

CHAPTER 11

Cost Management through Activity-Based Management

REVIEW QUESTIONS:

- 11.1 The two main purposes of activity-based costing are to provide costing information on cost objects, and to enable management to continuously improve the enterprise, and if necessary, reengineer activities to achieve this objective.

Let's Talk

This chapter not only builds upon cost accounting, especially activity-based costing, but also on the ideas of world-class manufacturing, Just-In-Time (JIT) manufacturing, kanban systems, and continuous improvement. If the student is not familiar with these concepts, it would be a good idea to review the first few chapters of the text, and also Chapter 10 (Activity-Based Costing) now.

- 11.2 Activity-based management is an ongoing process involving four phases:
- *Identify value-added and nonvalue-added activities:* To continually improve, one of management's highest priorities is to determine which activities add value to the customer or are essential to the proper running of the company. A great need also exists to identify those activities that represent waste. Once these nonvalue-added activities are identified, innovative ways to eliminate, reduce, or reengineer them can take place.
 - *Reengineer the enterprise:* This process, which usually takes three to five years to complete successfully, is the redesign of how work is done through the activities of the organization. The basic principles of reengineering include focusing on root causes of costs, and keeping activities simple.
 - *Benchmarking value-added activities:* After a process is reengineered, it only contains value-added activities. The goal of the benchmarking phase is to compare the value-added activities to those performed by world-class best practitioners. These practitioners can be in the industry of the reengineered enterprise, as well as from other industries. Benchmarks are not static, and must be reviewed and updated periodically.
 - *Developing a performance measurement system for continuous improvement:* Performance measurements based on vendors, time, productivity, and customer satisfaction are keys to continuous improvement. Targets for each can be derived from benchmarking.
- 11.3 The ABM process is never really complete because business conditions are always changing. The environments in which enterprises operate are dynamic, customer wants and needs change, competitors enter and leave, new technologies become available, and the like. Additionally, problems always exist and will get worse if left unchecked, ABM can assist in identifying and measuring them.
- 11.4 Value-added activities are of two types
- Activities that add value to the customer, such as assembling, painting, or delivering.
 - Activities that are considered essential for the proper functioning of the enterprise, such as payroll.
- 11.5 The difference between value-added and nonvalue-added activities is determined by examining if the activity increases the value of the product or service that the enterprise provides. Some activities are easily classified as value-added (assembly, delivery, etc.) or nonvalue-added (litigation, warehousing, etc.). Some activities are harder to determine and an in-depth study is necessary.
- 11.6 Complexities that drive costs include: excessive numbers of vendors, purchase orders, invoices, and receiving memos flowing into accounts payable, parts, product engineering changes, schedule changes, poorly designed products, features/options/accessories, and complicated or outdated production activities.
- 11.7 Reengineering the enterprise means that the entire enterprise is subject to an evaluation of changes in activities, processes, or procedures. These changes are

Let's Talk

Sometimes the classification of an activity as either value-added or nonvalue-added is very difficult. For example, for most companies, litigation is considered nonvalue-added. As this chapter discusses, an attempt should be made to reengineer the company and eliminate this nonvalue-added activity. But is this correct? The litigation activity can also be considered value-added since it is necessary for the proper functioning of the enterprise. The important issue students should grasp is that the clear-cut nonvalue-added activities should be tackled first.

designed to make the enterprise into what it should be by the elimination of nonvalue-added activities, and simplifying all activities. Reengineering examples include:

- evaluation and elimination of nonvalue-added purchasing activities by the use of an Electronic Data Interchange system.
- altering the production line from one which encouraged large work-in-process inventories, to a just-in-time production line.
- elimination of billing, collecting, processing activities, along with all the associated paperwork and files through and Electronic Data interchange system with the enterprise's customers.
- forming quality circles versus departmental, functional jobs.
- development of an ICBIS and a visual factory control system.

11.8 Benchmarking is the evaluation and comparison of certain activities to those of world-class organizations. The comparisons are made with similar activities in both organizations, based on various performance measurements. The enterprise doing the benchmarking determines performance targets that equal or surpass the best practices. A common pitfall in benchmarking is to copy or "cherry pick" the activities of the best-practices organization. Cherry picking may ignore factors that lead to success within the benchmarking firm that are different from the success factors of the benchmarked firm, e.g., empowerment, training, performance measures, and reward systems. The underlying factors for the successful activity should be investigated and understood.

11.9 The fundamental purpose of a site visit during benchmarking is to collect information concerning the benchmarked activity. Questions such as "How is it done at the world-class organization? How do we do it? How can we do it better?," are the focus of the information gathered.

11.10 Any benchmark performance goal has to be a moving target. Business competition will force improvement just to stay even.

11.11 The four types of performance measurements commonly used for ABM are:

- Vendor
- Time-based
- Productivity
- Customer Satisfaction.

The seven rules (students only need to list and discuss four) that should be followed when developing performance measurements are:

- Performance measurements are not isolated from each other or from the function and goals of the enterprise. Therefore, all performance measurements should be supportive of company goals and strategies, as well as compatible with each other. Goals that do not support the overall company direction should be reconsidered. If, for example, a certain machine is essential for the production of a key product, a machine uptime performance measurement supports not only the measurement of the machine efficiency, but also is in line with the goals of the enterprise.
- Performance measurements should be quantitative. Having quantitative measurements facilitates comparisons – visually as well as numerically. Ratios are oftentimes appropriate for performance measurements, such as the contribution margin velocity ratio, or machine uptime.
- Performance measurements should be simple and easily relatable to the performance being measured. A good example is machine uptime, which measures the hours of machine uptime to total hours (uptime and downtime). Workers can readily determine that to increase the machine uptime performance measurement, machine uptime must be increased (or machine downtime reduced).
- Performance measurements should induce beneficial behavior. Care should be taken when assigning performance measures to insure that the measure is not unduly influenced by factors beyond the control of the worker. For example, if a worker is responsible for machine uptime, it follows that the worker should have control over the maintenance and operations of the machine. If not, possible excessive maintenance downtime (slow worker, poor response, etc.) that is uncontrollable by the worker will adversely affect the measure, potentially forcing the worker into dysfunctional behaviors such as delaying regular maintenance that results in premature failure of the machine.
- Performance measurements should be crafted to emphasize positive aspects, if possible. Although this is somewhat cosmetic, the people being measured can feel good about what they have accomplished. Too often, performance measures only report about bad things under a “management-by-exception” philosophy that is inappropriately applied. For example, machine uptime is a better presentation of the performance measure than machine downtime.
- Performance measurements should clearly show where improvements have been made, and how much further improvement is possible. The frequency of measurement should be in line with the activity being measured, and the target performance should be periodically reviewed and revised to indicate new higher levels of performance. For our machine uptime example, monthly measures are

