Case Study Eastern Gear, Inc.

Eastern Gear, Inc., in Philadelphia, Pennsylvania, is a manufacturer of custom-made gears ranging in weight from a few ounces to over 50 pounds. The gears are made of different metals, depending on the customer's requirements. Over the past year, 40 different types of steel and brass alloys have been used as raw materials. See Exhibit 1 for details.

Eastern Gear sells its products primarily to engineering research and development laboratories or very small manufacturers. As a result, the number of gears in most orders is small; rarely is exactly the same gear ordered more than once. The distribution of order sizes for March 2012 is shown in Exhibit 2.

Recently, the president of Eastern Gear decided to accept a few larger orders for 100 gears or more. Although lower prices were accepted on these orders, they helped pay the overhead. It was found that the large orders caused many of the small orders to wait for a long time before being processed. As a result, some deliveries of small orders were late.

ORDER ENTRY

When a customer wishes to order a gear, the order is taken by James Lord, sales manager and marketing vice president. The customer specifies the type of gear desired by submitting a blueprint or sketch. The quantity of gears required and the type of material are also specified by the customer. On occasion, the customer's engineer will call up after the order has been placed and request a change in the design. In these cases, it may be necessary to stop production and wait for new raw materials or for the design to be clarified. The customer's prints submitted with the order do not always contain the tolerances or finishes required during machining. As a result, the customer is contacted directly when the information is needed.

After the order is received, one copy is sent to the production supervisor, Joe Irvine, and the second copy is sent to Sam Smith, the controller. Upon receipt of the customer's order, Smith places a purchase order for the raw materials required. These materials often take from one to two weeks to arrive, depending on the supplier and the type of material ordered.

After receiving the customer order, the supervisor reviews the order and places it on file until the raw material arrives. The customer order is then routed through the shop along with the materials. In the past, the production process for most gears has taken about two weeks after receipt of raw materials. Recently this production time has increased to four weeks.

Irvine expressed concern about the bottlenecks that appear in the production process. One week the bottleneck may be in one machine center, and the next week it is in another. These bottlenecks make it difficult to get the orders out on time.

EXHIBIT 1 Raw materials.

Type of Material	2011 Usage $(000)
A	$ 36
B	10
C	15
D	43
E	110
F	18
G	32
H	75
I	40
J	60
K	30
All Others	53
Total	$522

EXHIBIT 2 Sales, March 2012.

Order Size	Number of Orders	Total $ Value of Orders
1	80	$ 3,200
2	53	4,250
3	69	8,163
4	32	4,800
5	82	16,392
8	47	15,987
10	64	26,871
15	22	13,172
20	42	31,555
25	27	23,682
30	18	21,600
40	22	32,000
50	10	18,693
100	4	12,500
200	2	14,068
400	1	9,652
700	2	35,600
1,000	1	20,000
	578	$312,185

PHYSICAL LAYOUT AND MATERIALS FLOW

Eastern Gear utilizes a standard job shop layout, as shown in Exhibit 3. Each work center has a common set of machines or processes. The materials flow from one work center to another, depending on the operations needed for a particular order.

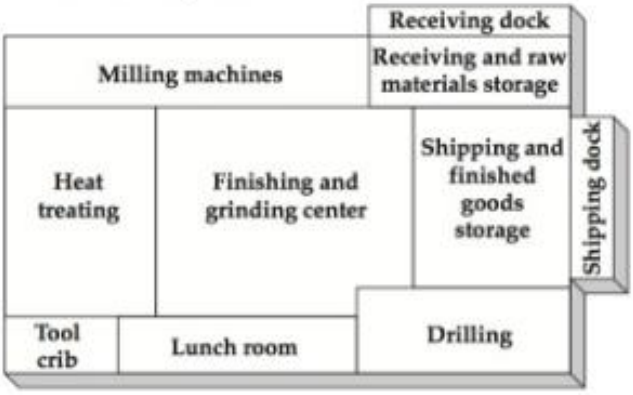
A typical order will take the following path. First, the raw material, a gear blank, is sent to the milling work center. Here the teeth are cut into the edge of the gear according to the customer's specifications. Next, the gear blanks are sent to the drilling work center, where one or more holes may be drilled in the gear. The gear is then sent to a grinding center, where a finish is put on the gear teeth and the surface of the gear. Next, the gear may be sent to heat-treating if this operation is required by the customer. After the batch of gears is completed, they are inspected by the next available worker and shipped to the customer.

In Exhibit 3, note how the machines are grouped by similar type on the shop floor. For example, all drills are located together in one work center, and all milling machines are in another work center. While this layout facilitates development of worker skills and training, it results in a jumbled flow of products through the shop.

