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LINKS – SUPPLY CHAIN MANAGEMENT FUNDAMENTALS SIMULATION

FINAL REPORT

In LINKS, we manage the supply chain of an on-going high-tech manufacturing business within the simulated set-top box industry. Working with our teammates, we're in direct competition with other firms in our LINKS simulation industry. Our goal is to improve our firm's overall financial, operating, and market performance.

INDUSTRY 1 FIRM 3 (PU13)
Sandesh George Oommen
Gopi Varma Manthena
Siva Theja Aravapalli

INTRODUCTION

Supply chain management is a term used for procurement, manufacturing, distribution and transportation processes within a company. LINKS simulation provides exposure to all these elements individually and to their interactions, from upstream product development through inventory management, to the customer-facing elements of service and generate demand. It also gives an exposure to manage and balance trade-offs in supply chain with an experience into the competitive dynamics among various firms in an evolving marketplace. This simulation encourages the use of fact-based supply chain analytics to managing information flows and integrating them into the decision-making process.

ORDER OF DECISION MAKING

The order of decision making was:
Distribution -> IT -> Generate Demand -> Forecasting -> Transportation -> Manufacturing -> Procurement -> Research Studies

DISTRIBUTION STRATEGY

Owning a distribution center allows post-production which reduces the duties and tariffs and makes the supply chain flexible enough to handle the uncertainty in demand. Following decisions were taken in region 2 and region 3 and all these decisions remained the same throughout our game.

REGION 2: We did not open our own DC. We outsourced it because the demand in Region 2 was low compared to Region 1 and 3. So the cost of setting up a new DC would not be profitable. RFID was also out-sourced because we did not own a DC in this region.

REGION 3: We decided to open our own DC in this region to do postponed production which would reduce duties and tariffs. According to our calculations, this reduction was more than the cost for setting up this new DC. RFID was insourced because profit from this was more than cost of insourcing since demand was very high in Region 3 compared to Region 1 and 2.

Emergency Carrier was changed to M for plant to DC shipments because we used carrier M for normal transportation in both regions and there was a 20% rebate on transportation if a single carrier was used for both regions (including emergency shipments). However, we always made sure that we never had to use this emergency carrier throughout the game as we always planned to have enough inventory. Our decision for choosing Carrier M will be discussed under the Transportation Strategy.

IT STRATEGY

IT synchronization was done for Carrier M since we had selected Carrier M and surface transport for both regions. IT synchronization was required because the delivery rate was very low for surface transportation which needed improvement.

Similarly, our selection of suppliers was primarily based on least unit cost criteria and so IT synchronization was required to improve the delivery rates and reduce the failure rates. Hence, we used IT synchronization for Supplier F for the first 3 decisions and then for Supplier E for the next rounds since we had initially selected supplier F for both delta and epsilon components and then shifted to supplier E for remaining rounds.

GENERATE DEMAND STRATEGY

Price changes were implemented during the fourth round. These changes were made based on the most profitable price available in the Price Sensitivity Research study which we had ordered in the previous month. This move of ours did not create any positive impact. In fact, it reduced our total revenue and hence, we did not make any more price changes throughout the game.

We increased marketing expenditure in the last two decisions mainly because of two reasons. Firstly, we increased marketing expenditure in regions and channels where we made price changes during the fourth round. We did this to ensure that our price change decisions would give good results by increasing our sales. But this did not work out for us. Secondly, we increased marketing expenditure in certain regions and channels in the last month's decisions since we had a lot of inventory left beyond the expected demand. We thought this would help us to use up the inventory by increasing the sales in the last month which proved to be a right decision.

FORECASTING STRATEGY

We used a combination of 'simple moving average' with n=3 in regions and channels where the demand had a higher variation and 'exponential smoothing with trend' in regions and channels which had an increasing/decreasing trend. Generate demand decisions such as marketing expenditure and price changes were also considered while making the decisions. Overall, we would say that forecasting was the most important decision in the LINKS simulation game since it directly affects every other decision. Our strategy was a mix of the models mentioned above along with intuition and common sense because the models might not necessarily perform well in cases where the historical data is about 3 to 7 months.