inadequate to facilitate weekly (or even daily) monitoring and improvements in the machine performance.

- There is an optimum number of performance measurements that can be used effectively. Too many measures create excessive evaluation time for only minor improvements. Conversely, too few measures inadequately characterize the overall process, resulting in unknown inefficiencies and other undesirable performance.

The benefits of developing and using a performance measurement system are related to the axiom "What's measured is what's done." The enterprise won't be able to improve what isn't measured. By measuring performance, that performance can be improved.

Let's Talk

At Bentley Nevada, machine downtime is graphed and reported instead of machine uptime. If the machine is up 98% of the time, then 98% of the information communicated tells just one thing. Bentley wants to know "everything" (really, as much as possible) about the other 2% (the reasons for the downtime). To accomplish this, stacked bar graphs are constructed measuring the different events causing a machine's downtime. For example, the dip insertion machines' graphs are taped to each machine above the operator's panel as part of its continuous improvement program.

11.12 Traditional financial performance measurements often lead management to employ cost-cutting throughout the organization, as cutting costs will, temporarily, increase the financial measurements. Traditional financial performance measures include:

- *Sales and market share:* Performance measures often focus on the short-term financial results of the organization by only reporting them for the current year. Problems with these types of measures occur because changes necessary for the long term are not monitored (e.g., observing trends).
- *Return on investment or return on assets:* These performance measures can be adversely impacted by short-term investments in assets, which are needed to improve performance in other areas (production, etc.).
- *Net income:* This measure is focusing on the results, not on the activities that cause the results. Therefore, determining results of activity changes is very difficult, which may result in poor decisions.
- *Earnings per share:* As was the case for using net income as a performance measure, the activities that create the earnings are not being measured. Additionally, managers feel significant pressure to look at short-term results, which are not necessarily the proper way to cause lasting beneficial change in the enterprise.

- 11.13 Focusing on improving the activities that nonfinancial performance measurements identify will advance the competitiveness of the organization, thus leading to improved financial performance. Focusing on financial measures often leads to across-the-board cost cutting and layoffs. This, in turn, can lead to a vicious cycle of people being overworked and making more mistakes, resulting in poorer financial performance, causing management to initiate another round of cost cutting and layoffs.

Let's Talk

You may want to emphasize the problems of focusing on financial measures by asking the students if they have experienced dysfunctional behaviors created by such cost cutting and layoffs. Would they expect the quality of the product or services in major corporations that are currently laying-off thousands of workers to increase, stay the same, or decrease?

- 11.14 Performance measurements should move from financial towards nonfinancial measures the farther down the organizational chart. The CEO should be concerned with financial measures, whereas the shop foreman or worker should have a mix of nonfinancial measures.

Between levels of an organization, the measures are linked via a system that provides communication of goals and strategies. Specifically, measures on lower levels are created to mesh with specific higher level measures. The linking provides each worker, at whatever level, the ability to control their measures, and to understand how they relate up and down the levels. Ultimately, everyone knows where to look to correct problems that cause poor performance.

The performance measurements provide checks of expected performance to actual performance at each level. Thus, management can readily assess problems and trace them to their source.

- 11.15 A vendor certification program selects vendors that can meet performance measurement standards of quality, price, and delivery time. After being certified, vendors are given long-term contracts and have access to production schedules. Essentially, certified vendors become extensions of the enterprise. By using certified vendors, companies can reduce the number of vendors (and the costs associated with keeping vendors on the books), as well as costs for ordering, inspecting, and counting purchases.

11.16 Vendor nonfinancial performance measurements include quality, price, on-time delivery, and bonus. To be certifiable, a vendor must score above 95 in the four areas with the scoring system shown in Exhibit 11-9.

11.17 The longer it takes to perform an activity, the more resources it takes and the more likely it is that rework will have to occur to correct defects or mistakes. On the other hand, the shorter the activity time, the greater the ability to respond to changes in customer (internal and external) demand.

11.18 Speed in world class manufacturing falls into the following four categories:

- design engineering in getting new products from design to the production stage
- vendors in getting raw materials to the production process (supplier lead time)
- converting raw materials to finished products (production lead time)
- delivering finished products to consumers (delivery lead time)

11.19 To achieve LTE ratios of one, the following must occur (student names four):

- on-time delivery of high-quality materials
- lot sizes equal to one
- zero setup time
- zero time between operations
- zero defects
- zero machine downtime.

The positive results from improving the production LTE ratio include (student names four):

- increased cash flow
- increased profit
- improved customer service
- better quality
- lower inventories
- less spoilage, scrap, and rework
- smaller lot sizes
- faster responsiveness to changes in the marketplace (flexibility)

11.20 Continuous flow and synchronized operations are possible when the delivery lead time and the production lead time are equal. Production would be synchronized with delivery, and vice versa. Thus, a D:P ratio of 1 is needed.

Let's Talk

With a D:P ratio less than one, production time is less than the required delivery time. Some managers may want to maintain a D:P ratio of slightly less than one. Inventory buildup could be checked with JIT.

