



## Fair Dealing (Short Excerpt)

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5. Wally's Widget Warehouse takes orders from 7 a.m. to 7 p.m. The manager wants to analyze the process. There are three steps required to ship a customer order. The first step is to take the order from a customer (capacity: 100 customers/hr). The second step is to pick the order for the customer (capacity: 80 customers/hr), and then the warehouse has to pack the order ready for shipping (capacity: 60 customers/hr). Wally promises that every order placed today gets shipped tomorrow. That means that the picking and packing operations must finish all orders before they go home.

Wally wants to figure out the following.

- Draw the flowchart of the process from customer order placement to shipping
  - What is the current maximum output of the process assuming that no one works overtime?
  - How long will the picking and packing operations have to work if we have a day where the order taker works at his maximum capacity?
  - Given  $c$ , what is the maximum number of orders waiting to be picked?
  - Given  $c$ , what is the maximum number of orders waiting to be packed?
  - If we double the packing capacity (from 60 to 120 orders per hour), what impact does this have on your answers in parts  $c$ ,  $d$ , and  $e$ ?
6. Anvi, the manager of a bakery, is interested in analyzing her bread-making process. The raw materials required for making bread are carried in inventory. Two steps are required in preparing the bread. The first is preparing the dough and baking the loaves, here referred to as bread making. The second is packaging the loaves. Due to the size of the mixers in the bakery, bread is made in batches of 100 loaves. A batch of 100 loaves is baked every hour. The loaves are then put into an intermediate stocking area ready for packing. Packaging needs only 0.75 hour to place the 100 loaves in bags. The loaves are then stored, waiting for shipment

Anvi is considering buying an additional bread-making machine (though not an additional packaging machine). The time for each individual bread-making operation is still one hour per 100 loaves. Assume that the bakery can sell all it can bake.<sup>4</sup>

- Draw flowcharts for the situations with both one and two bread-making machines.
- When there is only one bread-making machine what is the capacity of the bakery per hour? What are the utilizations of the bread-making and packing operations?
- Jacobs, F. Robert, Richard B. Chase & Jaydeep Balakrishnan. **Operations & Supply chain Management - The Core - Canadian Edition**. McGraw-Hill Ryerson Limited, 2010. ISBN: 9780070969070. 448 pages.

## CASE 1

## Kristen's Cookie Company (A)

You and your roommate are preparing to start Kristen's Cookie Company in your on-campus apartment. The company will provide fresh cookies to starving students late at night. You need to evaluate the preliminary design for the company's production process to figure out many variables there are, including what prices to charge, whether you will be able to make a profit, and how many orders to accept.

### Business Concept

Your idea is to bake fresh cookies to order, using any combination of ingredients that the buyer wants. The cookies will be ready for pickup at your apartment within an hour.

Several factors will set you apart from competing products such as store-bought cookies. First, your cookies will be completely fresh. You will not bake any cookies before receiving the order; therefore, the buyer will be getting cookies that are literally hot out of the oven.

Second, like Steve's Ice Cream,<sup>5</sup> you will have a variety of ingredients available to add to the basic dough, including chocolate chips, M&M's, Crispy Crunch bars, coconut, walnuts, and raisins. Buyers will telephone in their orders and specify which of these ingredients they want in their cookies. You guarantee completely fresh cookies. In short, you will have the freshest, most exotic cookies anywhere, available right on campus.

### The Production Process

Baking cookies is simple: mix all the ingredients in a food processor; spoon out the cookie dough onto a tray; put the cookies into the oven; bake them; take the tray of cookies out of the oven; let the cookies cool; and, finally, take the cookies off the tray and carefully pack them in a box. You and your roommate already own all the necessary capital equipment: one food processor, cookie sheets, and spoons. Your apartment

has a small oven that will hold one tray at a time. Your landlord pays for all the electricity. The variable costs, therefore, are merely the cost of the ingredients (estimated to be \$0.60/dozen), the cost of the box in which the cookies are packed (\$0.10 per box; each box holds a dozen cookies), and your time (what value do you place on your time?).

