University of Michigan

Digital Technologies and the Future of Manufacturing MOOC Specialization

Additive Manufacturing Case Project

BACKGROUND:

For 30 years, Engines-R-Us has been the main supplier of jet engines of the world's largest aircraft manufacturers. The company is reputed for the quality of its engines, which historically have lasted longer and require less maintenance than those of competing suppliers. Today, the company specializes in manufacturing turbofan engines (image), a propulsion system used in most modern commercial planes due to its fuel efficiency and relatively higher thrust.

The company is lead by Wendy, the CEO and the following members of the executive leadership team:

- Bill, Vice President (VP) of Manufacturing
- Shauna, VP of Sales
- Roberto, VP of Finance
- Tina, VP of Vendor Management & Strategic Sourcing

LEGACY CHALLENGES:

Over the past 5 years, the company has experienced significant revenue growth around their newest engine model and increased their customer base by 15%. To accommodate this growth, Engines-R-Us has gradually reduced the maintenance program for engine models older than 20 years to direct more resources towards supporting the newer engine models. Their ERS-50 model, a top seller and highest-rated engine in company history, is one of these older models. Another condition informing the reduction of support for older models is the availability of replacement parts. For example, the original manufacturers who produced the parts for the ERS-50 have been out of business for many years. Knowing these manufacturers were shutting down, Tina (VP of Vendor Management & Strategic Sourcing) and Bill (VP of Manufacturing) had the foresight 10 years ago to gradually increase Engines-R-Us's maintenance inventory of key parts in order to service the ERS-50, based on the average service life of the aircraft onto which the engines would be placed. However, these inventories are now running low.

While many of the ERS-50 customers have upgraded to the newer ERS-70X, there were 2 customers who still relied heavily on the ERS-50 as part of their regular operations. They just love the performance and reliability of the engine. Plus, their respective maintenance crews know these engines just as well as the crews at Engines-R-Us do. Wendy, CEO of Engines-R-Us, considers these 2 customers strategic partners of Engines-R-Us (their respective CEOs are board members) and is committed to finding a solution to providing the key parts required to keep the ERS-50s running as long as possible. She, along with Tina and Bill, sat down with these 2 customers and shared their concerns about the shrinking inventory of parts for the ERS-50. Both customers realized that the situation was forcing them to upgrade their engines sooner than expected, but noted they would need at least 3 more years of service from the engines if possible. It was determined there was enough inventory to support both customers for 3

years, all except for one part -- a primary gear. The customers typically replace 10 primary gears per year, so a total of 60 were needed to cover the next 3 years, or at least 20 per year. And between the customers and Engines-R-Us, there were only 10 primary gears in existence. Tina was charged by Wendy to see what could be done about this problem.

Tina reached out to her vendor network for proposals to supply Engines-R-Us with the 60 primary gears. Not surprisingly, she only received a proposal from one vendor. The vendor said Engines-R-Us had to place a minimum quantity order of 1000 parts at the current price to make it economically feasible for the vendor to incur the setup cost to make the part. This vendor was planning to set up a shop to manufacture the part using traditional methods such as injection moulding or die casting and hence had to incur significant setup costs, that was the rationale behind his demand for a minimum order quantity. Tina thought, “Unless I’m going to build some kind of sculpture made out of 940 gear parts, this certainly isn’t going to work.” In addition it was clear that Roberto, VP of Finance, would not approve of the significant investments needed for placing the order for 1000 parts. Bill had also been thinking about this problem since it's his team that supports customers in the maintenance of the engines. He had recently read about Additive Manufacturing in a research journal and wondered if this might be a solution. And given the dead-end Tina encountered, it was certainly worth mentioning it to Wendy.

After they presented this idea about Additive Manufacturing technology to Wendy, she decided to have both Tina and Bill determine if this technology could actually be a viable solution. You have been hired as an external Additive Manufacturing consultant by Tina and Bill to advise them.