Secure uninterrupted supply of components in Furniture AB's supply chain

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This master thesis was conducted at Components AB, a company within the Furniture AB group, consolidating the flow of components in Furniture AB's supply chain. Components AB are acting two steps upstream in Furniture AB's supply chain, packing and supplying the Furniture AB suppliers with fitting bags that are crucial for a big part of the Furniture AB range. The aim of this master thesis was to investigate how Components AB can secure uninterrupted supply of components and minimum impact on Furniture AB's supply chain during a potential disruption in their only European packing and warehouse facility.

Introduction

The increased competition on the market is constantly putting pressure on both the individual firm as well as the supply chains to increase its efficiency (doing things right) and effectiveness (doing the right things) to retain their competitiveness (Paulsson, 2007). The competition creates trends as lean manufacturing and reduction of the supplier base, which reduce the resilience and robustness of supply chains and make them more vulnerable for disruptions (Paulsson, 2007).

Zsidisin et al. (2005) discuss the consequences of the increased efficiency of supply chains which they call "The dark side of supply chain management", and they identify that most businesses are interested in the benefits of a leaner supply chain but neglect the increased supply chain vulnerability it creates. Norrman & Jansson (2004) describe a supply chain disruption at the Swedish telecom company Ericsson, with a total cost of 400 million dollar, which played a big part in their decision to withdraw from the mobile phone terminal business.

Furniture AB has increased their supply chain efficiency by consolidating a big part of both the purchasing of components and the packing of fitting bags through Components AB. This creates scale of economy but it also creates (almost) a "single sourcing situation" of fitting bags within Furniture AB's supply chain. A sample of a fitting bag is visualised in Figure 1.

The business at Components AB has been continuously growing during the last years and their facility in Europe has been expanded several times. As the situation looks today, a big lasting disruption in the packing and warehouse facility in Europe would be a disaster for Furniture AB's supply chain.

Figure 1 – Sample of a fitting bag

Purpose and problem definition

The general problem definition of this master thesis is how Components AB can secure uninterrupted supply of components and minimum impact on Furniture AB's supply during a potential disruption in their packing and warehouse facility in Europe. This could be further broken down into the following questions;

- What proactive actions could be taken before a potential disruption to be able to handle (with no or minimum impact on Furniture AB's supply chain) different scenarios of loss of packing and warehouse capacity in the existing facility in Europe. Loss scenarios requested for analysis are 25%, 60% and 100%[1].

- How to secure that right actions are taken after a potential disruption in the packing and warehouse facility in Europe?

Following deliverables were performed in order to answer the problem definition;

- Evaluate the current set-up of the supply chain and the robustness and resilience of the flow of components.

- Evaluate possible redesigns of the supply chain and/or backup solutions to be able to handle a potential disruption.

- Create a business continuity plan for the flow of components in Furniture AB's supply chain, to prepare the organization of Components AB and the supply chain members to do the right things after a potential disruption.

It is important that the purpose is to find the best possible solution from a Furniture AB's supply chain perspective, not from the perspective of Components AB. The solution shall be created according to "what is best for Furniture AB".

Methodology

This master thesis is based on the constructed research approach, a research procedure for producing innovative constructions, intended to solve problems faced in the real world and by the knowledge gained, make a contribution to the theory within the area which it's applied (Lukka, 2003). The key elements of the constructive research approach are illustrated in Figure below.

[1] Levels of capacity loss were directions from Components AB

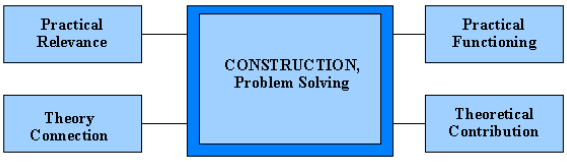

Figure 1 - Central elements of the constructive research method (Lukka, 2003)

The primary data was collected via interviews with several co-workers at Components AB and at Furniture AB. The interviews at Components AB contributed with information useful for both the creation of the business continuity plan as well as for the assessment and evaluation of the existing supply chain flow. The interviews at Furniture AB contributed with the level of risk that Furniture AB is prepared to accept and how far they are prepared to go to avoid the supply chain risk.

A test was performed where fitting bags, normally packed automatically, instead was packed manually. The test should simulate a scenario where parts of or all automatic packing equipment is destroyed or inaccessible

The theoretical base in this master thesis is mainly; supply chain management, supply chain risk management, business continuity management and business continuity planning.

Disposition

The three empirical and analytical chapters in the study are divided according to the three sub-purposes;

- Current supply chain set-up
- Preventing and Responding strategies
- Business continuity planning

Current supply chain set-up

Around 70% of the fitting bags for Furniture AB's supply chain is packed in Components AB' only European packing and warehouse facility. More than 220 Furniture AB suppliers are dependent on deliveries of fitting bags from Components AB in order to keep their production of Furniture AB for Furniture AB running.

Furniture AB's supply chain has benefited from cost savings, stable quality as well as increased availability and flexibility through Components AB. But as Components AB grew, another consequence of the centralized volumes slowly revealed - deceitful supply chain vulnerability.

