E-Supplement to Chapter 4 Operations and Supply Chain Strategy

Task E-4.1 Bullwhip effect through lot-sizing

There are two reasons for the bullwhip effect. One is the non-transparency in a SC because of a lack of communication. Another one is the effect of lot-sizing in companies which are part of the same SC.

Imagine we have four different retailers for new iPhone 6 cases. They are all ordering the cases from a production company in Atlanta. We assume that weekly demand is nearly constant. Consider the following data:

Table E-4.1 Initial data for bullwhip effect through lot-sizing

Retailer	Amount/order	Order frequency	Customer demand/week
W	570	every 2 weeks	285
X	120	every week	120
Y	525	every 3 weeks	175
Z	600	every 3 weeks	200
∑			780

Table E-4.2 Order overview for bullwhip effect through lot-sizing

Week	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Retailer W	-	570	-	570	-	570	-	570	-	570	-	570
Retailer X	120	120	120	120	120	120	120	120	120	120	120	120
Retailer Y	-	525	-	-	525	-	-	525	-	-	525	-
Retailer Z	-	-	600	-	-	600	-	-	600	-	-	600
Demand Atlanta	120	1215	720	690	645	1290	120	1215	720	690	645	1290
Demand customer/week	780	780	780	780	780	780	780	780	780	780	780	780

The demand in Atlanta fluctuates extremely because every retailer optimizes their order quantities separately. You can see that demand in Atlanta and actual demand of customers differs sometimes a lot because of non-coordinated lot-sizing.

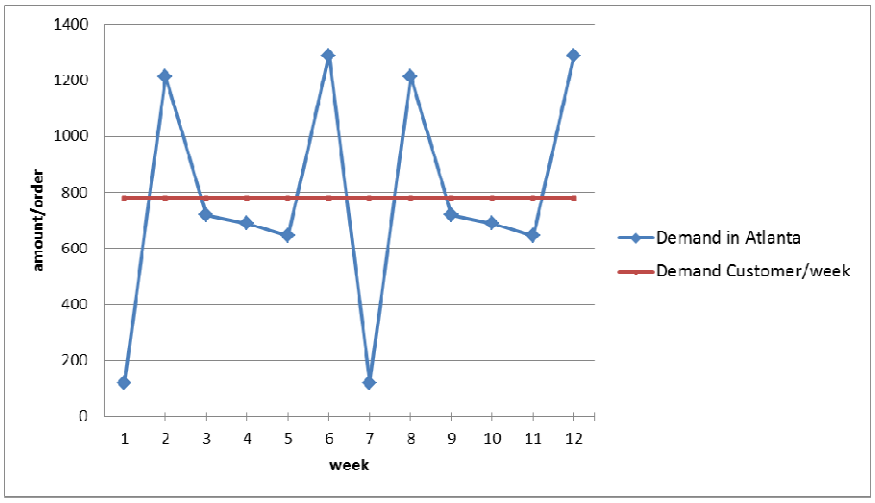


Fig. E-4.1 Relation demand in Atlanta and real demand customer/week

Case-study VMI: Bosch and Franz Wolf Ltd

Consider the case from collaboration of companies Bosch and Franz Wolf Ltd (see www.supplyon.com).