11.21 World-class manufacturers demand 100% machine uptime. To achieve this very high percentage, the manufacturers have comprehensive preventive maintenance programs with workers trained to perform the daily and weekly preventive maintenance tasks.

11.22 The three types of productivity measures are:

- *Work force productivity* These measures indicate the number of units produced per direct labor hour. (Care has to be taken when using this ratio as it can lead to unnecessarily large production runs.)
- *Direct materials yield* These measures indicate how efficiently raw materials are being converted into finished products. Waste, excessive scrap, or defects are indirectly measured.
- *Activity productivity* These measures indicate how efficiently an activity is being performed. (Care has to be taken when using this ratio also since it can lead to unnecessarily large production runs.)

11.23 The two types of customer satisfaction performance measurements are:

- *On-time delivery* This measure shows if the finished product is being delivered at the time specified by the customer.
- *Complete order filling* This measure tracks how many orders are completely filled.

11.24 The ABM idea that internal customers must be satisfied before it can be expected that external customers will be satisfied acknowledges that internal customer dissatisfaction will ultimately result in external customer dissatisfaction. By treating each activity as a separate customer, and satisfying that customer, the end result will be a satisfied external customer.

11.25 The two curves on a snake chart show the customer's view of the importance of various service attributes, and the customer's rating of the enterprise's performance on these attributes. The ultimate goal of the enterprise is to have the two snakes overlay, indicating that the enterprise is precisely meeting the perceived needs of the customer.

11.26 Graphs are used to convey information that might not otherwise be comprehended. Essentially, graphs can turn data (numbers) into information (relationships, trends, etc.).

11.27 The six basic types of graphs styles include:

- *Scattergraphs* These graphs can reveal relationships between “scattered” pairs of data points.
- *Line graphs* These graphs readily show fluctuations over time. Care must be taken when setting up the grids to maximize the visibility of data trends and changes.
- *Control charts* These are line graphs that show how a measured value is varying around the expected average and upper and lower control limits.
- *Bar graphs* Bar graphs show how proportions or quantities are related to each other. The two types of bar graphs are horizontal (comparing different items at the same time period) and vertical (comparing the same item at different time periods).
- *Sectographs* These graphs show how totals are divided up. The two primary types are pie charts and layer graphs.
- *Picturegraphs* These are similar to bar charts except that the “bars” are actually represented by little pictures or signs that relate to the item being measured.

Let's Talk

Obviously, the above list can only be considered an overview of a portion of the many types of graphs available with today's computing packages. The above types, however, are the most useful when trying to obtain information out of data. Some may think that the fancier the plots, the better. This is not true. Excessive decorations (e.g. three dimensional columns, fancy shadings and backgrounds) can easily distract from the real information in the plot, and can unnecessarily increase the time it takes to create the plots. Students should be warned about spending lots of time on any plot to get it “just right.”

CHAPTER-SPECIFIC PROBLEMS:

11.28 Identifying value-added and nonvalue-added activities:

<u>nonvalue-added</u>	Inspecting raw material
<u>nonvalue-added</u>	Store raw material
<u>value-added</u>	Casting tool
<u>nonvalue-added</u>	Stacking casting
<u>value-added</u>	Grinding and polishing tool
<u>nonvalue-added</u>	Inspecting finished tool
<u>nonvalue-added</u>	Store finished tool
<u>value-added</u>	Shipping tool

11.29 Calculation of vendor nonvalue-added cost:

		<u>Vendor A</u>		<u>Vendor B</u>
Inspection rejection	(1.5 x \$45)	\$67.50	(0.1 x \$45)	\$4.50
Paperwork rejection	(5.0 x \$45)	\$225.00	(0.5 x \$45)	\$22.50
Rework at company	(15.5 x \$45)	\$697.50	(1.0 x \$45)	\$45.00
Material received early	(3.0 x \$45)	\$135.00	(1.0 x \$45)	\$45.00
Material received late	(20.0 x \$45)	\$900.00	(8.0 x \$45)	\$360.00
Excess materials	(8.5 x \$45)	\$382.50	(1.0 x \$45)	\$45.00
Short materials	(13.5 x \$45)	<u>\$607.50</u>	(2.5 x \$45)	<u>\$112.50</u>
Total nonvalue-added activities:		<u>\$3,015.00</u>		<u>\$634.50</u>

Calculation of vendor performance index:

Vendor A VPI	$(\$60,000 + \$3,015.00) \div \$60,000.00$	=	<u>1.05</u>
Vendor B VPI	$(\$60,000 + \$634.50) \div \$60,000.00$	=	<u>1.01</u>

