

D472 Task 1 Case Study

Operation and Supply Chain Disruption at Autojor Manufacturing

Background

Autojor Manufacturing (AJM), based in Louisville, Kentucky, is a company that produces high-dollar electronic components for the automotive industry. The company has been in operation for over 25 years and has a reputation for providing high-quality products at competitive prices. The company has a current partnership with a supplier in Houston, Texas, that provides 100% of key components (small metal gears). The company has recently experienced an operation and supply chain disruption that threatened to impact its ability to deliver products to customers.

Disruption

This disruption occurred when AJM's supplier in Houston experienced a fire at their manufacturing facility, resulting in a complete shutdown and a shortage of critical components. This incident disrupted AJM's supply chain and ability to deliver products to their customers, resulting in lost sales and potential loss of business. The company had to incur expedited freight costs during the plant start-up after the fire.

To tackle the disruption, AJM quickly formed a team to evaluate options and determine the risk factor based on various start-up time frames. AJM held internal meetings to assess their inventory positions and determine the next steps to take. A team was quickly assembled two days later to evaluate various options and assess the risk factor based on different time frames scheduled for the supplier's start-up. During the interviews, AJM discovered that their employees were concerned about the potential long-term effects of the disruption, including fears of layoffs, employee reductions, and loss of business. Multiple news sources and social media outlets added to the uncertainty with a range of opinions, many of which were based more on emotions than on facts. From a customer perspective, AJM avoided major outages with the three large automotive companies—Cadallia (CD), Lexiplus (LP), and Elecktoe (ET)—with only one disruption caused to Cadallia and potential penalties forthcoming. The extensive communication with the three companies throughout the disruption was key to ensuring that all options could be explored.

Resilience

Despite the disruption, AJM demonstrated short-term resilience by immediately contacting other potential sources, engaging expedited carrier services, and reviewing potential substitutions. They also increased communication with their customers to manage their expectations regarding potential inventory outages. However, the disruption had a



significant impact on the company's operations and supply chain, with production levels decreasing by 100% three weeks after the disruption.

Data Analysis

The disruption had a significant impact on AJM's operations and supply chain, leading to a 100% decrease in production levels three weeks after the supplier's facility fire. However, the company was able to avoid stock outages with Cadallia, Lexiplus, and Elecktore thanks to on-hand inventory at the supplier site and maintaining min-max levels for finished goods. Unfortunately, production for the OEM market (where AJM's name is not directly on the products) was stopped immediately, and subassembly materials were reassigned. While the company was fortunate to avoid stock outages, the data showed that the current recovery plan could be more robust.

During discussions with key executives, it became clear that there were concerns about some of the processes or lack of processes in the current operation. The executives noted that it took two days to assemble a team to respond to the disruption, there was no clear-cut leader for the response, and the procurement process had only one supplier for a key item.

In addition, the leadership team felt that the min-max inventory level carried at the organization was tying up capital. Long-term options were needed to allow the leadership team to feel comfortable reducing inventory to free up capital. They also felt that the recovery time to a secure inventory level was too long and wanted to explore long-term options for sourcing.

A positive factor highlighted in the findings was the effectiveness of the ERP system, with barcode scanning at the point of production and within the warehouse operations. The internal resources combined with EDI communication for demand from the customer base provided AJM with real-time data to formulate a plan. One point expressed by leadership was the barcoding technology and whether an RFID system would enhance the ability to capture data. In addition, the leadership team wanted to have a better understanding of the analysis capabilities of big data and the potential for improved forecasting.

The AJM's leadership team identified concerns with the procurement process, the lack of a clear-cut leader for a disruption response, and the min-max level tying up capital. To mitigate future disruptions, they evaluated three long-term solutions:

Solution 1: Multisource Supply Chain

The AJM leadership team is evaluating the implementation of a multisource supply chain strategy. This strategy is being considered as a strategic option to increase the resilience and viability of the company's supply chain and reduce the risk of supply chain disruptions that would negatively impact their ability to meet the needs of their customer base (Cadallia, Lexiplus, and Elecktore).