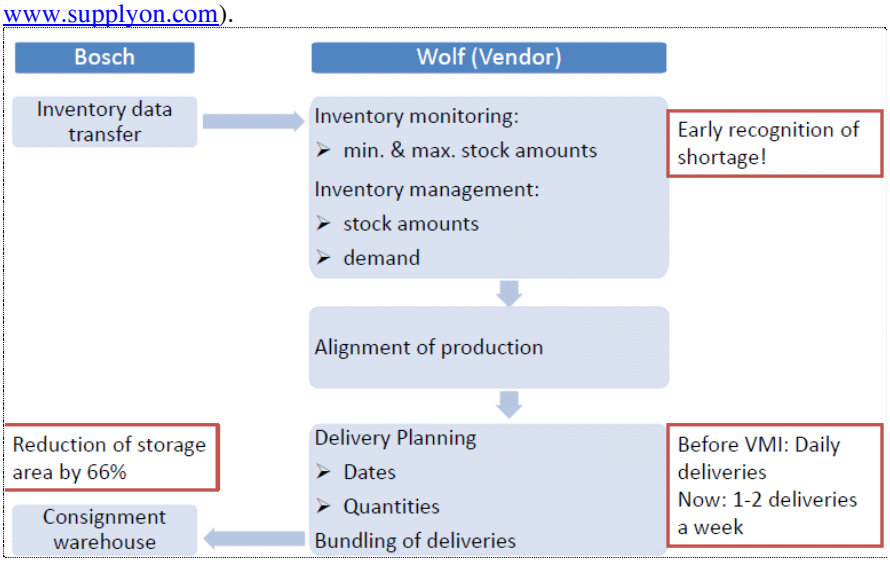


Fig. E-4.2 VMI concept

The main objective of this VMI project has been to increase flexibility and efficiency of inventory management in order to meet delivery time pressure and cost pressure. Implementation of VMI brought the following advantages to both companies:

For Bosch:

- Actual inventory & demand information / data
- Optimal alignment of production facilities
- Transportation cost savings
- Facility cost savings
- Positive effect regarding Working Capital
- Long-term collaboration

For Fritz Wolf Ltd:

- Permanent stock availability
- Procurement activities outsourced (cost savings)
- Facility cost savings
- Positive effect regarding working capital

The analysis of the influence of VMI for a vendor reveals the following aspects. Naturally, once a supplier is granted an access to a customer´s stock database, he has a better visibility of how much of which items are consumed, how much is returned, shelf time and other data. This information allows for better planning and usage of resources as well as for having a better insight in the market especially if a vendor may work together with several customers on the basis of VMI. VMI reduces and sometimes eliminates the stock outs and helps to highlight real value-added activities for both parties, therefore, resulting in cost saving.

VMI also yields in additional net income for a customer as operating, purchasing and administrative costs are cut. Both customer and a vendor benefit from stronger supply chain relationship resulting in increased sales, fewer stock outs and, in the end, higher customer satisfaction.

Case-study CPFR: Henkel and Erosky

Defining the problem

In the late 1990s, Henkel's operations efficiency was suffering from serious mistakes in demand forecasting and execution methods. Inventory levels were unacceptably high. At the same time, stock-outs on the retailer side were chronic. Transportation also suffered from significant inefficiencies. The company was experiencing sales-forecast accuracy of between 40 and 45%, which was very low.

Developing a solution
To solve this problem, Henkel had to implement a coherent forecasting model in collaboration with retailers. For Henkel the solution was seen in CPFR, the set of collaborative processes. The CPFR model can be broken down into three categories: planning, forecasting and replenishment.

Acquiring Input data
For data input, adequate software was needed. On the software side, Henkel uses a NetWORKS collaborative module from Manugistics Group, Inc., as a platform for information-sharing. For model development, different confidential planning data among retailers and manufacturers are required, e.g., point of sales data, planned events, current inventory level and lead time.

Testing the solution
The partners (Henkel and Eroski) began exchanging information on outgoing stock, stock figures and orders. They also shared information on order forecasts once a week, every 15 days on sales forecasts, and every four months on the promotional event calendar.

Analysing the results
With the CPFR pilot in place, the quality of Henkel´s sales forecasts improved steadily.
The sales-forecast error dropped down from about 50% to around 5%. Other KPIs showed similarity strong results: a 98% customer service level, 2% stock-outs or a 98% truck fill rate.

Implementing the results
To get the CPFR pilot rolling, the partners set up a relatively small team. Henkel contributed five people, while Eroski supplied four. And they were backed by internal information technology staffers, as well as a team of external consultants. Within six months of launching the CPFR pilot, Henkel presented its results. But it took another six months to get all of the project´s elements into place.

References:
Altekar, R.V.,2005.Supply Chain Management: Concepts and Cases. ebook.

Case Study Airport Berlin Brandenburg International(BER): centralized vs. decentralized supply chain

In 2006 the construction of the new main airport, located south-east of Berlin, started. Construction site operators needed to deal in advance with the question of how to supply large amounts of concrete. Overall it was estimated that 2.5 million cubic metres of concrete would be needed. During peak times 10,000 cubic metres per day would be required, equivalent to 100 concrete mixers per hour.

There were two potential concepts as to how the contractors could manage this problem: a centralized or a decentralized supply chain. A decentralized supply chain concept means that the concrete is sourced from multiple regional factories and transported to the construction site by trucks. The centralized supply chain involves building a new concrete factory close to the airport, so that the entire demand could be provided from one source.

