

Problem 11-22 (45 minutes)

1. A percentage analysis of the company's quality cost report is presented below:

	<i>Year 1</i>			<i>Year 2</i>		
	<i>Amount</i>	<i>Percentage*</i>		<i>Amount</i>	<i>Percentage*</i>	
Prevention costs:						
Machine maintenance.....	\$ 215	5.2 %	22.3 %	\$ 160	3.5 %	27.1 %
Training suppliers.....	5	0.1	0.5	15	0.3	2.5
Design reviews	<u>20</u>	<u>0.5</u>	<u>2.1</u>	<u>95</u>	<u>2.1</u>	<u>16.1</u>
Total prevention cost	<u>240</u>	<u>5.8</u>	<u>24.9</u>	<u>270</u>	<u>6.0</u>	<u>45.7</u>
Appraisal costs:						
Incoming inspection	45	1.1	4.7	22	0.5	3.7
Final testing.....	<u>160</u>	<u>3.9</u>	<u>16.6</u>	<u>94</u>	<u>2.1</u>	<u>15.9</u>
Total appraisal cost.....	<u>205</u>	<u>5.0</u>	<u>21.3</u>	<u>116</u>	<u>2.6</u>	<u>19.6</u>
Internal failure costs:						
Rework.....	120	2.9	12.4	62	1.4	10.5
Scrap	<u>68</u>	<u>1.7</u>	<u>7.1</u>	<u>40</u>	<u>0.9</u>	<u>6.8</u>
Total internal failure cost.....	<u>188</u>	<u>4.6</u>	<u>19.5</u>	<u>102</u>	<u>2.3</u>	<u>17.3</u>
External failure costs:						
Warranty repairs	69	1.7	7.2	23	0.5	3.9
Customer returns	<u>262</u>	<u>6.4</u>	<u>27.2</u>	<u>80</u>	<u>1.8</u>	<u>13.5</u>
Total external failure cost.....	<u>331</u>	<u>8.0</u>	<u>34.3</u>	<u>103</u>	<u>2.3</u>	<u>17.4</u>
Total quality cost	<u>\$ 964</u>	<u>23.4 %</u>	<u>100.0 %</u>	<u>\$ 591</u>	<u>13.1 %</u>	<u>100.0 %</u>
Total production cost	<u>\$4,120</u>			<u>\$4,510</u>		

*Percentage figures are subject to rounding error.

Problem 11-22 (continued)

From the above analysis it would appear that Bergen, Inc.'s program has been successful, because:

- total quality costs as a percentage of total production have declined from 23.4% to 13.1%.
- external failure costs, those costs signalling customer dissatisfaction, have declined from 8% of total production to 2.3%. These declines in warranty repairs and customer returns should translate into increased sales in the future.
- internal failure costs have been reduced from 4.6% to 2.3% of production costs, which represents a 50% drop.
- appraisal costs have decreased from 5.0% to 2.6% of total production—a drop of 48%. Higher quality is reducing the demand for final testing.
- quality costs have shifted to the area of prevention where problems are solved before the customer becomes involved. Maintenance, training, and design reviews have increased from 5.8% of total production cost to 6% and from 24.9% of total quality costs to 45.7%. The \$30,000 increase is more than offset by decreases in other quality costs.

2. Guy Laflamme's current reaction to the quality improvement program is more favourable as he is seeing the benefits of having the quality problems investigated and solved before they reach the production floor. Because of improved designs, quality training, and additional pre-production inspections, scrap and rework costs have declined. Consequently, fewer resources are now required for customer service. Throughput has increased and throughput time has decreased; work is now moving much faster through the department.
3. To measure the opportunity cost of not implementing the quality program, Bergen Inc. could assume that:
 - sales and market share would continue to decline and then calculate the revenue and income lost.
 - the company would have to compete on price rather than quality and calculate the impact of having to lower product prices.

Problem 11-26 (30 minutes)

1. a., b., and c.