11.30 Assessing types of activities:

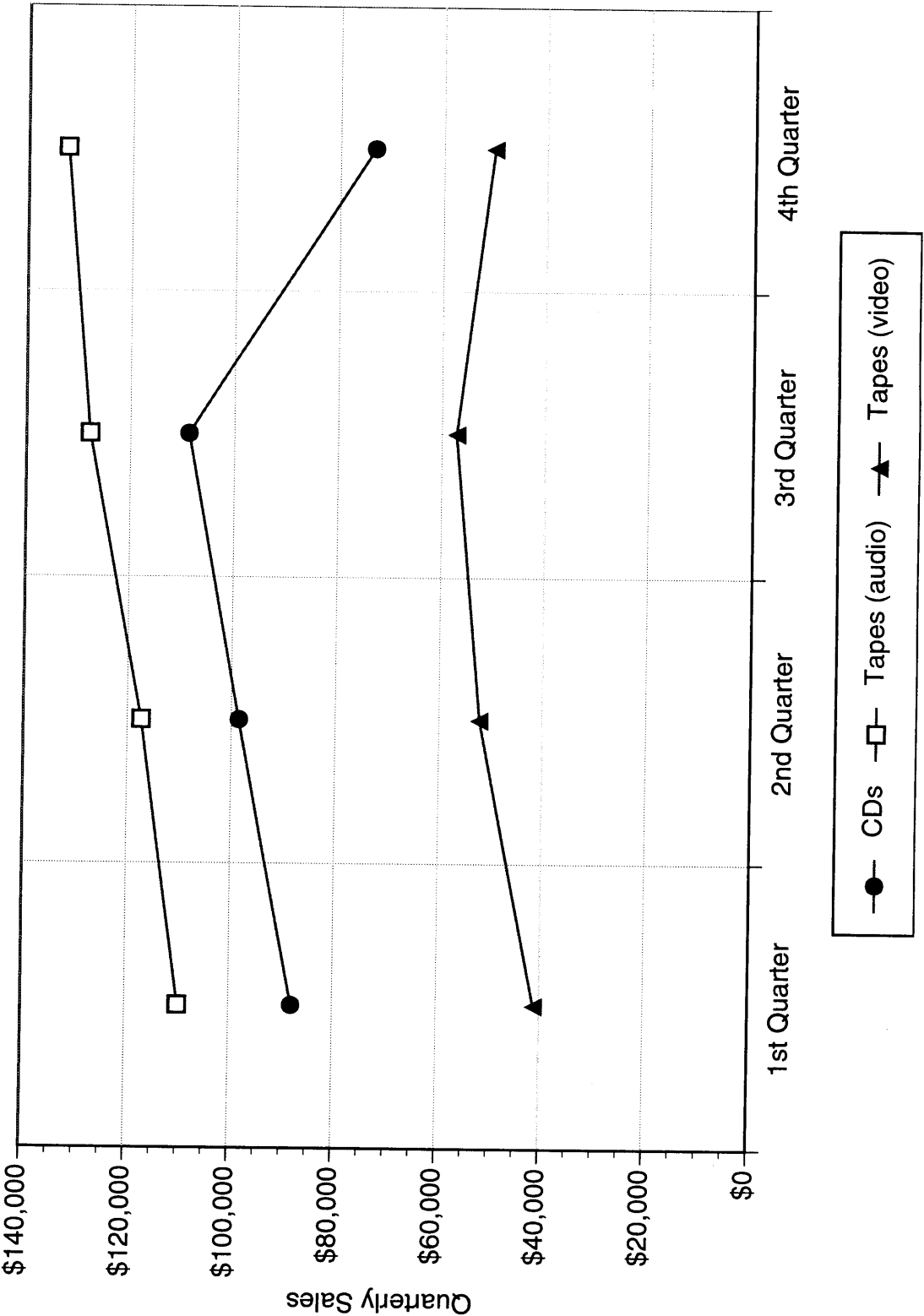
ACTIVITY	VALUE-ADDED	NONVALUE-ADDED
Review of invoices		x
Engineering parts	x	
Cleanup of excess materials		x
Dealing with customer complaints		x
Product delivery	x	
Materials movement		x
Materials assembly	x	
Inspection of incoming product deliveries		x
Quality control by all employees	x	
Quality control department		x
Purchase order preparation		x
Tracking machine setup time	x	
Storage of raw materials		x
Using graphs to illustrate performance	x	
Product rework		x

Let's Talk

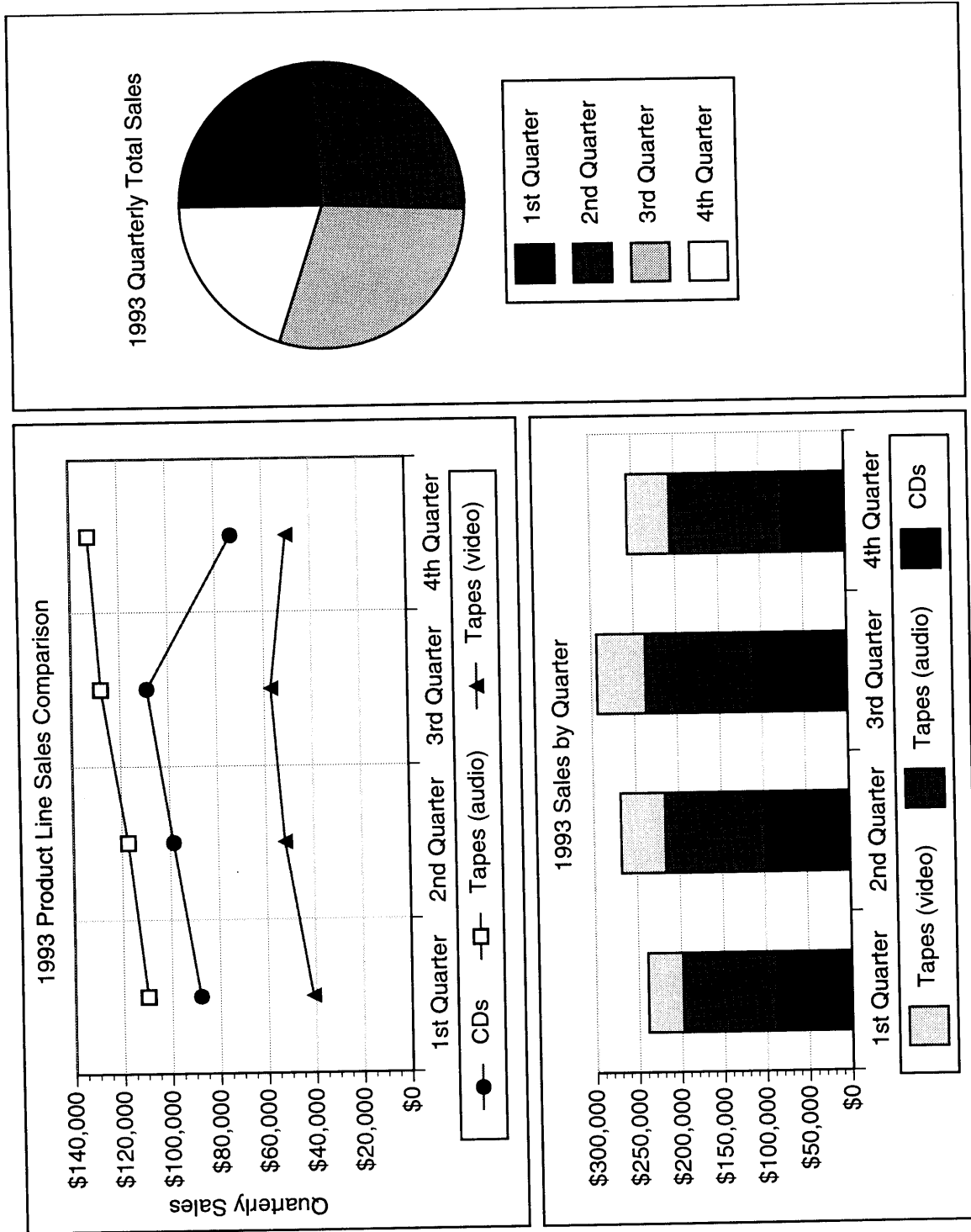
Students may have trouble identifying nonvalue-added and value-added activities since certain activities can sometimes appear to be both. For example, proofing invoices may be a necessary activity, and therefore considered value-added in the short run. However, since the purchasing activity can be reengineered into an EDI system, and invoice-related activities eliminated, the activity can be considered nonvalue-added in the long run.