Many different aspects needed to be considered before the contractors reached a decision: Security of supply, and contract structure, as well as ecological and social sustainability. The decentralized supply chain guarantees that security of supply is provided, due to the large amount of concrete factories. If one of them is unable to produce more, another could fill the gap. On the other hand, due to the many different contractors it is difficult to ensure the highest quality. For take-off and landing runways especially, the best quality possible needs to be provided. The contract structure of this concept is fairly classic: every supplier is responsible for its own product. Construction site operators work legally on the safe side. Every day 500 trucks would transport concrete to the construction site, which would be an extraordinary burden for the local infrastructure, environment and residents.

Applying a centralized solution means that a new concrete factory needs to be built. This increases fixed costs. In the case of a breakdown, fatal consequences could occur, as a new supply may not be instantly available. High quality security would be easier to manage, due to the fact that there are only a few suppliers. On the other hand, construction managers are also held liable for the quality. Through delivering the raw materials by train, streets and the environment would be protected.
Factors for the analysis of centralized vs decentralized sourcing strategy in the context of single vs multiple sourcing is shown in Table E-4.3.

Table E-4.3: Factors analysis on a centralized vs decentralized sourcing strategy

Aspect	Decentralized Supply Chain	Centralized Supply Chain
Supply security	Provided through multiple smaller concrete factories	Central concrete factory needs to be established
Quality security	Hard to control due to many suppliers	More power in quality control
Contract structure	“Traditional”: Suppliers will be held liable	Risky: Construction site operator itself is held liable
Ecological and social sustainability	Approximately 500 sessions of concrete mixers each day	Supply of raw materials by train

Eventually it was decided to implement the centralized concept. Quality assurance and the social and ecological impact especially were relevant to the decision. In

2006 operations were commissioned at the site, which was at that point Europe's most modern concrete factory.

Reference

Riedel, Guido (2012): Berlin Brandenburg International (BER): Planning and Implementation of a Concrete Supply Chain for the Airport Construction site. In: *Logforum*, 8th ed., 2012, p. 320.

Case Nissan: Resilient Supply Chain

Nissan Motor Co Ltd was established in the 1930s in Japan and is dedicated to automotive business. The natural disasters in Japan in March 2011 badly hit Nissan's SC. The Iwaki and Tochigi plants were almost ruined. Almost all production operations were stopped for many days. The Yokohama plant was able to recover its operation on 17 March, while Iwaki and Tochigi plants were unable to relaunch production until 18 April.

However, despite the damage, even in 2011 Nissan was able to achieve positive results in terms of company growth and revenue. Global sales rose by 17.1%. Nissan had developed an extensive risk management programme prior to March 2011. A possible earthquake in Japan was timely forecasted as early as 2010 and the response team had been built in advance. The team's responsibility was to gather information on the damage and take appropriate action to stabilize the situation and recover quickly. If necessary, a global and regional disaster headquarters could be set up to gather information about the facilities' conditions and business continuity. The business continuity plan has been carried out along with suppliers by assessing the situation and prioritizing the actions to be taken.

The first priority was given to employee safety. Second, the task was to prevent any further disasters, such as fire or stock damage. Third, the focus was directed to speed up the recovery and develop the business continuity plan. Finally, last but not least, the task was to contribute to society with cooperation and aid. Global and regional headquarters had been practising simulation training to prepare in advance for an assumed large-scale earthquake. Nissan had carried out its disaster preparation and safety measures exercise just three weeks before the disaster, and this played a vital role in their speedy recovery.

Right after disaster struck, Nissan called for an immediate global disaster control meeting in 15 minutes in its Yokohama head office. The disaster committee members were already well aware of the severity of the disaster, as the shocks could be felt 100 miles away from the epicentre. The disaster committee started work on the recovery operations in each business location, subject to the safety and status of the employees, vendors and suppliers. Hundreds of employees from other facilities were dispatched to help restore damaged facilities. The global disaster control chief supervised all the operations and was closely monitoring recovery efforts in Japan while continuing operations abroad.

The recovery of Nissan's SC was faster than in other Japanese companies as Nis-

san was not part of the Keiretsu group and had diversified supplier sources as well as established a global procurement system. Nissan was free to choose parts suppliers whenever it need to. Nissan changed parts procurement and maintained production assembly outside of Japan and worked to overcome the impact of the disaster. The other reason for quick recovery was that Nissan was holding higher inventory levels to boost sales at the time when disaster struck.

Three very essential actions determined the effectiveness of such disaster mitigation and recovery:

- being fully prepared for disaster
- carrying out drills
- going into action as quickly as possible after disaster struck.