Implementing a multiple-sourcing strategy will provide AJM with the flexibility to manage any future supply chain disruptions without significant interruption to its business operations. Multisourcing offers several attractive advantages:



1. Reduced dependency on one supplier: By sourcing from multiple suppliers, AJM can reduce its dependence on a single supplier, providing a safety net if that supplier experiences difficulties.
2. Increased flexibility to cope with unexpected events: Multiple sourcing allows AJM to cope with unexpected events that could jeopardize capacity by having alternative suppliers that can meet peak demand.
3. Reduced supplier bottlenecks: Having more suppliers that can provide critical components can reduce supplier bottlenecks and ensure that the supply chain is not solely dependent on one supplier.
4. Maximized company effectiveness: Sourcing from the best possible suppliers can maximize company effectiveness, ensuring that various elements are sourced from suppliers with the right capabilities and expertise.
5. A competitive advantage: AJM can achieve a competitive advantage by combining its internal core competencies and abilities with those of its suppliers.
6. Designs for multiple supply chains: AJM can design multiple supply chains that work together to serve different segments of their customer base based on different markets.
7. Cost savings: Competition among suppliers could provide more bargaining power that allows for cost savings.

Implementing a multisource supply chain will allow AJM to reduce dependency, increase flexibility, and reduce capacity risks. To further mitigate possible disruptions, AJM has selected three suppliers from various U.S. geographic regions. Each supplier was selected based on their production capability, operational efficiency, and reliability of order delivery.

Solution 2: 3D Printing

(Supporting data can be found below)

AJM explored the potential of continuous 3D printing as a long-term solution to ensure the company can meet commitments to its current customer base while enhancing opportunities for expansion and new markets.

To properly utilize 3D tools, an expansion facility would need to be constructed adjacent to the current facility. The building would be 100,000 square feet and designed for inputs, production, and finished material storage. Staffing would be 10 individuals at the cost of \$150,000 each. The machines are estimated at \$625,000 each.

Some benefits of going along with a tighter supply chain include printed parts that are considered stronger than molded items, no costly retooling, reduction of min-max levels, and overall inventory reduction. Supporting analysis of potential cost factors and payback are provided. The construction period is estimated at nine months, and machine delivery can be coordinated with that timeline.

At full capacity, the estimated payback on the recommended project is projected to be 4.3 years. This payback period does not include the potential for new business, as the 100,000-square-foot facility could hold 12 continuous 3D printers. Opportunities would be in areas outside AJM's current line supplied to Cadallia, Lexiplus, and Elecktores, and all options should be researched.



Solution 3: Third-Party Inventory Warehouse Integration

The AJM leadership team decided to explore the option of third-party inventory warehouse integration. Using the viable supply chain model framework, AJM has determined that, in order to increase the resilience and viability of their supply chain, third-party inventory warehouse integration is a long-term option to prepare for future supply chain disruptions while also decreasing inventory cost.

