Wyndor glass co. research paper

Entertainment, Movie

18 Chapter Two Linear Programming: Basic Concepts 2. 1 ACASE STUDY: THE WYNDOR GLASS CO. PRODUCT-MIX PROBLEM Jim Baker is excited. The group he heads has really hit the jackpot this time. They have had some notable successes in the past, but he feels that this one will be really special. He can hardly wait for the reaction after his memorandum reaches top management. Jim has had an excellent track record during his seven years as manager of new product development for the Wyndor Glass Company.

Although the company is a small one, it has been experiencing considerable growth largely because of the innovative new products developed by Jim’s group. Wyndor’s president, John Hill, has often acknowledged publicly the key role that Jim has played in the recent success of the company. Therefore, John felt considerable confidence six months ago in asking Jim’s group to develop the following new products: • An 8-foot glass door with aluminum framing. • A 4-foot 6-foot double-hung, wood-framed window.

Although several other companies already had products meeting these specifications, John felt that Jim would be able to work his usual magic in introducing exciting new features that would establish new industry standards. Now, Jim can’t remove the smile from his face. They have done it. Background The Wyndor Glass Co. produces high-quality glass products, including windows and glass doors that feature handcrafting and the finest workmanship. Although the products are expensive, they fill a market niche by providing the highest quality available in the industry for the most discriminating buyers. The company has three plants.

Plant 1 produces aluminum frames and hardware. Plant 2 produces wood frames. Plant 3 produces the glass and assembles the windows and doors.

Because of declining sales for certain products, top management has decided to revamp the company’s product line. Unprofitable products are being discontinued, releasing production capacity to launch the two new products developed by Jim Baker’s group if management approves their release. The 8-foot glass door requires some of the production capacity in Plants 1 and 3, but not Plant 2. The 4-foot 6-foot double-hung window needs only Plants 2 and 3. Management now needs to address two issues: 1.

Should the company go ahead with launching these two new products? 2. If so, what should be the product mix—the number of units of each produced per week— for the two new products? Management’s Discussion of the Issues Having received Jim Baker’s memorandum describing the two new products, John Hill now has called a meeting to discuss the current issues. In addition to John and Jim, the meeting includes Bill Tasto, vice president for manufacturing, and Ann Lester, vice president for marketing. Let’s eavesdrop on the meeting. John Hill (president): Bill, we will want to rev up to start production of these products as soon as we can.

About how much production output do you think we can achieve? Bill Tasto (vice president for manufacturing): We do have a little available production capacity, because of the products we are discontinuing, but not a lot. We should be able to achieve a production rate of a few units per week for each of these two products. John: Is that all? Bill: Yes. These are complicated products requiring careful crafting. And, as I said, we don’t have much production capacity available. An Application Vignette Swift & Company is a diversified protein-producing business based in Greeley, Colorado.

With annual sales of over $8 billion, beef and related products are by far the largest portion of the company’s business. To improve the company’s sales and manufacturing performance, upper management concluded that it needed to achieve three major objectives. One was to enable the company’s customer service representatives to talk to their more than 8, 000 customers with accurate information about the availability of current and future inventory while considering requested delivery dates and maximum product age upon delivery. A second was to produce an efficient shift-level schedule for each plant over a 28-day horizon.

A third was to accurately determine whether a plant can ship a requested order-line-item quantity on the requested date and time given the availability of cattle and constraints on the plant’s capacity. To meet these three challenges, a managementscienceteam developed an integrated system of 45 linear programming models based on three model formulations to dynamically schedule its beef-fabrication operations at five plants in real time as it receives orders. The total audited benefits realized in the first year of operation of this system were $12. 74 million, including $12 million due to optimizing the product mix.

Other benefits include a reduction in orders lost, a reduction in price discounting, and better on-time delivery. Source: A. Bixby, B. Downs, and M. Self, “ A Scheduling and Capable-to-Promise Application for Swift & Company, Interfaces 36, no. 1 (January–February 2006), pp. 69–86. The issue is to find the most profitable mix of the two new products. John: Ann, will we be able to sell several of each per week? Ann Lester (vice president for

marketing): Easily. John: OK, good. I would like to set the launch date for these products in six weeks. Bill and Ann, is that feasible? Bill: Yes.