There is constant interference of the orders being processed in the shop. The typical order spends 90 percent of its time waiting in line for a machine to become available. Only 10 percent of the time is actually spent processing the order on a machine. As a result, it takes a relatively long time (four weeks) for an order to make its way through the shop.

Large and small orders are processed together. No special work flow is utilized for different order sizes. As a matter of fact, large orders are helping to keep the shop at full capacity.

EXHIBIT 3 Layout.



COMPANY BACKGROUND

Business has been booming at Eastern Gear. For the first two years the company lost money, but over the last several months a small profit has been made. Sales are up by 100 percent in the last quarter. See Exhibit 4 for more details.

Although sales are increasing rapidly, a recent market survey has indicated that sales can be expanded even more in the next few years. According to the market survey, sales will be $5 million in calendar year 2012 if the current delivery lead time of five to six weeks is maintained. If total delivery lead time can be reduced to the former three to four weeks, sales could be expanded to $5.5 million instead of $5 million.

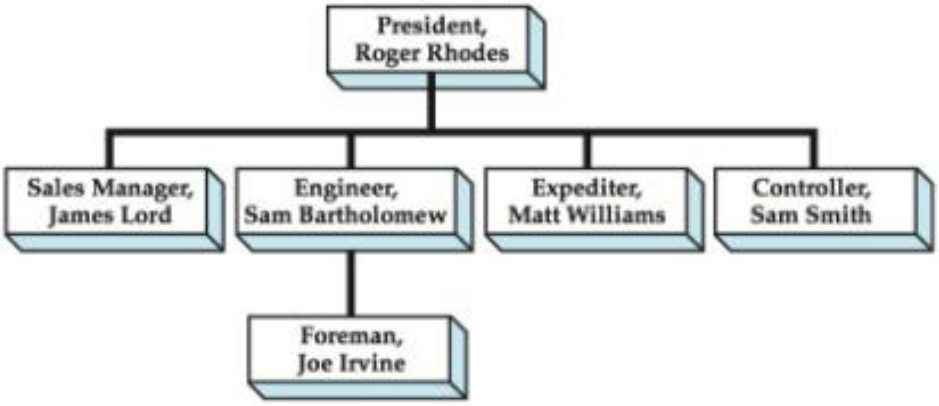
Because of increased delivery lead times, the company has recently added an expediter, Matt Williams. Each morning Williams reviews the work in progress in the shop and selects those orders that

EXHIBIT 4 Financial data.

	2009	2010	2011	First Quarter, 2012
Sales	560*	1,500	3,100	1,063
Manufacturing costs				
Materials	63	273	522	214
Labor	136	587	1,063	327
Overhead	70	216	412	140
Depreciation	172	398	422	150
Total manufacturing costs	441	1,474	2,419	831
Sales expenses	70	130	263	80
G & A expense	75	110	297	93
Total costs	586	1,714	2,979	1,004
Profit before tax	(26)	(214)	121	59

*All figures in thousands of dollars.

EXHIBIT 5 Organization chart.



appear to be behind schedule. Each order that is behind receives a red tag, indicating that it should be treated on a rush basis. At the present time, about 20 percent of the orders have rush tags on them. Williams also spends his time looking for past-due raw materials and lost orders as well as explaining late orders to customers.

The organization chart for the company is shown in Exhibit 5. Roger Rhodes is the president and founder of Eastern Gear. He handles contacts with some of the large customers, arranges the financing needed by the company, and sits in on the weekly production meeting. During these meetings, scheduling problems, employee problems, and other production problems are discussed.

The company engineer is Sam Bartholomew. His responsibilities include design of the company's products, procurement and maintenance of equipment, and overseeing of the supervisor, Joe Irvine. Bartholomew also attends the weekly production meetings, and he spends about 10 hours a week on the factory floor talking with individual workers.

The company is currently experiencing about a 6 percent return rate on completed orders due to poor quality. In 75 percent of the cases, the returned orders have failed to undergo one or more operations or the operations have been improperly done. For example, in one returned order, all the gears were missing a hole.

Occasionally, the company will receive rush orders from its customers. In this case, the order is referred directly to Rhodes for approval. If the order is accepted, the raw materials are rush-ordered and received the next day. After receipt of the raw materials, the order is rushed through production in four days. This is accomplished by Fred Dirkson, a trusted employee, who hand-carries the rush orders through all operations. About 10 percent of the orders are handled on a rush basis.

The workforce consists of 50 employees, who are highly skilled or semiskilled. The milling machine operators, for example, are highly skilled and require at least two years of vocational-technical training plus several months of on-the-job training. Within the last quarter, 10 new employees have been added to the workforce. The employees are not unionized, and good labor relations exist. The workforce is managed using a family-type approach.

Discussion Questions

1. What are the major problems being faced by Eastern Gear?
2. What action should Rhodes take to solve his problems?
3. How can this case be related to operations strategy and process design concepts?