

### Group Project

1. The key factors that influence the design of Amazon's US distribution network relate to infrastructure and customer service. Amazon place great value of providing world-class customer service and their customers' preferences factor greatly into executive decisions. Amazon also has to consider infrastructure related to their distribution network, including where to put their distribution centers and their relationships with suppliers, in order to exceed customers' expectations. This also includes Amazon's method of shipping to customers, to meet promised delivery times. The focus is on customer service, with infrastructure put in place to exceed the expectations of customers consistently.
2. The main challenges for Amazon to replicate its US operations in Europe are the differences in culture between Americans and Europeans. There are also significant differences in culture between the inhabitants of different European countries, such as Germans and French. These cultural differences result in a different customer mindset and different products for inhabitants of each country. There are also differences in the relationship between businesses and vendors, including those involved in the shipping of products. There are many challenges for businesses who expand into Europe, especially for those who enter multiple countries. Another challenge relates to the meeting of customer expectations, such as standard next-day delivery. Amazon succeeded in overcoming these challenges by extensively researching the different cultures and choosing to have three different websites, one for each country.
3. A. Firstly, Amazon should apply economic order quantity (EOQ) to find its order quantity Q for each inventory. The EOQ equation is shown below:

$$Q^* = \sqrt{\frac{2 \times K \times R}{h}}$$

Where  $Q^*$  is the optimal order quantity or EOQ,  $K$  is setup costs or administrative processing and transportation cost in this case study,  $R$  is the demand rate per time, and  $h$  represents holding cost rate per unit per time.

Before calculating EOQ, Amazon has to calculate holding cost rate per unit per week. Amazon can obtain this value by finding the annual inventory costs per unit and dividing that amount by 52 weeks. Given a tablet costs \$250, the holding cost should be  $h = (\$250 \times 50\%) / 52 = \$2.40384615$  per tablet. Then, Amazon can calculate EOQ for each inventory by plugging in the value into the EOQ equation above. Below is the calculation of order quantity for UK inventory:

$$Q^* = \sqrt{\frac{2 \times 200 \times 1500}{2.40384615}} = 499.5998$$

Amazon will obtain order quantity of 499.5998 tablets for UK inventory, 576.8882 tablets for Germany inventory, and 446.8557 tablets for France inventory. In practice, Amazon is not able to purchase tablets in decimal quantity. The value should be rounded up. Therefore,  $Q$  will be 500 for UK, 577 for Germany, and 447 for France, instead.

Next, Amazon has to use re-order point (ROP) equation to find its reorder level  $R$ . The equation below represents the ROP formula:

$$ROP = DL + z_{\alpha} \sigma_D \sqrt{L}$$

Where D represents demand per time, L is lead time for each order,  $z_{\alpha}$  is z-value at  $\alpha$  confidence level, and  $\sigma_D$  equals standard deviation of demand. The calculation of reorder level for UK inventory is shown below:

$$ROP = (1500 \times 2) + 2.054 \times 200 \times \sqrt{2} = 3580.959$$

Amazon will obtain reorder level of 3,580.959 tablets for UK inventory, 4,726.199 tablets for Germany inventory, and 2980.959 tablets for France inventory. Again, Amazon should round these values up to 3,581 for UK, 4,728 for Germany, and 2,981 for France.

Amazon could calculate the safety stock from reorder level. The safety stock equals reorder level minus its expected demand. For example, the safety stock of Amazon's inventory in UK equals  $3581 - (1500 \times 2) = 581$  tablets. Thus, Amazon notices that the safety stock of Amazon's inventory in Germany and France should be 727 and 581 tablets.

Lastly, Amazon could be able to approximate the average inventory by adding cycle stock to safety stock. Amazon will obtain  $(500/2) + 581 = 831$  tablets for the UK inventory, 1016 tablets for the German inventory, and 805 tablets for the French inventory. Therefore, the total amount of average inventory held in all three DCs is 2652 tablets.