Two terms commonly used to evaluate the supply chain vulnerability for disruptions are supply chain robustness and supply chain resilience.

Supply chain robustness
Wieland & Wallenburg (2012) defines robustness as the ability of a supply chain to resist change without adapting its initial stable configuration.

The level of robustness for the flow of components within Furniture AB's supply chain is low, mainly due to;

- Low stock of components at Furniture AB suppliers. A historically strong delivery performance from Components AB enables a possibility to keep low stocks of components.
- Make to order. Components AB have no or very low stock of fitting bags.
- Centralized packing operations. Centralizing all packing operations in one European facility creates low flexibility and high risk.
- High utilization of packing machines. The packing operations are running 24/7 and with 85% utilization.

Supply chain resilience
Cranfield University (2003) defines resilience as the ability of the supply chain to return to its original (or desired) state after being disturbed.

The level of resilience for the flow of components within Furniture AB's supply chain is low, mainly due to;

- It will take at least 18 months to build a new facility. This could however be handled by temporary using a 3PL or an Furniture AB distribution center.
- It will take at least 18 months to replace the current level of automatic packing capacities. Manual packing capacity could temporary replace but with unsecure lead-time and quality performance.

Responding and Preventing strategies

The available actions of how to reduce the impact of a disruption in the flow of components have been divided into preventing and responding strategies. All strategies were analyzed regarding their effect on cost and quality as well as their reliability, level of capacity reduction and potential other aspects.

Responding strategies
Advance planning of the response and recovery phases to mitigate the risk of impact. Does not involve any investments or changes in the running operations, but describes in which ways the organization can act when an event occurs.

A total of four responding strategies were evaluated to handle a disruption in the packing and warehouse facility;

1. Arrange internal manual packing at temporary facility
2. Arrange manual packing at Furniture AB suppliers
3. Order standard machines
4. Use sub-contractors or partners to support with packing capacity

Arranging manual packing at Furniture AB suppliers is the only responding strategy available that, theoretically, could handle a full-scale disruption within short notice. Even though some manual packing could be handled by Components AB and some by sub-contractors, Furniture AB suppliers would still need to handle the packing operations for around 60-80% of the total volumes.

However, the manual packing test that was conducted proved that the quality level of manual packing was very low. One year of manual packing would, according to the test, result in almost 7.9 million unsatisfied customers. Such quality deviations would have big negative consequences for Furniture AB's reputation for many years ahead.

Preventing strategies
Advance actions to increase the robustness and/or resilience of a supply chain through investments or changes in the running operations. Preventing strategies must be initiated before the actual event occurs.

Several preventing strategies were evaluated;

1. Transfer packing machines and capacities to Furniture AB suppliers (owned and managed by Components AB)
2. Encourage Furniture AB suppliers to pack and partly purchase their own components
3. Develop a new generation of pre-assembled components
4. Establish a second packing and warehouse facility in Europe
5. Store X number of machines at another external/internal facility
6. Store dismantled machines at machine suppliers
7. Keep safety stocks of packed fitting bags
8. Increase capacity in the Chinese packing and warehouse facility. Establish a running supply of fitting bags to Europe

Establishing a second packing and warehouse facility was the most efficient, but also most expensive, preventing strategy. The cost increase is estimated to 1,2 million EUR/year which can be compared with the 6170 million EUR/year in sales value that is dependent on an uninterrupted flow of components.

The centralized packing operations jeopardize the supply chain continuity and the ripple effects of a full-scale disruption would be devastating for the whole supply chain. The cost savings from the centralized packing operations, in one facility, seem to be a clear sub-optimization to increase the competitiveness of Components AB.

Given the reliability and consequences of the available responding strategies, the recommendation to Furniture AB and Components AB is to invest in one or several of the proposed preventing strategies. The most efficient preventing strategy to ensure this would be to establish a second warehouse and packing facility.

Business continuity planning

A supply chain continuity plan was created to secure that the right actions are taken after a potential disruption in the packing and warehouse facility in Europe, The difference from the supply chain continuity plan, compared with a regular business continuity plan, is the focus on the whole Furniture AB's supply chain. The plan is constructed according to what is best for Furniture AB and Furniture AB's supply chain.

The structure was inspired by the sample table in by Kildow (2011) but with greatly reduced number of chapters. The author questions if Kildow's (2011) statement "the plan should contain sufficient direction to those who will be carrying out the procedures and not a word more" corresponds to her suggested extensive sample table.

The strategies in the supply chain continuity plan will be structured according to Table 1, describing the different categories of the disruption;

		Automatic packing capacities	**Warehouse capacities**
Temporary disruption	25%		
	60%		
	100%		
Permanent disruption	25%		
	60%		
	100%		

Table 1 - Categories of disruption

This structure will insure a flexible plan, which is recognized by Gallagher (2005) as a key feature of a successful contingency plan. The directions will be short and simple as recommended by both Harris (2006) and Kildow (2011). The plan will also be strategic and not dig too much into details, which is another key feature according to Gallagher (2005).