A detailed examination of the production process, which specifies how long each of the steps will take, follows. The first step is to take an order, which your roommate has figured out how to do quickly and with 100 percent accuracy. (Actually, you and your roommate devised a method using the Internet to accept orders and to inform customers when their orders will be ready for pickup. Because this runs automatically on your personal computer, it does not take any of your time.) Therefore, this step will be ignored in further analysis.

You and your roommate have timed the necessary physical operations. The first physical production step is to wash out the mixing bowl from the previous batch, add all of the ingredients, and mix them in your food processor. The mixing bowls hold ingredients for up to three dozen cookies. You then dish up the cookies, one dozen at a time, onto a cookie tray. These activities take six minutes for the washing and mixing steps, regardless of how many cookies are being made in the batch. That is, to mix enough dough and ingredients for two dozen cookies takes the same six minutes as one dozen cookies. However, dishing up the cookies onto the sheet takes two minutes per sheet.

The next step, performed by your roommate, is to put the cookies in the oven and set the thermostat and timer, which takes about one minute. The cookies bake for the next nine minutes. So total baking time is 10 minutes, during the first minute of which your roommate is busy setting the oven. Because the oven holds only one cookie sheet, a second dozen take an additional 10 minutes to bake.

Your roommate also performs the last steps of the process by first removing the cookies from the oven and putting them aside to cool for five minutes, then carefully packing them in a box and accepting payment. Removing the cookies from the oven takes only a negligible amount of time, but it must be done promptly. It takes two minutes to pack each dozen and about one minute to accept payment for the order.

That is the process for producing cookies by the dozen in Kristen's Cookie Company. As experienced bakers know, a few simplifications were made in the actual cookie production process. For example, the first batch of cookies for the night requires preheating the oven. However, such complexities will be put aside for now. Begin your analysis by developing a process flow diagram of the cookie-making process.

## Key Questions to Answer Before You Launch the Business

To launch the business, you need to set prices and rules for accepting orders. Some issues will be resolved only after you get started and try out different ways of producing the cookies.

Before you start, however, you at least want a preliminary plan, with as much as possible specified, so that you can do a careful calculation of how much time you will have to devote to this business each night, and how much money you can expect to make. For example, when you conduct a market survey to determine the likely demand, you will want to specify exactly what your order policies will be. Therefore, answering the following operational questions should help you:

1. How long will it take you to fill an order?
2. How many orders can you fill in a night, assuming you are open four hours each night?
3. How much of your own and your roommate's valuable time will it take to fill each order?
4. Because your cookie sheets can hold exactly one dozen cookies, you will produce and sell cookies by the dozen. Should you give any discount for people who order two dozen cookies, three dozen cookies, or more? If so, how much? Will it take you any longer to fill a two-dozen cookie order than a one-dozen cookie order?
5. How many food processors and cookie sheets will you need?
6. Are there any changes you can make in your production plans that will allow you to make better cookies, or more cookies in less time or at lower cost? For example, is there a bottleneck operation in your production process that you can expand cheaply? What is the effect of adding another oven? How much would you be willing to pay to rent an additional oven?

## Questions

1. What happens if you are trying to do this by yourself without a roommate?
2. Should you offer special rates for rush orders? Suppose you have just put a sheet of cookies into the oven and someone calls up with a "crash priority" order for a dozen cookies of a different flavour. Can you fill the priority order while still fulfilling the order for the cookies that are already in the oven? If not, how much of a premium should you charge for filling the rush order?
3. When should you promise delivery? How can you look quickly at your order board (list of pending orders) and tell a caller when his or her order will be ready? How much of a safety margin for timing should you allow?
4. What other factors should you consider at this stage of planning your business?
5. Your product must be made to order because each order is potentially unique. If you decide to sell standard cookies instead, how should you change the production system? The order-taking process?

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