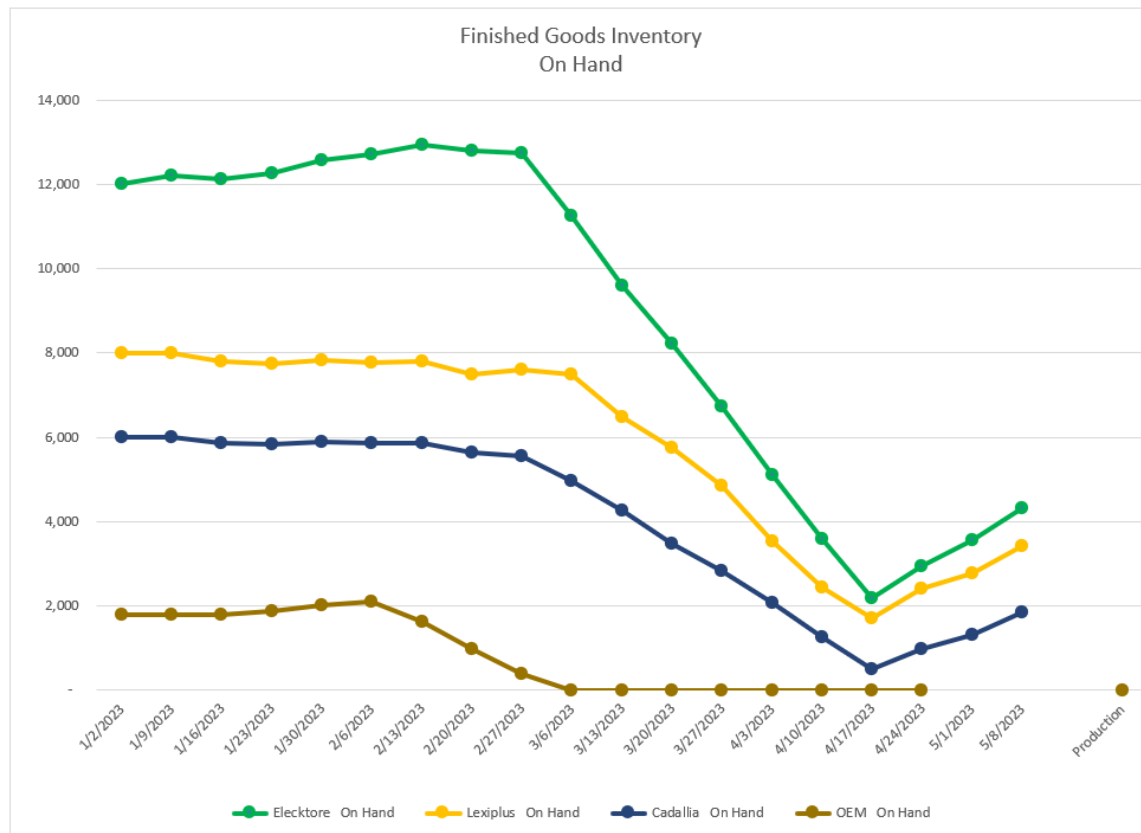
Utilizing a third-party inventory warehouse integrator will allow AJM the agility to respond to future supply chain disruption without an interruption in operations. This would also provide additional benefits, including the following:

1. **Diversification of suppliers:** A third-party warehouse could work with multiple suppliers to provide the critical components needed for AJM products. This would reduce the risk of a single supplier experiencing a disruption that would impact AJM's supply chain.
2. **Increased inventory management:** A third-party warehouse would have expertise in inventory management and could help AJM optimize its inventory levels to ensure that it has enough stock to meet demand without holding excess inventory that ties up capital.
3. **Improved supply chain visibility:** A third-party warehouse could provide AJM with real-time visibility into its inventory levels and the status of its suppliers and carriers. This would allow AJM to respond quickly to any disruptions in its supply chain.
4. **Cost savings:** By working with a third-party warehouse, AJM could potentially reduce its warehousing and logistics costs. This is because the third-party warehouse would be able to leverage economies of scale and negotiate better rates with carriers.

Overall, using a third-party warehouse to manage inventory could help AJM mitigate the impact of future disruptions on its supply chain. This would allow the company to better serve its customers and maintain its reputation for providing high-quality products at competitive prices. AJM would need to carefully evaluate potential third-party partners to ensure their values align and that they have a proven track record of effective inventory management and logistics.



