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**The Impact of Distribution Center Bypass in the Luxury Fashion Industry**

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# The Impact of Distribution Center Bypass In the Luxury Fashion Industry

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## Summary:

This study analyzes the effects of eliminating a layer of regional distribution centers in the distribution of a large global fashion retailer's luxury products and instead distributing the products from a central warehouse in Italy directly to retail or wholesale outlets around the globe. Based on the devised cost model and the assumptions made, it is determined that centralization is most effective for high-priced products with high uncertain demand, and least effective for low-priced products with high predictable demand.



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## KEY INSIGHTS

1. Product price, demand uncertainty, and demand volume are significant determinants in whether or not a centralization strategy is cost-effective.
2. High-priced products with high uncertain demand generally benefit from centralization.
3. Other considerations such as the effects of lead-time variability, holding cost calculations, demand correlation, as well as the qualitative advantages and risks of distribution centralization should weigh heavily in deciding whether centralization makes sense.

## Introduction

This study aims to analyze the costs and benefits of replacing AMSA Corporation's luxury product lines' current distribution system with a more centralized system. AMSA Corporation is an upscale American fashion design and retail company with annual revenues of approximately \$5 billion. The company's

products include men's and women's clothing, footwear and accessories and various home products. Currently, the luxury lines are all consolidated in the Italy facility after production, shipped to one of the regional distribution centers, each of which are associated with demand in their particular region, and then distributed to final retail or wholesale destinations. The European market, however, is served directly from the facility and will not be considered in this study. The distribution system, even though it meets customer requirements, contains a layer that may be adding unnecessary movements and costs. The goal of this study is to understand the impact of eliminating the role of the regional distribution centers and to recommend, at the product or product category level, the system that has the potential to minimize costs without compromising service levels and company standards.

The effect of inventory centralization was first illustrated by D.H Maister in 1975 through a study titled "Centralization of Inventory and the Square Root Law". The Square Root Law refers to the amount of inventory in a system being proportionally

related to the square root of the number of warehouses at which it is stocked. As mentioned above, the effect of the variation in demand is reduced, because the pooled standard deviation of demand is calculated through taking the square root of sum of the squares of the individual standard deviations, as opposed to the actual demands, which are simply summed up.

The basic framework of analysis for this study is a cost model. The model calculates cost differentials in five different cost categories (outlined below) between centralized and decentralized distribution options for specific product categories, based on quantitative inputs. It also makes several mentioned assumptions in its calculations; however, it is constructed as a dynamic tool in the sense that all of its inputs are considered to be variables. AMSA management is thus able to use the tool and tailor it to very specific products by changing its inputs. The tool calculates relevant costs and recommends whether or not the particular product category's distribution should be centralized.

### The Cost Categories

The cost model includes a detailed cost analysis outlining the effects of centralization on five different cost categories, namely:

- Transportation costs
- Facility holding costs
- Facility processing costs
- Ordering costs
- Pipeline costs

Pipeline costs include those associated with in-transit goods, including insurance. These costs are not included in transportation and holding costs, and are thus considered a separate category.

### The Cost Model

The cost model works is designed to provide total supply chain cost outputs (centralized and decentralized) for a particular product or product category for which a determined set of inputs are introduced into the model. First, the relevant product input parameters are determined. Some of the product inputs include price, cost, Order-Up-To Level review periods, lead-times, and transportation costs.

The cost analysis requires that the calculations be divided into two sections: 'initial shipment' calculations, and 'after initial shipment' calculations for both the decentralized and centralized systems. The initial shipment is the amount of product shipped to stores to be available on the first day of

the fashion season. This 'initial shipment' strategy floods the consumer market with the new products to create a market effect with a one time shipment, and does not use a fulfillment strategy as in the 'after initial shipment. The percentage is an input into the model and can be altered. The shipment of luxury goods from the Italian facility to only four different regional distribution centers is considered. These four regional distribution centers are located in: United States, Hong Kong, Japan, and South Korea.

A newsvendor calculation determines the production quantities for the product and the initial shipment quantity. After the initial shipment Order-Up-To inventory calculations determine the replenishment quantities and inventory levels. The reasons for choosing these methods are described in detail in the study.

The inputs are then used to calculate supply chain costs in the five mentioned cost categories. Afterwards, a decision is rendered for that particular product or product category that either recommends centralization or decentralization.

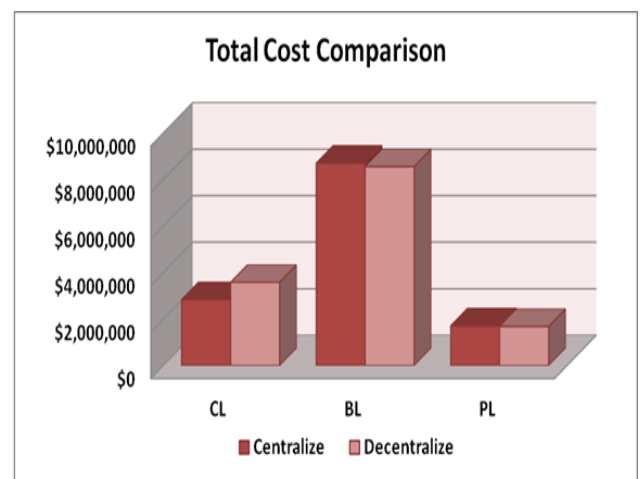
### Findings

Three different product categories were selected, in consultation with AMSA management, to be analyzed via the cost model:

- CL handbags (high-priced; low-demand)
- BL footwear (low-priced; high-demand)
- PL accessories (low-priced; medium-demand)

The results of the cost model indicate that it is advisable that the distribution of CL handbags be centralized, but the distribution of BL footwear and PL accessories remain decentralized.

