INCREASE THE VEHICLE UTILIZATION BY CONSOLIDATING SHIPMENTS WITH SUPPLIERS
- A case study at IKEA

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Abstract

Cutting of costs and to being as efficient as possible has never been as important as it is today in order to stay competitive in the market. IKEA are currently facing increasing challenges with the production growth due to a high demand from the market and goals for 2020. This large growth will affect the bottom line of the supply chain, the suppliers. Consequently the transportation frequency of goods will be widely affected. Since the current utilization of the loading units is not yet satisfactory, IKEA would like to investigate the possibilities of performing Co-Loads with suppliers in order to cut transportation costs and increase the vehicle utilization. The issue was investigated through literature, interviews and observations, which lead to the following conclusions. Between suppliers it is to a large extent possible to perform Co-Loads. Two different scenarios were studied; Cluster optimization, which is limited by a 100 km distance between suppliers, and Off-limit optimization, which is an observation outside the limitation of 100 km. Both scenarios increased the average volume of the shipments in the loading unit types by 8.5 and 9.4 % respectively. At the same time the number of shipments was reduced by 7.2 and 8.6%. Finally a supplier set-up for one supplier cluster and one supplier was determined.

Keywords: Production Ramp-Up, Production Growth, Vehicle Co-Load, Transport Efficiency, Co-Loading, Truck Utilization

1. Introduction

The supplier base of IKEA is growing bigger every year and currently IKEA have more than 1030 suppliers in over 50 countries. IKEA will be facing big challenges within the next years and the goals are to reach 500+ IKEA stores globally and 50 billion EUR in sales in 2020, [1]. This will require a huge production Ramp-Up and it will affect the bottom line of the supply chain, the supplier and the transportation of goods.

IKEA are a home furnishing company founded in 1943 by Ingvar Kamprad at the age of 17 years. Ingvar was born and raised in Elmtaryd in the village of Agunnaryd in Sweden and thereof the company name. In 1958 the first IKEA store opened in Almhult, Sweden and since then, more than 355 new stores have opened and IKEA are now operating in over 38 countries all over the world, [2].

The current transport situation today is that no supplier set-up exists for determining which supplier is the most suitable to perform Co-Loads. Neither exists any clear picture of the situation if it is possible to perform Co-Loads. Moreover, a planned shut-down of a Consolidation Point (CP) near the suppliers located in the adjacent areas increases the need of performing Co-Loads.

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1.1. Problem discussion

IKEA have the responsibility of 28 suppliers located in Lithuania, plus a few more located in the adjacent countries. Within a time frame of three to four years the production, for some of the suppliers, will increase up to 600 %, according to the forecasts and goals. This corresponds to a production growth from 1.5 million units to approximately 9 million units. As the production from these suppliers will increase, so will the transportation. Subsequently low utilization leads to unnecessary costs. If a higher utilization can be obtained much money can be saved.

Today, a Third Party Logistic provider (3PL) is managing the distribution of goods from each supplier to its End Receiver by either intermodal transportation with truck and vessel or only by truck. Are there possibilities for Co-Loading between suppliers and if so, which suppliers are suitable? If so, which suppliers have the best opportunity to perform Co-Loads? The management have settled a distance limitation of 100 km if a Co-Load should be performed. Can this limitation be justified?

1.2. Methodology

As indicated in the title, the Case Study strategy was chosen to conduct the investigation. The reason for this is that the phenomenon Co-Loading was identified. Several sources were used to secure that the phenomenon was covered from many different aspects, triangulation. Hence, the abductive approach was used since all data could not be gathered initially, there was

an ongoing process in which data were evaluated and examined throughout the thesis. Data collection of secondary data is mainly related to articles and books where articles were mainly collected from acknowledged data bases. Primary data were collected through several sources such as non-standardized interviews, day-to-day conversations, brainstorming and phone. Thus, non-published data in terms of internal documents from the host company, IKEA were also used.

2. Theory

In many shipments, the volume of goods is not enough to fill a full truck and, consequently, the shipment has to depart with low vehicle utilization. This is a well-known problem in the transportation industry and since the beginning of the 21st century the empty run of the trucks has been around 20%. At the same time, the truck utilization is varying around 56 %, [3]. For that reason it is of vital importance to reach volumes so that a Full-Truck-Load (FTL) can be ordered from the carrier. Transportation costs can be reduced if FTL is used but should not depend upon increased batch sizes. Instead the 3PL companies should simplify for companies that are making small batches by Co-Loading from multiple suppliers near each other and thereby obtain economics of scale with FTL, [4]. By examining the characteristics of the situation, such as flow patterns, transportation charges and time value of freight goods, a better insights about what types of loading and distribution method can be obtained, [5].

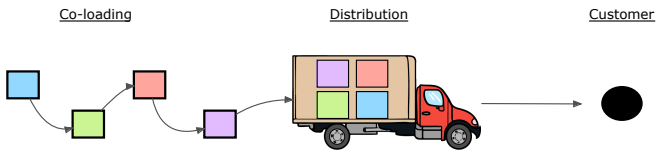

Figure 1: Vehicle Co-Loading

Vehicle Co-Loading implies the involvement of picking up and dropping of goods from different locations and destinations by using a milk-run technique with only one truck, see Figure 1 for a simplified illustration, adopted from [5]. Vehicle Co-Loading needs clear sizes of transportation units, i.e. pallets. Each of the suppliers needs to either round up, or round down, the quantity to a whole pallet. They also have to adjust the size of the shipment so that the FTL is reached with the given truck type, [6]. Also, trade-offs have to be made when using the transportation method Co-Loading. This method needs more stops along the way to the End Receiver which leads to a longer lead time due the stops and due to the fact that the total amount of kilometers will increase because of longer routes. However, it is essential to take advantage of the lower transportation charges that come from larger load sizes, [5].