Conclusion

Solving the real world problem of how to secure uninterrupted supply of components and minimum impact on Furniture AB's supply chain if a potential disruption arises in the packing and warehouse facility in Europe, gained learning of how to solve a similar real-world problem. A construction that can be used for similar scenarios, i.e. not necessarily connected to Furniture AB, is visualized in Figure 2.

The construction describe a method of how to evaluate if your supply chain is robust and resilient enough to handle a list of identified sources of risk, and how to combine responding and preparing strategies to handle a potential disruption.

Preventing strategies are added until a responding strategy is perceived good enough to minimize the consequences of a potential disruption.

The construction leads to the creation of a supply chain continuity plan, meant to find the best possible strategy of how to handle a disruption from a supply chain point of view, not from the perspective of the individual company. The supply chain continuity plan describes the chosen responding strategy and prepares the supply chain members of how to act after and during a potential disruption.

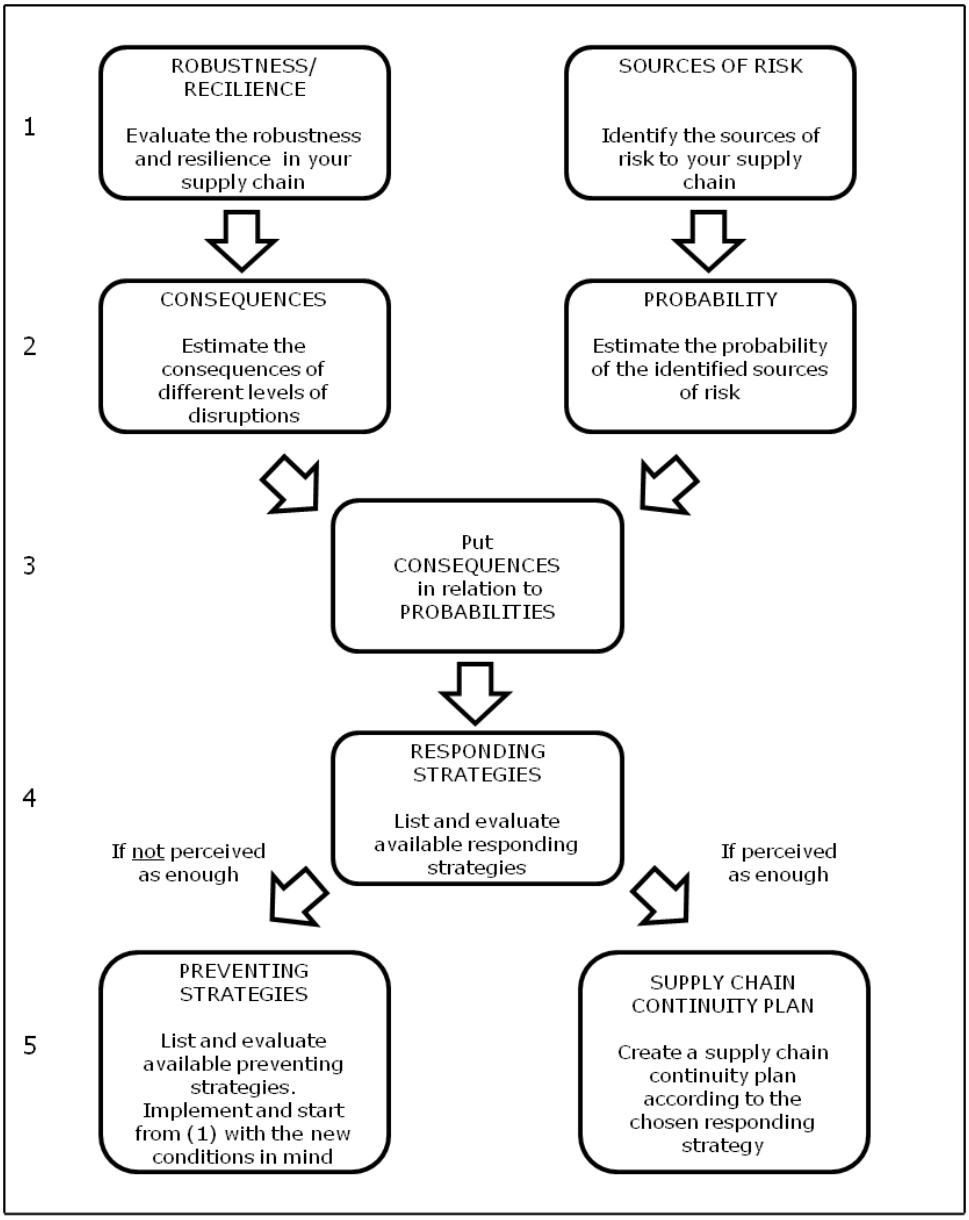

Figure 2 - A general construction of how to evaluate if your supply chain is robust and resilient enough to handle a list of identified sources of risk, and how to combine responding and preparing strategies to handle a potential disruption

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