Ann: We'll have to scramble to give these products a proper marketing launch that soon. But we can do it. John: Good. Now there's one more issue to resolve. With this limited production capacity, we need to decide how to split it between the two products. Do we want to produce the same number of both products? Or mostly one of them? Or even just produce as much as we can of one and postpone launching the other one for a little while? Jim Baker (manager of new product development): It would be dangerous to hold one of the products back and give our competition a chance to scoop us. Ann: I agree.

Furthermore, launching them together has some advantages from a marketing standpoint. Since they share a lot of the same special features, we can combine the advertising for the two products. This is going to make a big splash. John: OK. But which mixture of the two products is going to be most profitable for the company? Bill: I have a suggestion. John: What's that? Bill: A couple times in the past, our Management Science Group has helped us with these same kinds of product-mix decisions, and they've done a good job. They ferret out all the relevant data and then dig into some detailed analysis of the issue.

I've found their input very helpful. And this is right down their alley. John: Yes, you're right. That's a good idea. Let's get our Management Science Group working on this issue. Bill, will you coordinate with them? The meeting ends. The Management Science Group Begins Its Work At the outset, the Management Science Group spends considerable time with Bill Tasto to

clarify the general problem and specific issues that management wants addressed. A particular concern is to ascertain the appropriate objective for the problem from management’s viewpoint.

Bill points out that John Hill posed the issue as determining which mixture of the two products is going to be most profitable for the company. 19 20 Chapter Two Linear Programming: Basic Concepts Therefore, with Bill’s concurrence, the group defines the key issue to be addressed as follows. Question: Which combination of production rates (the number of units produced per week) for the two new products would maximize the total profit from both of them? The group also concludes that it should consider all possible combinations of production rates of both new products permitted by the available production capacities in the three plants.

For example, one alternative (despite Jim Baker’s and Ann Lester’s objections) is to forgo producing one of the products for now (thereby setting its production rate equal to zero) in order to produce as much as possible of the other product. (We must not neglect the possibility that maximum profit from both products might be attained by producing none of one and as much as possible of the other.) The Management Science Group next identifies the information it needs to gather to conduct this study: 1. Available production capacity in each of the plants. 2.

How much of the production capacity in each plant would be needed by each product. 3. Profitability of each product. Concrete data are not available for any of these quantities, so estimates have to be made. Estimating these quantities requires enlisting the help of key personnel in other units of the company. Bill Tasto’s staff develops the estimates that involve production

capacities. Specifically, the staff estimates that the production facilities in Plant 1 needed for the new kind of doors will be available approximately four hours per week. (The rest of the time Plant 1 will continue with current products. The production facilities in Plant 2 will be available for the new kind of windows about 12 hours per week. The facilities needed for both products in Plant 3 will be available approximately 18 hours per week. The amount of each plant's production capacity actually used by each product depends on its production rate. It is estimated that each door will require one hour of production time in Plant 1 and three hours in Plant 3. For each window, about two hours will be needed in Plant 2 and two hours in Plant 3. By analyzing the cost data and the pricing decision, the Accounting Department estimates the profit from the two products.

The projection is that the profit per unit will be $300 for the doors and $500 for the windows. Table 2. 1 summarizes the data now gathered. The Management Science Group recognizes this as being a classic product-mix problem. Therefore, the next step is to develop a mathematical model—that is, a linear programming model—to represent the problem so that it can be solved mathematically. The next four sections focus on how to develop this model and then how to solve it to find the most profitable mix between the two products, assuming the estimates in Table 2. 1 are accurate.

Review Questions 1. 2. 3. 4. 5. What is the market niche being filled by the Wyndor Glass Co.? What were the two issues addressed by management? The Management Science Group was asked to help analyze which of these issues? How did this group define the key issue to be addressed? What information did the group need to gather to conduct its study? TABLE 2. 1

Data for the Wyndor Glass Co. Product-Mix Problem Plant 1 2 3 Unit profit Production Time Used for Each Unit Produced Doors 1 hour 0 3 hours $300 Windows 0 2 hours 2 hours $500 Available per Week 4 hours 12 hours 18 hours