Graphs and Supporting Data



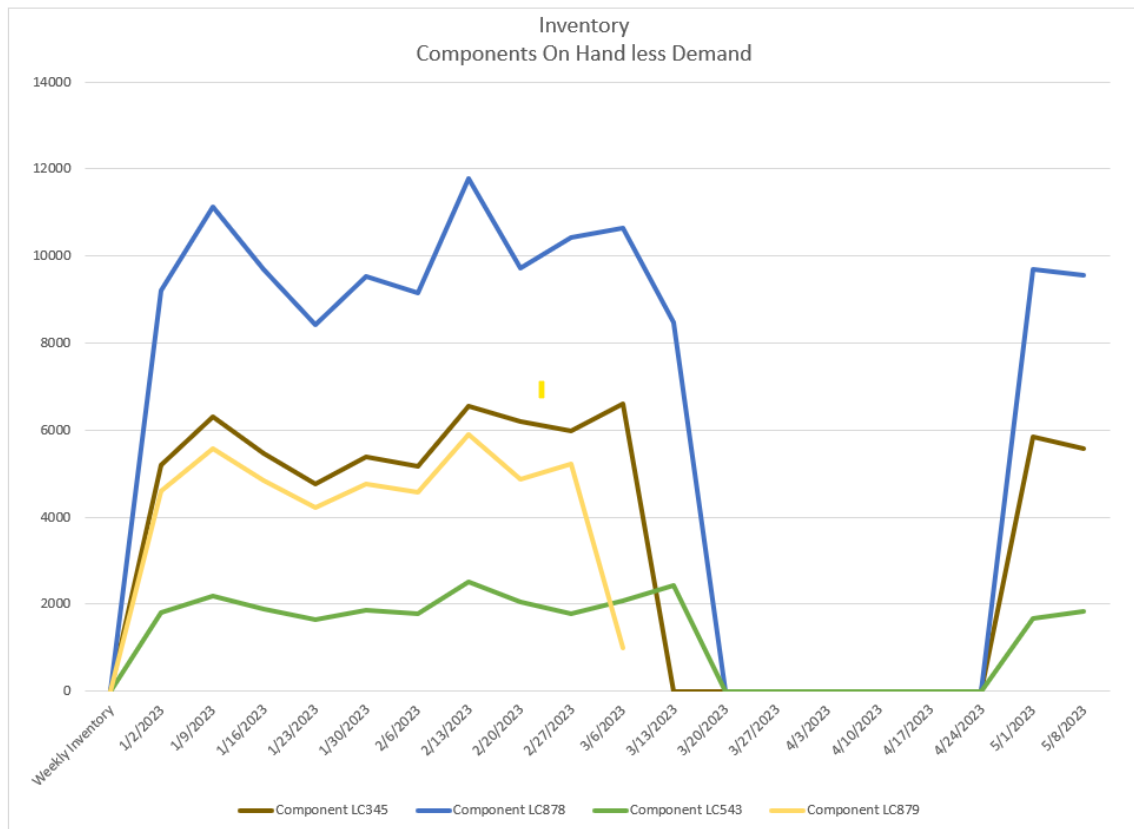
Alt Text:

A line graph of finished goods inventory on hand from January to May where a decline begins in early March, and a rebound appears to start in the middle of April.

Description of "Finished Goods Inventory On Hand" graph:

On the graph, the y-axis (vertical) has increments of 200, starting at 0 and continuing to 14,000. The x-axis (horizontal) indicates weekly finished goods inventory on hand, starting on 1/2/2023 and ending on 5/8/2023. Four company's product lines are represented by colored lines on the graph. The green line, the top line, represents Elektore, the yellow line represents Lexiplus, the dark blue line represents Cadallia, and the brown line, the bottom line, represents OEM. All lines start to decline in March. The decline ends in mid-April and a rebound appears from the end of April into May.





Alt Text:

A line graph of the weekly inventory of components on hand less consumer demand from January to May where a drastic decline begins in early March, and a rebound appears to start at the end of April.

Description of "Inventory Components On Hand less Demand" graph:

On the graph, the y-axis (vertical) has increments of 2,000, starting at 0 and continuing to 14,000. The x-axis (horizontal) indicates weekly inventory of components on hand less demand, starting on January 2, 2023, and ending on May 8, 2023. Four components are indicated by colored lines on the graph. The blue line, the top line, represents component LC878, the brown line represents component LC345, the yellow line represents component LC879, and the green line, the bottom line, represents component LC543. All lines drastically decline around early March, and a rebound appears to start at the end of April for all components except LC879 (the yellow line). This line does not appear after 3/6/2023.



3D Printing Option Data

Actions	Amount	\$ each	Total Cost	
Industrial Continuous 3D	6	\$625,000	\$3,750,000	Installed with support and training
Manufacturing addition	1	\$14,980,000	\$14,980,000	Customized for storage of FG and raw materials. Room for six additional machines for future expansion
Staffing	10		\$1,250,000	Annual
		Total	\$18,730,000	
*Based on 96.5% machine efficiency		Years to pay back	4.3	

Weekly Demand	20,300		Annual Demand	1,055,600
Unit avg cost (current)	\$14.50		Annual Costs	\$15,306,200
Transportation	\$1,750.00	per t/l		\$91,000
			Total	\$15,397,200
			Reduction with 3D on unit	
			28%	\$4,285,736
			FRT. Reduction	\$91,000
			Annual Savings	\$4,376,736