TRANSPORTATION STRATEGY

Only 1 carrier was used in both regions throughout the game to avail transportation rebate. The selected carrier was Carrier M which had comparatively cheaper per unit cost and a decent delivery rate for surface transportation which was improved through the IT synchronization. Only surface transportation was used to reduce cost and air was used only in the last month to ensure a 100% delivery rate, so that we weren't left with any delayed units at the end of the game. Number of units to be transported were calculated by considering the forecasted amount, delivery performance and IT synchronization.

We transported Product 0 to region 3 where we owned a DC, and accordingly transportation of Product 1 and Product 2 were reduced according to the ratio of their demands.

MANUFACTURING STRATEGY

To take advantage of the reduction in tariffs and duties (in region 3 where we owned a DC) and to account for the variability in demand, we made sure that we produced Product 0 to the maximum extent possible. We decided to increase our production of product 0 from zero initially to 10,000 (due to a monthly increase limit) in the first month and in increments of 10,000 each in the subsequent months till it reached 30,000. Production of product 1 and product 2 were also reduced accordingly. For the last month, we had to reduce our product 0 production to use up all the existing inventory.

Postponed production was made minimum in region 1, just enough to account for demand uncertainty because it results in extra cost in region 1. Postponed production was made maximum in region 3 to reduce the duties and tariffs since it qualifies as "local" manufacturing. Production of product 0 in

sufficient quantities also helped us to ensure that no unfilled orders are present throughout the game. We also ensured that the total production never exceeded 1,00,000 units as it requires another production shift which will further increase the costs.

PROCUREMENT STRATEGY

Our procurement strategy was always based on the Spot market prices available after every month. We always tried to strike a balance between cost, delivery rate and failure rate, with cost being a primary factor for us because we had IT synchronization with suppliers to improve the delivery rate and reduce failure rate. Based on spot prices, suppliers were changed from the beginning until last round to reduce cost in the following way:

	Month 4	Month 5	Month 6	Month 7	Month 8
Gamma	A	A	A	A, B	B
Delta	F	F	F	E, F	E
Epsilon	F	F	F	E, F	E

Quantity of Epsilon was calculated based on forecasting for next period and so ordered accordingly. In the last period, no Epsilon was ordered because it will not be delivered until the month gets over.

Except for last month, surface transportation was used throughout the game to reduce the costs. For the last month, we used air transportation to ensure that no undelivered units are present at the end of the game. Extra sub assembly components were always ordered to account for delivery performance of surface transportation and failure rate by calculating historical delivery rates and failure rates from previous months.

RESEARCH STUDIES STRATEGY

Only 'Price Sensitivity Analysis' was ordered 1 month prior to Generate demand price change decision to determine the best price change policy to attain maximum profit.

KEY POINTS TO IMPROVE PERFORMANCE

Since we performed well compared to the other firms in the industry, we want to mention a few important points that helped us and certain points which we could have done to make our performance even better.

- Forecasting is the key to LINKS simulation game. Since the historical data available is less, models coupled with intuitive decisions might help.
- Instead of using the average delivery rate for suppliers and carriers, forecast the delivery rate of each supplier and carrier using historical data just like demand forecasting.
- Postponed production should be utilized to the maximum extent possible to reduce tariffs and duties in regions with owned DC (except for region 1).
- We owned a DC in region 3 and used outsourced DC in region 2. Considering the high number of tariffs and duties, we believe having an owned DC in region 2 also would increase our profit significantly.
- Spot market prices of suppliers must be reviewed after every month to select the suppliers which offer lowest unit cost for sub-assembly components. However, delivery rates and failure rate also should be considered to a minimal extent even though cost is the main factor.
- Demand fluctuations are very sensitive to price changes. Hence, careful analysis is required if someone decides to make a price change.