Immediately after the disaster, Nissan called together factory managers from around the world to Japan in order to elaborate on the shortage of parts and logistics to avoid a collapse of global production. Nissan postponed all new development works, cutting down on overtime for three months as well as cutting down on almost all expenditure.

The following stages were included in Nissan's disaster management strategy:

- preparedness and assessment
- setting priorities
- empowering people
- taking leadership.

First, Nissan created a contingency plan and assessed the damage to the operations. Second, the priorities were set. The first priority was the safety of the employees; the second was turning normal pull production to push production to make sure that the products would be available on demand for customers so that users would keep buying. Regarding communication and following recovery, each individual had to be aware of customer demand in the short run as well as in the long run. The plan should be sufficiently visible to see the post-crisis picture so communication had to be clear and simple. Third, Nissan gave power to the employees working on the front line. Nissan enabled teams to make fast decisions to handle the situation, which ultimately helped towards a faster recovery. Fourth, leaders had to engage and commit. The leaders are morale boosters for staff and work as role models. Leaders needed to be authentically engaged and committed to the plan, since employees would help to create and achieve the plan if leaders are with them in its implementation.

The results of the company's risk assessment, preparedness, actions and further business continuity were very impressive. The global disaster headquarters, Nissan technical centre and Nissan advance technology centres were built to withstand disaster so that these facilities were among those buildings not impacted and could work on contingency plans.

Nissan has been developing future strategies related to natural disasters. In March 2012, simulation training was held based on a new scenario incorporating findings and new measures. Future strategy regarding SC resilience is to localize production of vehicles in the markets. For example, Nissan has forecasted to procure 85% of local production of fully built units by the end of 2015 in the US. It reflects the company's other strategy, to decentralize its production from Japan, as lessons learned from the disaster were very clear – if another such disaster occurs, production in global facilities should not halt/be hampered. The decentralization strategy will work on both sides, as the strengthening of the Japanese Yen has been lowering the company's profitability. Nissan's disaster risk management strategy can be seen in the annual reports. It confirms that Nissan has been working on proactive disaster risk management strategies and is ready to handle any case that might arise.

Nissan had global as well as regional disaster headquarters, clearly indicating the work and responsibilities among different departments to handle the disaster in an efficient way. For example, the chief of the global disaster team will have from the first response teams current information about the situation of human resources, control centre, purchasing, and maintenance and service, while deputy chiefs of supportive and recovery actions will also convey a report about the situation. Deputy chiefs will be in charge of regional disaster chiefs and will exchange reports and instructions. Each division has been given the authoritative power to take preventative measures to minimize the impacts of disaster.

References

www.nissan-global.com

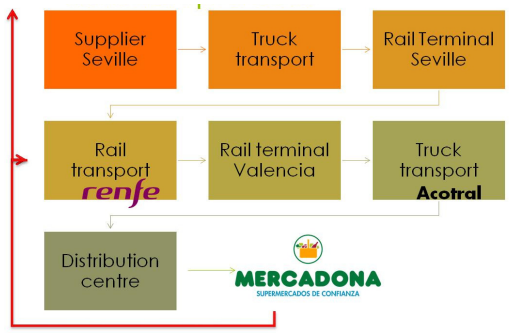
Schmidt, W. and Simchi-Levi, D. 2013. *Nissan Motor Company Ltd: Building Operational Resiliency*. Cambridge, MA: MIT Sloan Management, pp. 1–12.

Answers Case Mercadona

1. The case study shows positive real-life examples which can be applied to other business. Even though Mercadona is a first-class example of implementing sustainability in the supply-chain management, where can you see possible limitations of this concept?

==> Long distances; suitable for large volume of goods; rail capacity; geography; big companies (buying power); trust, motivation and commitment of all participants to collaboration.

2. Consider a new supply chain redesigned within the collaborative agreement by Mercadona, Renfe and Arcotral. At which point could a reverse flow/closed-loop supply chain be implemented (consider Fig. 18 below)?



3. As stated in the case study, collaborative agreements only work on "trust and a win-win situation for all". What challenges can you see which could become critical for the supply chain?

==> Coordination between road and rail companies; coordination between trucks and warehouse to achieve fulfilment of supermarket deliveries; customization of Renfe's train services to be able to transport large amounts of goods to Mercadona; collaboration between companies only works based on trust and a win-win situation for all.