development comprises the following features:

1. Previously, Fab outsourced their logistics in order to fundamentally improve on-time delivery. Now Fab aims to stop using third-party logistics firms to handle delivery planning. Instead, the company will bring all logistics operations in-house and use an uninterruptable power supply (UPS) to transport products to customers.
2. Fab promises free shipping with a minimum order value (in the US, this is $49). But they also have adopted an alternative shipping policy: free shipping on orders taking more than 5 working days; expedited shipping orders (an extra shipping cost) are promised to be shipped within 1–3 working days. Thus, Fab is able to split the order flow and ensure the stability of their delivery timetable without affecting customer satisfaction level.

Summary

From Fab.com's case study, we can learn that e-commerce is a crucial opportunity for business success. From the SCOM point of view, in order to fulfil the goal of being a global company and remaining profitable, the objectives of satisfying customers with fast delivery and the right products, and achieving lowest costs and highest margins should be achieved. Continuous improvement of cost structures is critical to continue providing customers with exceptional service and benefits, which will result in the greatest possible long-term stakeholder value. Fab seems to focus on developing successful supply-chain management with efficient and effective inventory management, establishing supplier relationship management, investing in new facilities for stocking items and information technology, and improving logistics, to ensure a high level of customer satisfaction at minimal costs.

Discussion:

- Analyze the advantages and disadvantages of flash-sale strategy! How can we improve this based on inventory systems?
- Analyze the trade-offs between delivery time and costs (include transportation, inventory and facility costs)!
- Where can you see how information technology has impacted operations and SC management?
- Which methods of facility location could be applied at Fab.com?
- What can you say about Fab's decision on back-sourcing of logistics operations?
- If you had to analyze Fab's performance in comparison with other companies in the branch (such as Amazon), how would you proceed?

2.3.2 Homeplus: The Store Comes to Your Home

Tesco is known by the name Homeplus in South Korea and has adapted its business model to better meet the needs and preferences of its local customers. In this regard, the following three aspects are particularly relevant:

- long working hours and little spare time
- high technology acceptance
- high store rent in major cities.

The concept is based on establishing a virtual store using M-commerce technology in which shoppers can browse through pictures of available products at a public place, in this case a subway station. The products can be selected by scanning the QR-code with a smartphone which uses a mobile application to directly order the selected products. The ordered products are then sent to the customer's home within the same day. Deliveries are arranged to arrive in minutes or hours, rather than days, so the groceries will be in the shopper's kitchen that night and there is no need to wait in to collect them.

The virtual store perfectly fits the expectations of the local customers: sales increased 130% in 3 months, and the number of registered users went up by 76%. The virtual M-commerce store might be more suitable for the Korean market than most other markets. Yet the benefits, such as shorter shopping times, convenient order and payment services, and home delivery, may also become more and more appreciated around the world as more and more countries reach similar smartphone acceptance rates. From an SCM perspective, additional benefits can be achieved.

Most notably, physical stores can be eliminated, leading to a more cost-efficient SC with direct shipping as a distribution strategy. The entire purchasing process can be automated without any human intervention from the retailer's side. With fewer centralized distribution centers, higher customer service (product availability) rates and reduced safety stock can be achieved. However, delivery costs for very small quantities could become a serious issue depending on the customers' order behavior and stores' delivery pricing policies.

Discussion:

- Consider the trade-offs between inventory costs, number of warehouses, and transportation costs. Explain the efficiency issues in this case study based on these trade-offs.
- Which distribution strategy is used by Homeplus in South Korea?
- Is it possible to implement a virtual store in your country? What challenges might be encountered?

2.4 Examples of Digital Supply Chains and Smart Operations

2.4.1 Amazon Robots

The US mega retailer Amazon has been consistently following a technological automation approach for the last several years. By increasingly using robots at their logistics centers, Amazon aims to achieve higher efficiency through cost decreases and faster process flows. However, the human workforce still plays an important role within most of the processes at Amazons fulfillment centers (Singularity Hub 2017b).

Amazon started introducing higher numbers of robots to their logistic processes in 2012, after acquiring the robotics company Kiva systems. In 2016, Amazon was using about 45,000 robots at its fulfillment centers globally, which represents a 50% increase compared to 30,000 robots used in 2015 (Quartz 2017b). Along with an increase in robot use, the number of Amazon's employees rose by about 50% between 2015 and 2016. The greater need for human workforce is explained by the fact that the increased use of robots led to a decrease in shipping costs, which finally led to a higher demand for Amazon products (Singularity Hub 2017b).

The robots working at Amazon's fulfillment centers are able to perform tasks which are regular and predictable in a controlled environment. These tasks include heavy lifting of packages, moving pallets between shelves, and shuttling goods from one end of the warehouse to the other. Tasks which include judgement, unpredictability, and fine motor skills still require a human workforce. Therefore, at Amazon's fulfillment centers, employees stock warehouse shelves according to how shelf space can be optimally used. Additionally, employees are responsible for product packaging and loading of trucks (Singularity Hub 2017b).

Although many tasks are still completed by people, technology is consistently improving, which could lead to robotic take overs in the near future. Amazon recently applied for a patent for a self-learning robot, including an automatic packaging system. This robot will be able to grab items ordered and package them appropriately, while secure data provides the opportunity to save the ideal packaging strategy of a product. Consequently, this task will no longer require a human workforce. However, according to Amazon, employees have no reason to be afraid of losing their jobs, as many tasks still require a human workforce, and additional working fields, such as machine maintenance, are evolving (Business Insider 2017b).

