

ADDITIONAL CASES

■ CASE 17.2 QUEUEING QUANDARY

Never dull. That is how you would describe your job at the centralized records and benefits administration center for Cutting Edge, a large company manufacturing computers and computer peripherals. The company provides a call center at the administration center for the 60,000 Cutting Edge employees throughout the United States. Employees contact the call center to obtain information about dental plans and pension options, to change tax forms and personal information, and to process leaves of absence and retirements.

The centralized records and benefits administration center and its call center opened just six months ago to replace 35 small regional administration centers across the country. Since this recent opening, you and Mark Lawrence, the director of human resources, have endured one long roller coaster ride. Receiving the go-ahead from corporate headquarters to establish the centralized records and benefits administration center was definitely an up. Getting caught in the crossfire of angry customers (all employees of Cutting Edge) because of demand overload for the records and benefits call center was definitely a down. Accurately forecasting the demand for the call center provided another up.

And today you are faced with another down. Mark approaches your desk with a not altogether attractive frown on his face.

He begins complaining immediately, "I just don't understand. The forecasting job you did for us two months ago really allowed us to understand the weekly demand for the center, but we still have not been able to get a grasp on the staffing problem. We used both historical data and your forecasts to calculate the average weekly demand for the call center. We transformed this average weekly demand into average hourly demand by dividing the weekly demand by the number of hours in the workweek. We then staffed the center to meet this average hourly demand by taking into account the average number of calls a representative is able to handle per hour.

But something is horribly wrong. Operational data records show that over thirty percent of the customers wait over four minutes for a representative to answer the call! Customers are still sending me numerous complaints, and executives from corporate headquarters are still breathing down my neck! I need help!"

You calm Mark down and explain to him that you think you know the problem: the number of calls received in a certain hour can be much greater (or much less) than the average because of the stochastic nature of the demand. In addition, the number of calls a representative is able to handle per hour can be much less (or much greater) than the average depending upon the types of calls received.

You then tell him to have no fear, you have the problem under control. You have been reading about the successful application of queueing theory to the operation of call centers, and you decide that the queueing models you learned in school will help you determine the appropriate staffing level.

- (a) You ask Mark to describe the demand and service rate. He tells you that calls are randomly received by the call center and that the center receives an average of 70 calls per hour. The computer system installed to answer and hold the calls is so advanced that its capacity far exceeds the demand. Because the nature of a call is random, the time required to process a call is random, where the time frequently is small but occasionally can be much longer. On average, however, representatives can handle 6 calls per hour. Which queueing model seems appropriate for this situation? Given that slightly more than 35 percent of customers wait over 4 minutes before a representative answers the call, use this model to estimate how many representatives Mark currently employs.
- (b) Mark tells you that he will not be satisfied unless 95 percent of the customers wait only 1 minute or less for a representative to answer the call. Given this customer service level and the average arrival rates and service rates from part (a), how many representatives should Mark employ?
- (c) Each representative receives an annual salary of \$30,000, and Mark tells you that he simply does not have the resources available to hire the number of representatives required to achieve the customer service level desired in part (b). He asks you to perform sensitivity analysis. How many representatives would he need to employ to ensure that 80 percent of customers wait 1 minute or less? How many would he need to employ to ensure that 95 percent of customers wait 90 seconds or less? How would you recommend Mark choose a customer service level? Would the decision criteria be different if Mark's call center were to serve external customers (not connected to the company) instead of internal customers (employees)?

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(d) Mark tells you that he is not happy with the number of representatives required to achieve a high customer service level. He therefore wants to explore alternatives to simply hiring additional representatives. The alternative he considers is instituting a training program that will teach representatives to more efficiently use computer tools to answer calls. He believes that this alternative will increase the average number of calls a representative is able to handle per hour from 6 calls to 8 calls. The training program will cost \$2,500 per employee per year since employees' knowledge will have to be updated yearly.

How many representatives will Mark have to employ and train to achieve the customer service level desired in part (b)? Do you prefer this alternative to simply hiring additional representatives? Why or why not?

(e) Mark realizes that queueing theory helps him only so much in determining the number of representatives needed. He realizes that the queueing models will not provide accurate answers if the inputs used in the models are inaccurate. What inputs do you think need reevaluation? How would you go about estimating these inputs?