11.31 There are numerous ways to present the information to management. The below graph shows the sales trends for the different products during the fiscal year.

1993 Product Line Sales Comparison



The following presentation of the data shows three different graphs together. The ability to observe data in different forms on the same page can be useful to management analyzing the information.

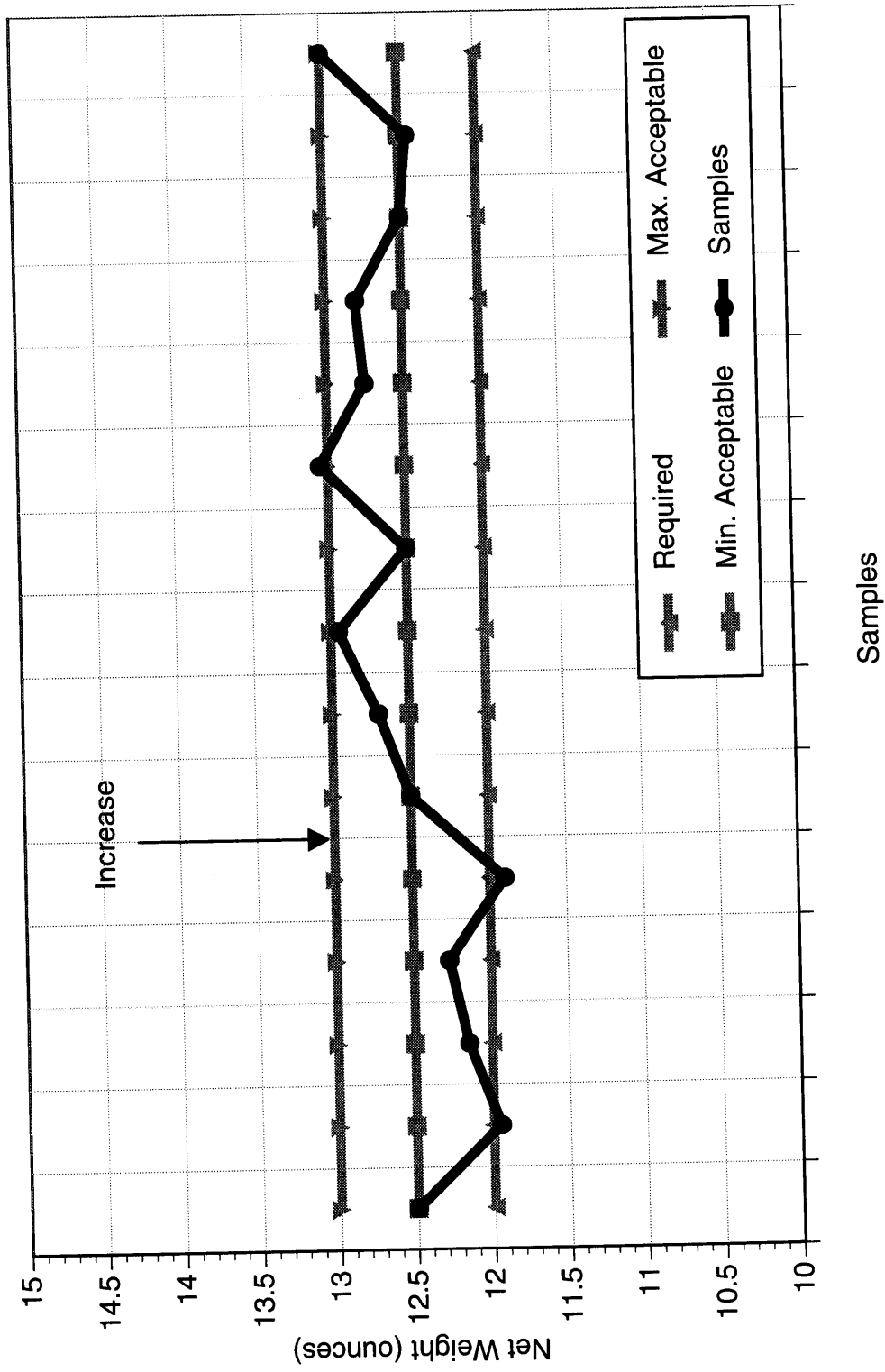


Let's Talk

Problem 11.31 show the power of finding significant information by graphing data, as evidenced by the line graph clearly showing the large decline in CD sales in the 4th quarter. But as easily, graphs can obscure information, as evidenced by comparing the total quarterly sales shown in the bar graph and the pie chart. The bar graph shows the total sales decline in the 4th quarter, but the decline is obscured in the pie chart. Because of this "capability," there is an ethical responsibility to present data in different ways. Fortunately, today's computing capabilities make this easily possible.