In this present case, Amazon clearly demonstrates its strong focus on robotic automation within the logistic processes, and this will continue into the future. Besides the increased use of robots in fulfillment centers, drone delivery is one of the retailer's future automation ideas.

Discussion

- Why is Amazon increasingly using robots at their fulfillment centers?
- What challenges and potential problems exist?
- What are potential future opportunities and risks that come with increased automation in logistic processes?

2.4.2 Adidas "Speedfactory": 3D Printing and Industry 4.0 in Supply Chain and Operations Management

The *Adidas Speedfactory* is a pilot project of the German sports equipment manufacturer Adidas. This factory is a new and highly innovative form of product manufacturing. It is based on an automatic production process which allows manufacturing to move closer to consumer markets, and Adidas can now produce faster than ever before (Adidas 2017).

Previously, the main manufacturing facilities of Adidas were located in Asia, most of them in China, Vietnam, and Indonesia. In this context, the delivery of finished sneakers to Germany took about 3 months. By building the new Speedfactory in Ansbach, Germany, in an area belonging to the German industrial company Oechseler, the completion time of one pair of sneaker is reduced to 5 h. Having a Speedfactory located in Germany, Adidas is now able to adapt production more intensively to customers' demands and wishes. As a single German Speedfactory cannot compensate for all the preliminary manufacturing work being done in Asian countries, the foreign facilities will be kept for the present (Welt 2016).

In stark contrast to the foreign production facilities, the production process at the Speedfactory is almost entirely automatic, with half a dozen machines being part of the shoe manufacturing. First, a knitting machine produces the fabric used for the sneaker's surface. Using a laser, another machine cuts the fabric into the correct shape. Simultaneously, the shoe sole is put together from plastic on the other side of the factory. With 160 employees working at the Speedfactory, the overall production process requires fewer personnel than usual. In 2017, the Speedfactory started mass producing with a planned annual output of 500,000 pairs of sneakers. Initially, the Speedfactory will cover the production of more expensive and complex sneaker models, such as running shoes, in order to achieve higher quality (Welt 2016).

The advantages of such a project are numerous. Storage of finished goods becomes less important and even unnecessary since the Speedfactory, which is local and fast, can produce the exact number of shoes that is actually sold. In addition, personalized models can be delivered much more easily and quickly to customers because of the short distance between production and customer. Another economic advantage of the Speedfactory is an increase in efficiency because of the ongoing work of the machines.

In 2017, another Speedfactory, this time in the USA, is planned to be completed. Within the same year, the German Speedfactory will introduce the innovative technology of 3D printing to its production process, taking the next step towards fully high-tech and automatic manufacturing (Welt 2016).

Discussion

- Why did Adidas start a Speedfactory project in Germany?
- What needs to be considered in terms of lead time and flexibility?
- What challenges and potential problems exist?

- What are the drivers of supply chain redesign at Adidas group?
- What impact might 3D printing and Industry 4.0 have on product development time, lead time, and transportation methods?
- What sustainability issues are addressed by the Speedfactory concept?

2.4.3 Predictive Analytics and Machine Learning: RueLaLa and Pharmapacks

Retailers must continuously strive to grow their revenue, margins, and market share. One method for doing this is price optimization models, which calculate the variance of demand as price levels rise or fall, and then combines this information with the relevant cost and inventory data to recommend prices that could maximize revenue and profits. This case study from the online businesses Rue La La and Pharmapacks highlights how these pricing models can be used for positive improvement.

Rue La La, an online fashion shop, offers limited-time, flash discounts on designer apparel and accessories. On the website, products are clustered according to similarities and sold in "events," or time limited sales on the clustered products. A timer counts down how much time the customer has, usually 1–4 days, before the sale event ends. These kind of businesses create a sense of urgency (great deals for a short time) and the impression of product scarcity (low product inventory) (Johnson et al. 2016).

Rue La La's "first exposure" items, or items which it is selling for the first time, generate most of the company's sales. Pricing these particular items and predicting what the demand for them will be is one of Rue La La's greatest challenges (Simchi-Levi and Wu 2018). For first exposure items, learning from customers' online behavior by changing the price during the event is not a method which Rue La La would like to use. Instead, they developed a demand prediction model, where data about the first exposure items is fed into the model to maximize revenue. Challenges in developing this model included trying to estimate lost sales resulting from stock outs, and predicting demand for new styles for which there was no data (Simchi-Levi and Wu 2018). Today, the model is used daily to automatically generate the best prices for events which will happen the next day. After implementing this model, Rue La La's revenue grew by 10%.

Similarly, the company Pharmapacks used a pricing software called "Master Mind" to increase their market share and revenue. With 25,000 different products sold and 570,000 orders shipped every month, the company works with 16 suppliers. By using the software to calculate the best price for each their products and to forecast demand, they now have six times the amount of sales they had in the past, growing the company by 3035%, as well as increasing their revenue to $160 million by 2016.

Acknowledgement We thank Mr. Arvid Holzwarth (MBA) (SupplyOn) for permission to use the SupplyOn Industry 4.0 case study.

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