DISCUSSION QUESTIONS

Discussion questions 1 through 16 appear in the text.

17. In what ways is product strategy linked to product decisions?

18. Describe four organizational approaches to product development. Which of these is generally thought to be best?

19. Explain what is meant by robust design.

20. What are three specific ways in which Computer Aided Design (CAD) benefits the design engineer.

21. What information is contained in a bill of materials?

22. What information is contained in an engineering drawing?

23. What information is contained in an assembly chart? In a process sheet?

24. Explain what is meant in service design by the “moment-of-truth.”

25. Explain how the House of Quality translates customer desires into product/service attributes.

CRITICAL THINKING EXERCISE

The design of successful new products, as suggested in this chapter, is a complex task. The task is performed in a variety of ways that include functional handoffs from one department to another, integrated organizations, project managers, and teams. What are the advantages and disadvantages of each? Moreover, as environmental issues become increasingly significant, how might these issues be integrated into the new product design process?

PROBLEMS

Problems 5.1 through 5.15 appear in the text.

5.16 Construct a house-of-quality matrix for a wrist watch. Be sure to indicate specific customer wants that you think the general public desires. Then complete the matrix to show how an operations manager might identify specific attributes that can be measured and controlled to meet those customer desires.
5.17 Prepare a bill-of-material for a pair of eyeglasses in a case.

5.18 Draw an assembly chart for a pair of eyeglasses.

5.19 Visit a local sandwich shop, like Subway, Blimpie, Quizno’s, etc. Construct a bill of materials for one of their trademark sandwiches. Perhaps the store clerk or manager will provide you with detail on the quantity or weight of various ingredients. Otherwise, estimate quantities.

5.20 Prepare a bill of materials and an assembly chart for a salad of your own choosing.

5.21 Perform a “product-by-value” analysis on the following problems:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Contribution</td>
<td>$0.75</td>
<td>$0.33</td>
<td>$1.25</td>
<td>$0.85</td>
<td>$0.75</td>
</tr>
<tr>
<td>Total Contribution</td>
<td>$63,000</td>
<td>$82,000</td>
<td>$95,000</td>
<td>$115,000</td>
<td>$57,000</td>
</tr>
</tbody>
</table>

5.22 Prepare a bill of materials for a wooden pencil, complete with eraser.

5.23 Prepare a bill of materials for the table illustrated below:

5.24 Prepare a bill of material for a computer mouse (GeniMouse).

5.25 Mr. Hess of California Windows, Inc. is considering making a change in the material the firm uses for panes in its residential window line. The new material has a slight mirror attribute that assists in reflecting ultra-violet light and restricts the transmission of heat. The new material will raise the cost of a standard window by $3.76. This product is in the mature stage of the life cycle and with no
modifications, Hess has estimated that sales of the window line will be 240,000 units per year for the next 5 years with a probability of 0.3, and has a 0.70 probability of selling 180,000 units per year over the four years. The standard price of a window unit is $45. With the new glass material, the price per unit can be increased to $50. However, Hess estimates that the demand for the newly designed window will be 210,000 units with a probability of 0.6, and that there will be a 0.4 probability of sales of 150,000 units. Which option will allow the company to maximize its expected monetary value (EMV)?

Page Engineering designs and constructs the air conditioning and heating (HVAC) systems for hospitals and clinics. Currently the company’s staff is overloaded with design work. There is a major design project due in eight weeks. The penalty for completing the design late is $14,000 per week since any delay will cause the facility to open later than anticipated, costing the client significant revenue. If the company uses its inside engineers to complete the design, it will have to pay them overtime for all work. Page has estimated that it will cost $12,000 per week (wages and overhead) to have company engineers complete the design. Page is also considering having an outside engineering firm do the design. A bid of $92,000 has been received for the completed design. Yet another option for completing the design is to conduct a joint design by having a third engineering company complete all electro-mechanical components of the design at a cost of $56,000. Page would then complete the rest of the design and control systems at an estimated cost of $30,000.

Page has estimated the following probabilities of completing the project within various time frames when using each of the three options. Those estimates are shown in the following table:

<table>
<thead>
<tr>
<th>Option</th>
<th>On time</th>
<th>One week late</th>
<th>Two weeks late</th>
<th>Three weeks late</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Engineers</td>
<td>.4</td>
<td>.5</td>
<td>.1</td>
<td>.1</td>
</tr>
<tr>
<td>External Engineers</td>
<td>.2</td>
<td>.4</td>
<td>.3</td>
<td>.1</td>
</tr>
<tr>
<td>Joint Design</td>
<td>.1</td>
<td>.3</td>
<td>.4</td>
<td>.2</td>
</tr>
</tbody>
</table>

What is the best decision based on an expected monetary value criterion? (Note: You want the lowest EMV since we are dealing with costs in this problem.)