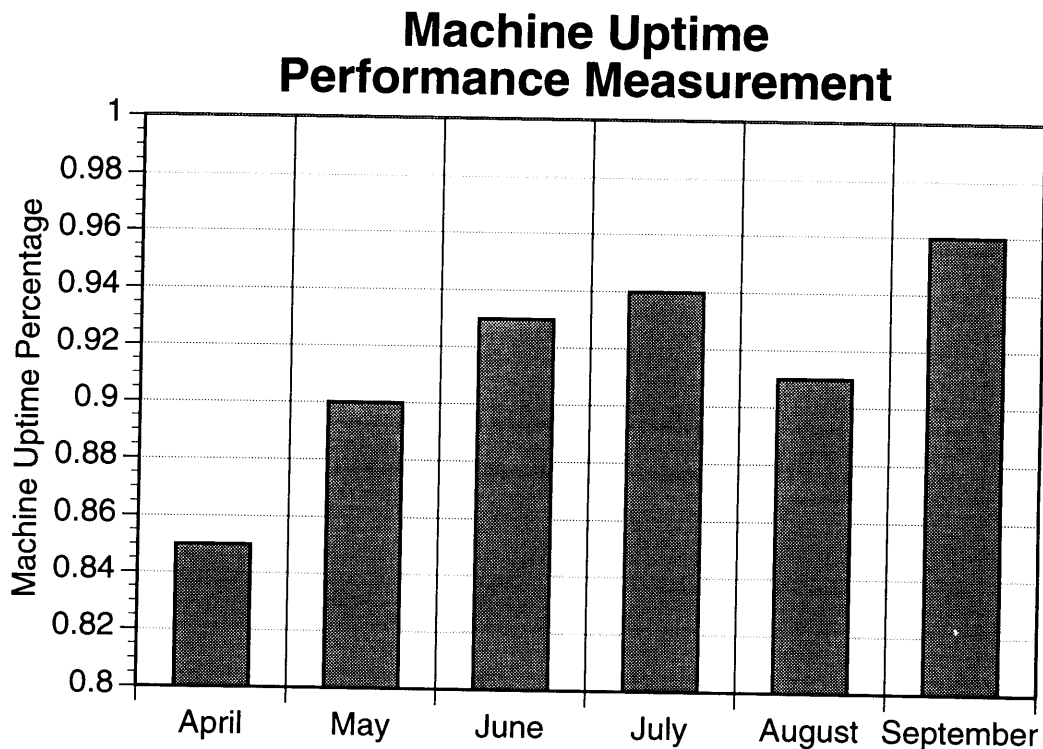
11.32 The control graph shows that increasing the fill was necessary to avoid being below the lower control limit.

Sample Weight



11.33 Calculation of machine uptime:

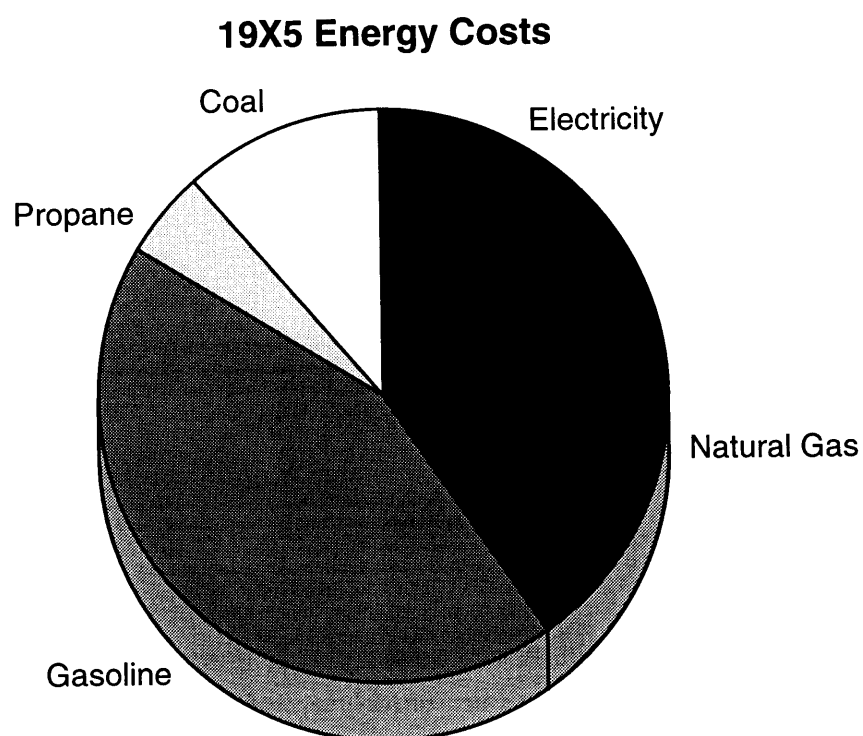
Month	Machine uptime performance measurement		
April	$1 - (15.5 \div 105.0)$	=	85%
May	$1 - (12.0 \div 120.0)$	=	90%
June	$1 - (8.0 \div 110.5)$	=	93%
July	$1 - (6.5 \div 105.0)$	=	94%
August	$1 - (9.5 \div 110.0)$	=	91%
September	$1 - (5.0 \div 120.0)$	=	96%