	<i>Month</i>			
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Throughput time in days:				
Process time	0.6	0.6	0.6	0.6
Inspection time	0.1	0.3	0.6	0.8
Move time	1.4	1.3	1.3	1.4
Queue time.....	<u>5.6</u>	<u>5.7</u>	<u>5.6</u>	<u>5.7</u>
Total throughput time.....	<u>7.7</u>	<u>7.9</u>	<u>8.1</u>	<u>8.5</u>

Manufacturing cycle efficiency (MCE):

Process time ÷ Throughput time	<u>7.8%</u>	<u>7.6%</u>	<u>7.4%</u>	<u>7.1%</u>
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Delivery cycle time in days:

Wait time.....	16.7	15.2	12.3	9.6
Total throughput time.....	<u>7.7</u>	<u>7.9</u>	<u>8.1</u>	<u>8.5</u>
Total delivery cycle time	<u>24.4</u>	<u>23.1</u>	<u>20.4</u>	<u>18.1</u>

2. a. The company seems to be improving mainly in the areas of quality control, material control, on-time delivery, and total delivery cycle time. Customer complaints, warranty claims, defects, and scrap are all down somewhat, which suggests that the company has been paying attention to quality in its improvement campaign. The fact that on-time delivery and delivery cycle time have both improved also suggests that the company is seeking to please the customer with improved service.
- b. Inspection time has increased dramatically. Use as percentage of availability has deteriorated, and throughput time as well as MCE show negative trends.
- c. While it is difficult to draw any definitive conclusions, it appears that the company has concentrated first on those areas of performance that are of most immediate concern to the customer—quality and delivery performance. The lower scrap and defect statistics suggest that the company has been able to improve its processes to reduce the rate of defects; although, some of the improvement in quality apparently was due simply to increased inspections of the products before they were shipped to customers.

Problem 11-26 (continued)

3. a. and b.

	<i>Month</i>	
	<i>5</i>	<i>6</i>
Throughput time in days:		
Process time	0.6	0.6
Inspection time	0.8	0.0
Move time	1.4	1.4
Queue time.....	<u>0.0</u>	<u>0.0</u>
Total throughput time.....	<u>2.8</u>	<u>2.0</u>

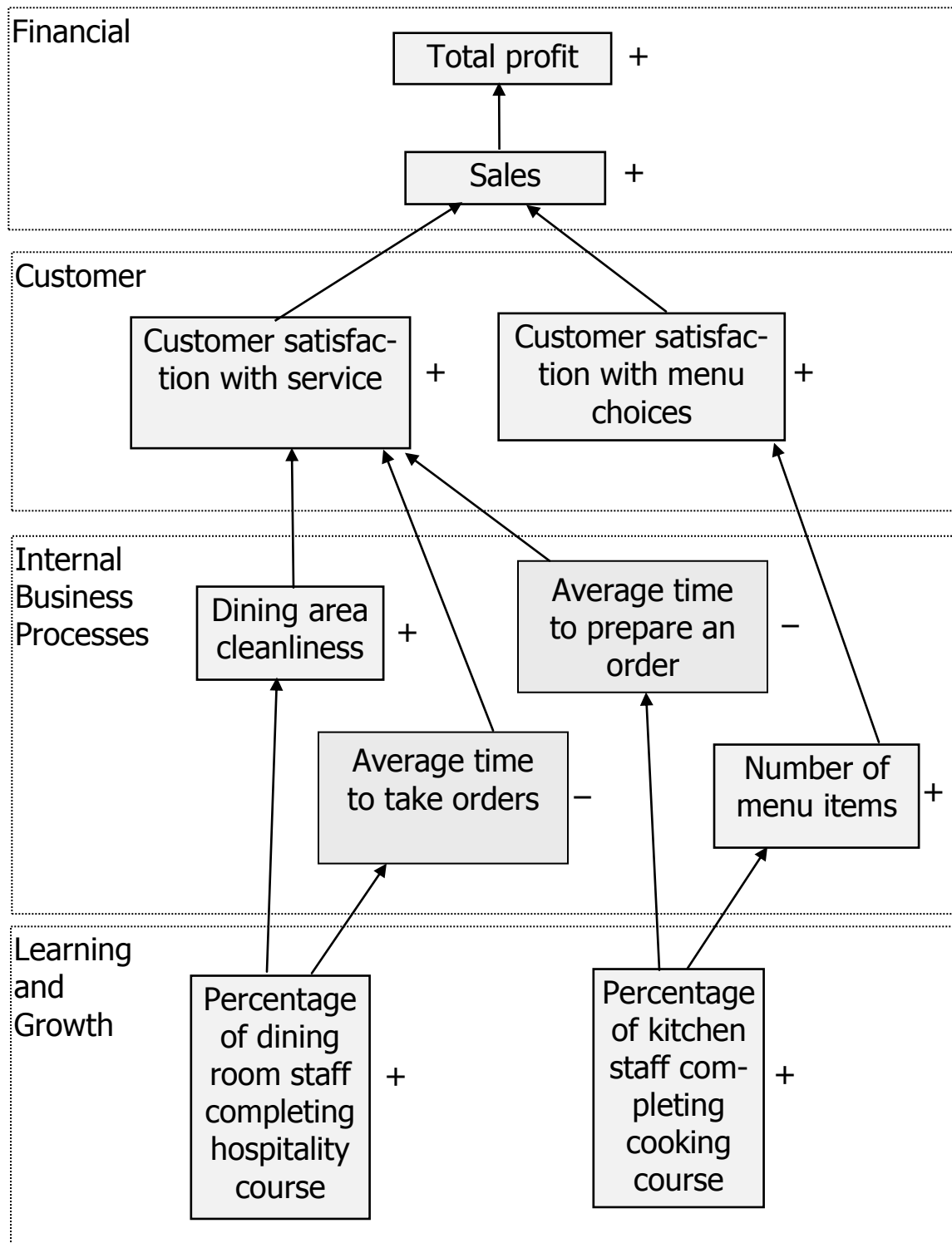
Manufacturing cycle efficiency (MCE):