3. Results

The suppliers were grouped into three clusters, red, green and blue, see Figure 2. In each cluster the suppliers were characterized as heavy, heavy/light or light depending on what type of goods they produce. A mix of heavy and light suppliers is essential in order to perform Co-Loads because light supplier reaches the truck volume limitation with little goods while heavy suppliers reach the truck weight limitation with little goods.

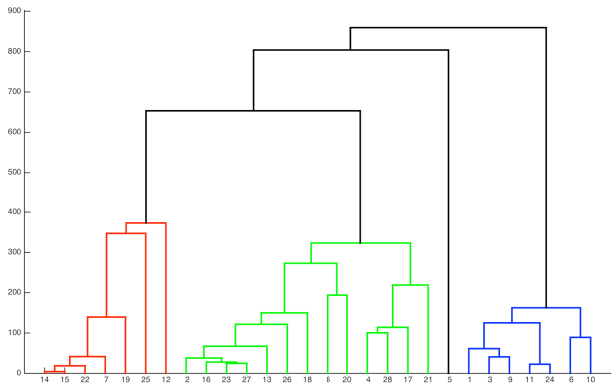

Figure 2: Supplier's relationship and clusters

3.1. Possible Co-Loading

Over 1547 shipments were studied and each shipment must fulfill the following; if a Co-Load should be possible the shipments must have the same End Receiver, be dispatched on the same day, not exceed the volume utilization in the truck by 80% and not exceed the weight limitation of the truck.

Two scenarios were established and measured and compared to the current situation with no Co-Loads. The Cluster method optimizes the suppliers within each cluster i.e. within the distance limitation of 100 km. The Off-limit method optimizes the entire set of suppliers without the distance limitation. See the results in Table 1.

Table 1: Co-Loading Results

Scenario	Current	Cluster	Off-limit
Shipments	1 547	1 436	1 414
Volume [m^3]	51,92	55,93	56,80
Volume Utilization [%]	0,59	0,63	0,65
Weight [kg]	17 042,44	18 359,78	18 645,44
Weight Utilization [%]	0,65	0,74	0,76

3.2. Supplier set-up

Three different aspects were established to find relations and possibilities between the suppliers, these are:

- The Supply Chain Matrix (SCM) - Information about where each supplier is delivering goods.
- The Distance Matrix (DM) - Information of distances between each supplier

- Weight classification Information about the goods being considered as heavy, heavy/light or light. Heavy/light or light is henceforth written in **bold**.

Combining this information into one matrix (Combination Matrix) gave valuable information about the suppliers relations to each other. The more number suppliers within each cluster, the better the chance to perform Co-Loads and increase the shipment dynamic. The Green cluster requires that more shipments be Co-Loaded in the future since the CP close to the Green cluster will be closed. The suppliers with the most potential due to high production growth within the next years are more relevant.

Based on above, the best cluster to perform Co-Loads is the green cluster, and especially supplier 20 since that supplier has a good relation with five other suppliers, see Table 2. For that reason supplier 20 was chosen as reference supplier and the others as core-suppliers. Lets study the intersection between

Table 2: Reference and core-suppliers

Supplier		**SUP20**
	End Receivers	209
SUP4	391	208/0,53/100
SUP8	361	200/0,55/71
SUP13	160	137/0,86/58
SUP16	86	61/0,71/70
SUP17	47	34/0,72/92

SUP20 and SUP13 as a short example. SUP20 is classified as heavy/light supplier with 209 unique End Receivers. SUP13 is also classified as heavy/light with 160 unique End Receivers. Of these 160 unique End Receivers 137 are the same as SUP20, which corresponds to 86%. The distance between SUP20 and SUP13 is 58 km.

4. Discussion

IKEA should work with the Green Cluster because those suppliers are favorable to perform Co-Loads because of the great mix of heavy and light suppliers. The Combination Matrix is a good foundation for getting a clue of which suppliers are the most suitable for each other. In order to increase the number of Co-Loads the distance limitation should be loosened up and kept as aim instead. Then a larger set of suppliers will be able to perform Co-Loads, which has proved to be beneficial, see the results from the scenarios. Both scenarios increase the performances in the transportation. However, these scenarios must be considered wisely due to the trade-offs. Choosing the Off-limit method requires collaboration with and between many suppliers in order to perform more Co-Loads, while the Cluster method requires a much closer relationship between the suppliers with fewer suppliers involved. Yet, lower costs and higher truck utilization are obtained with the Off-limit method. Lastly, to increase the Co-Loads even more, the dimensions of the pallet volumes should be smaller so that a more dynamic loading in the trucks is possible. This will allow the End Receivers to order more frequently but with a lower volume, which will keep down the stock, both for the suppliers and for IKEA.

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