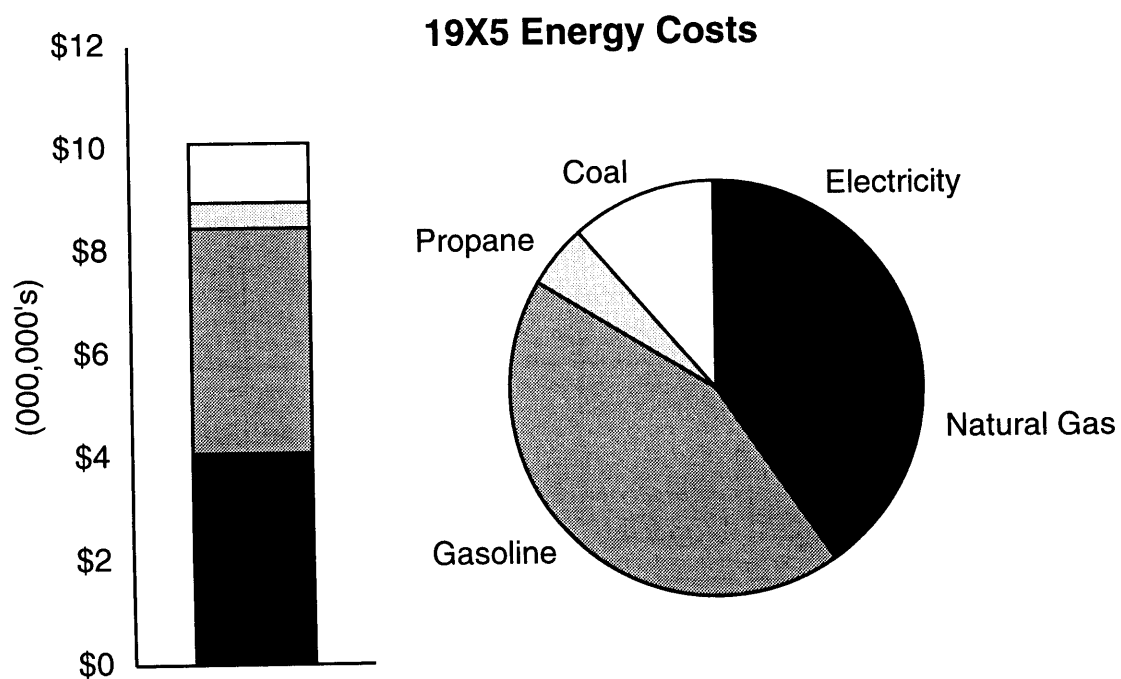
Comments:

Improvement is being achieved with the machine uptime performance measurement signifying that each month the machine is available for more work. The initial large month-to-month improvements in the ratio have begun to decrease. This indicates that the easy problems were addressed at first, with further, more difficult refinements being made in subsequent months. The ratio decrease in August may signify a one-time problem, or worse, potential instability of some of the more recent improvements. Future ratios should be observed closely to determine if the August problem will re-occur.