Process time ÷ Throughput time	<u>21.4%</u>	<u>30.0%</u>
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As non-value-added activities are eliminated, the manufacturing cycle efficiency improves. The goal, of course, is to have an efficiency of 100%. This is achieved when all non-value-added activities have been eliminated and process time equals throughput time.

Problem 11-27 (45 minutes)

1. Students' answers may differ in some details from this solution.



Problem 11-27 (continued)

2. The hypotheses underlying the balanced scorecard are indicated by the arrows in the diagram. Reading from the bottom of the balanced scorecard, the hypotheses are:
- If the percentage of dining room staff who complete the hospitality course increases, the average time to take an order will decrease.
 - If the percentage of dining room staff who complete the hospitality course increases, then dining room cleanliness will improve.
 - If the percentage of kitchen staff who complete the cooking course increases, then the average time to prepare an order will decrease.
 - If the percentage of kitchen staff who complete the cooking course increases, then the number of menu items will increase.
 - If the dining room cleanliness improves, then customer satisfaction with service will increase.
 - If the average time to take an order decreases, then customer satisfaction with service will increase.
 - If the average time to prepare an order decreases, then customer satisfaction with service will increase.
 - If the number of menu items increases, then customer satisfaction with menu choices will increase.
 - If customer satisfaction with service increases, sales will increase.
 - If customer satisfaction with menu choices increases, sales will increase.
 - If sales increase, total profits for the Lodge will increase.

Each of these hypotheses can be questioned. For example, even if the number of menu items increases, customer satisfaction with the menu choices may not increase. The items added to the menu may not appeal to customers. The fact that each of the hypotheses can be questioned does not, however, invalidate the balanced scorecard. If the scorecard is used correctly, management will be able to identify which, if any, of the hypotheses is incorrect. [See below.]

3. Management will be able to tell if a hypothesis is false if an improvement in a performance measure at the bottom of an arrow does not, in fact, lead to improvement in the performance measure at the tip of the arrow. For example, if the number of menu items is increased, but customer satisfaction with the menu choices does not increase, management will immediately know that something was wrong with their assumptions.