B. Before Amazon could calculate anything, Amazon has to find the addition of expected demand and the addition of standard deviation. To do so, the statistical principle has to be adopted. The picture below is the law of expected value and variance of the sum of two variables.

#### **Laws of Expected Value and Variance of the Sum of Two Variables**

1.  $E(X + Y) = E(X) + E(Y)$
2.  $V(X + Y) = V(X) + V(Y) + 2\text{COV}(X, Y)$

If  $X$  and  $Y$  are independent,  $\text{COV}(X, Y) = 0$  and thus  $V(X + Y) = V(X) + V(Y)$

In the case study, the UK distribution center, German distribution center, and French distribution center serve different groups of demand, so Amazon can conclude that the demands of tablet in UK, Germany, and France are independent. Therefore, the average demand is equal to  $1500 + 2000 + 1200 = 4700$  tablets per week, and standard deviation equals  $\sqrt{200^2 + 250^2 + 200^2} = 377.4917$  tablets.

Amazon would calculate the order quantity and reorder level. Two calculations below are shown how Amazon would calculate Q and R for single distribution center:

$$Q^* = \sqrt{\frac{2 \times 200 \times 4700}{2.40384615}} = 988.7366$$

$$ROP = (4700 \times 2) + 2.054 \times 377.4917 \times \sqrt{2} = 10496.54$$

After rounding the values up, Amazon would obtain the order quantity of 989 tablets per order and reorder level of 10,497 tablets. This translates to the safety stock of

$10497 - (4700 \times 2) = 1097$  tablets. The average inventory held in the DC is 1,591 tablets. That means 1,061 less inventory compared to three decentralized DCs serving that has been used at this moment.

4. A. The pros of maintaining the status quo include the relatively low cost of this strategy and the low risk resulting from the absence of changes. This strategy does not have the risk of damaging customer satisfaction, which would result from either of the other strategy. The cons of this strategy include the potential for lost opportunity. There are opportunities in the other strategies that are lost by maintaining the status quo, including the opportunity to cut costs and the opportunity to exceed the expectations of customers. This strategy over emphasizes the short-term instead of the long-term implications.

B. The pros of keeping the existing distribution centers but centralizing the management include the potential for a real-time system used for fulfilling customer orders. There is a significant investment involved in developing such a system but the system would enable Amazon to accept more orders. The cons of this strategy involve the inherent risk of a loss in customer satisfaction, during the transition. This system minimizes this risk because the transition is behind-the-scenes and the current operation continues during this time. There is another risk for orders that require the shipping of parts across countries. This risk to customer satisfaction would reduce over time as customers adapt. The decrease in inventory-holding costs and the additional revenue from orders are other advantages of this system. This system also emphasizes the strengths of Amazon in developing efficient distribution centers.

C. The pros of combining all distribution centers into a single center include the advantage of not having to go to other distribution centers to fill an order. There is a massive investment required for this strategy, in the development of a single distribution center and the extensive damage to customer satisfaction. The actual move of three centers into a single center is quite a challenge, as is the shipping of orders to customers in three different countries. The decision of where to place this one center is very difficult. These challenges are also present in the strategy of moving to two distribution centers presented in the case study. These strategies involve an unnecessary investment and disruption to operations.

What are the benefits and challenges of centralization in Amazon's EAD?

Benefits: Centralization in EDN could centralize purchases and extract high volume discounts from suppliers. Some products were extremely concentrated such as common media and 80% of total music sales were depend on only few vendors, which was one of the challenge. Additionally, suppliers were organized in country subsidiaries and negotiations were happening at the country level. Though vendors in Europe were outdated but good sign was that they wanted to move forward towards new approaches towards centralization. Network Optimization through centralization could lead to reduction of staff in operations team but it was required better

coordination and collaboration to leverage the opportunities and savings the EDN Offered. Centralizing the buying activity required relocation of employees and obtain a training based on European customer needs rather than country specific country needs. EDN was having a challenge to acquire IT resources and EDN project has to prove the ROI with respect to other cost saving projects to utilize the IT resources.