The overall results are illustrated as follow:



## Further Analysis

The two cost categories that have the biggest impact on total costs are transportation and holding costs. In all instances, transportation costs increase by approximately 7%. This result is expected, as centralization causes a higher frequency of transportation and smaller batch sizes. The holding costs behave differently however, and are what essentially cause the difference in the total costs, affecting the centralization decision. Since holding costs are a function of Cost of Goods Sold (COGS), and COGS is a function of price, the overall centralization decision is highly dependent on the price of the item.

### *Effect of Price*

Distribution Center bypass is a highly cost-effective strategy when the items are 'high-priced,' but not cost-effective when the items are 'low-priced'. When the 'low-priced' items are centralized, the decrease in holding costs is not enough to offset the increase in transportation costs. In general, holding costs decrease because of the aforementioned 'square root law,' and also because of the fact that the holdings of the regional distribution centers are eliminated.

### *Effect of Demand Uncertainty*

Also, different standard deviations of demand are introduced into the model in order to demonstrate the effect of demand uncertainty on the centralization decision. It becomes more cost-effective to centralize the distribution system as uncertainty of demand increases. This phenomenon was observed with all product categories that were analyzed.

The savings in an uncertain environment arise from the reduced holding costs of a centralized system. Since a more uncertain demand environment requires that higher amounts of safety stock and thus general inventory be held closer to the consumer and a centralized system reduces the overall inventory levels at the stores (which are assumed to have higher holding costs than the distribution centers), the savings in holding costs that arise from centralization are increased with uncertainty.

### *Holding Cost Calculations*

It is imperative that AMSA calculates its holding cost percentages accurately before using this cost model, as the model is dependent on these percentages. It is further important that the relationship between the calculated holding cost percentage and the Cost of Goods Sold (COGS) is firmly established.

Academically, holding costs are associated with COGS, since handling and insuring the goods are directly related to it. In real-world applications, however, it must be considered that part of the holding costs such as rent and utilities are fixed, and thus are in need of careful consideration when the percentages are determined.

### *Demand Correlation*

Moreover, it must be noted that the model would be biased towards centralization if positive correlation exists between the demands of the various regions. The model assumes that the demands in the various regions are independent. The more negatively correlated the various regional demands are, the more location pooling makes sense, as the pooled variation in demand decreases. Conversely, the more positively correlated the demands are, the more the effects of pooling are diminished.

### *Different Alternatives*

The study takes a 'centralize' or 'keep decentralized' decision approach, when in reality the optimal solution can be a hybrid approach, where the inventory of certain regional distribution centers are pooled and others' are not, for the same product. Other alternatives can also be the subject of a future study of AMSA's distribution strategy. The reason these alternatives are not considered in this study is the number of alternatives that exist. Decisions had to be made to consider only two alternatives, where the decision would either recommend a completely centralized or a completely decentralized system.

## Risks and Benefits of Centralization

The study also considers the qualitative benefits and risks of centralization, which are summed up in the below tables (The content is a summary of papers written by Cianciotto (2004), Singh and Ganapathiraman (2013) Strang and Woods (2010) and Zamsky (2005)):

<b>Benefits of Centralization of Inventory</b>
Overall "touches" in the supply chain decrease
Total amount of inventory decreases as the result of 'square root law'
Lead-time efficiency increases
Fixed asset utilization increases
New business growth opportunities because of freed up capital

<b>Risks of Centralization of Inventory</b>
Complexity in the supply chain increases
Service terms with suppliers may need to be renegotiated
IT systems must be adjusted
Inventory total loss risk due to force majeure events may increase

## Conclusion

The figure below illustrates a simplified tool for making centralization decisions, based on this study's findings. It must be noted that this tool is strictly based upon the assumptions made in this study. AMSA must analyze products for their specific properties and variables, before making a final decision. Also, it must clearly define what labels such as "high-priced" and "low predictable demand" mean in terms of their defining parameters. This figure only considers extreme examples in each category, based on the above analysis and concludes how effective centralization is in various scenarios:

<b>Demand</b>	<b>Low-Priced Item</b>	<b>High-Priced Item</b>
<b>Low and Uncertain</b>	<b>Likely Effective</b>	<b>Likely Effective</b>
<b>Low and Predictable</b>	<b>Likely Not Effective</b>	<b>Likely Not Effective</b>
<b>High and Uncertain</b>	<b>Likely Not Effective</b>	<b><i>Most Effective</i></b>
<b>High and Predictable</b>	<b><i>Not Effective</i></b>	<b>Likely Effective</b>

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