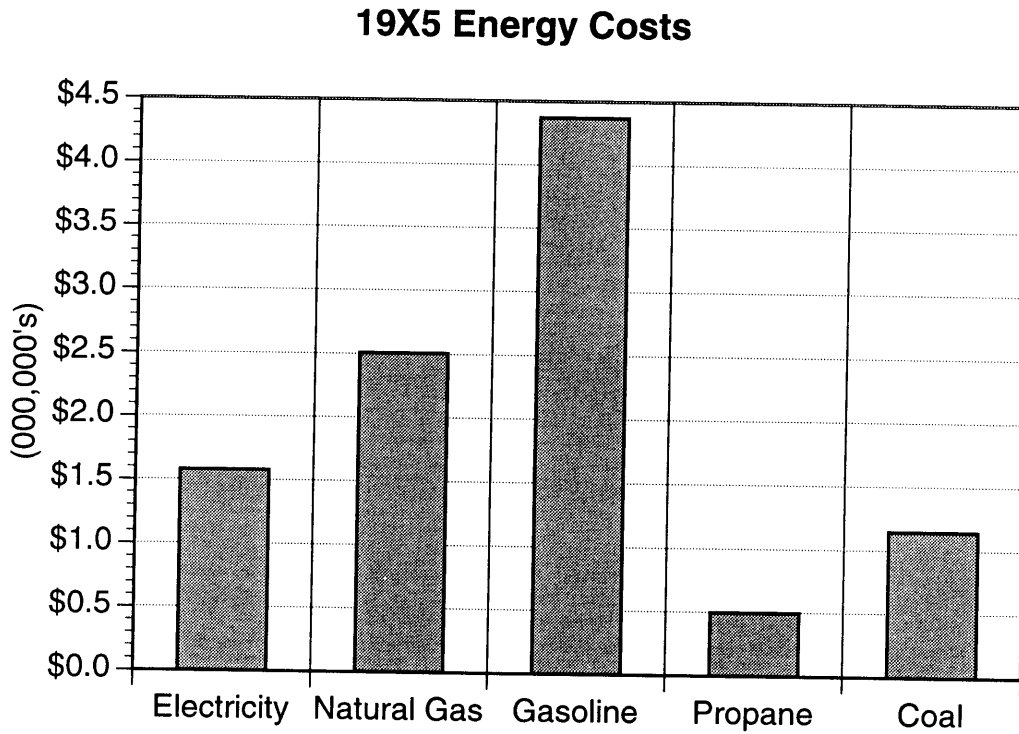
11.34 a. Pie chart



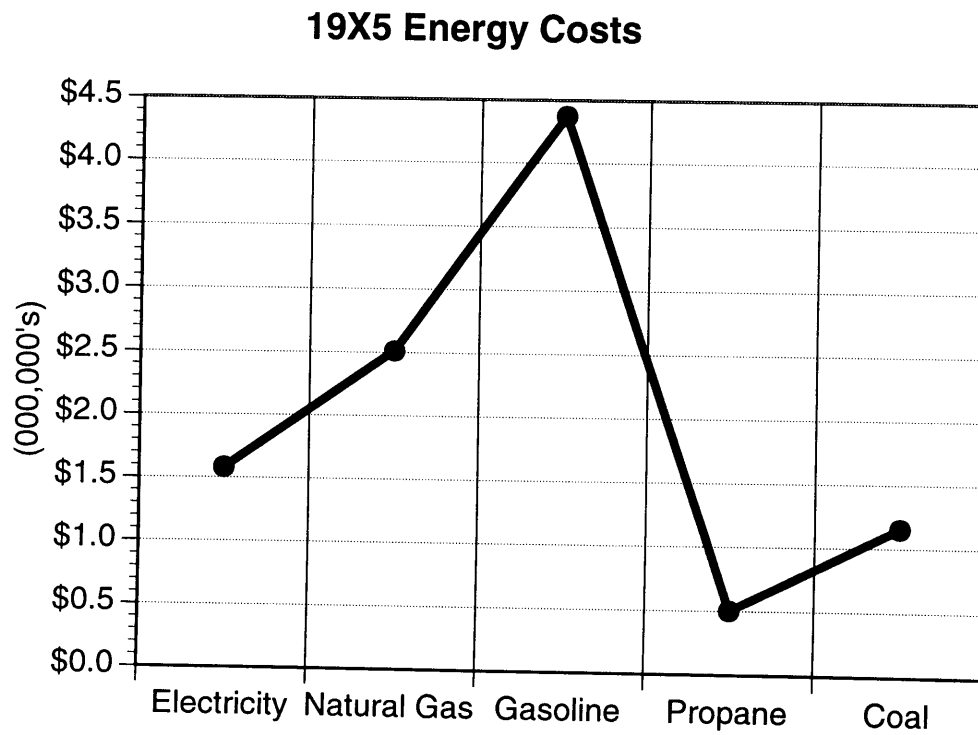
b. Dual (pie and bar) chart



c. Bar chart



d. Line chart



11.35 a. Calculation of the vendor performance index:

	Company A	Company B	Company C
Cost of nonvalue-added activities	\$800	\$675	\$395
Plus raw material cost	\$14,000	\$12,000	\$16,400
Subtotal	\$14,800	\$12,675	\$16,795
Divided by raw material cost	÷ \$14,000	÷ \$12,000	÷ \$16,400
VPI	<u>1.06</u>	<u>1.06</u>	<u>1.02</u>

- b. Companies A and B should be eliminated as vendors as their VPIs are greater than Company C's 1.02.

11.36 a. Calculating the vendor quality performance measurement:

Shipment	Acceptance Percentage	Calculation
1	98.1%	(1,200 - 23) ÷ 1,200
2	98.5%	(800 - 12) ÷ 800
3	98.0%	(1,500 - 30) ÷ 1,500
4	97.4%	(1,300 - 34) ÷ 1,300
5	96.4%	(900 - 32) ÷ 900

- b. The vendor consistently delivered materials within Infinity's acceptable quality performance measurement for the first four shipments. On the fifth shipment, the vendor fell slightly below Infinity's acceptance percentage. Of greater concern, however, is the steady decline in the acceptance percentage since the second shipment, foreboding the possibility of even less acceptable performance on future shipments.

- 11.37 a. The complete order filling percentages for each vendor are calculated as:

	$1 - (\# \text{ of backorders} \div \# \text{ of orders})$			Percentage
Vendor 1:	$1 - (5 \div 34)$	=	$1 - 0.15$	= 85 percent
Vendor 2:	$1 - (8 \div 51)$	=	$1 - 0.16$	= 84 percent
Vendor 3:	$1 - (11 \div 86)$	=	$1 - 0.13$	= 87 percent

- b. Vendor 3 has the highest complete order filling percentage at 87 percent.

- 11.38 On-time delivery performance measurement calculation:

$$513 \text{ on-time deliveries} \div 582 \text{ total deliveries} = \underline{88.1\% \text{ on-time delivery}}$$

- Complete order filling performance measurement calculation:

$$504 \text{ totally filled orders} \div 582 \text{ total orders} = \underline{86.6\% \text{ orders totally filled.}}$$

Let's Talk

Note that the calculation of the complete order filling performance measurement in Problem 11.38 is slightly different than given in the text, but is equivalent.

- 11.39 a. The value-added and nonvalue-added activities are identified as follows:

<u>Activity</u>	<u>Type</u>	<u>Minutes</u>
Production Line #1	Value-Added	30
Production Line #2	Value-Added	50
Quality control inspection	Nonvalue-Added	25
Product movement to storage location	Nonvalue-Added	60
Storing the product in inventory	Nonvalue-Added	45

- b. The production LTE ratio is calculated as follows:

$$\begin{aligned}
 \text{LTE ratio} &= \text{Value-added activities time} \div \\
 &\quad (\text{value-added activities time} + \text{nonvalue-added activities time}) \\
 &= (30 + 50) \div (30 + 50 + 25 + 60 + 45) \\
 &= 80 \div 210 \\
 &= \underline{38 \text{ percent}}
 \end{aligned}$$

- c. A 38 percent lead time efficiency ratio would not be acceptable in a world-class manufacturing environment, which demands at least a 40 percent ratio.

11.40 Calculating the contribution margin velocity ratio:

Product A	(\$63,856 - \$12,776)	÷ 7	=	\$7,297.14
Product B	(\$81,937 - \$28,665)	÷ 4	=	\$13,318.00
Product C	(\$120,542 - \$50,125)	÷ 6	=	\$11,736.17

Product B is most profitable, with a contribution margin velocity of \$13,318.00 per production day.

11.41 Calculating the most profitable product:

$$\text{Contribution margin velocity ratio} = \frac{\text{Product contribution margin}}{\text{Production lead time}}$$

$$\begin{aligned} \text{Critter Crunchers} &= \$1.50 \div 5 \text{ minutes} \\ &= \underline{\underline{\$0.30 \text{ contribution margin per production minute}}} \end{aligned}$$

$$\begin{aligned} \text{Darbs Drops} &= \$1.00 \div 2.5 \text{ minutes} \\ &= \underline{\underline{\$0.40 \text{ contribution margin per production minute}}} \end{aligned}$$

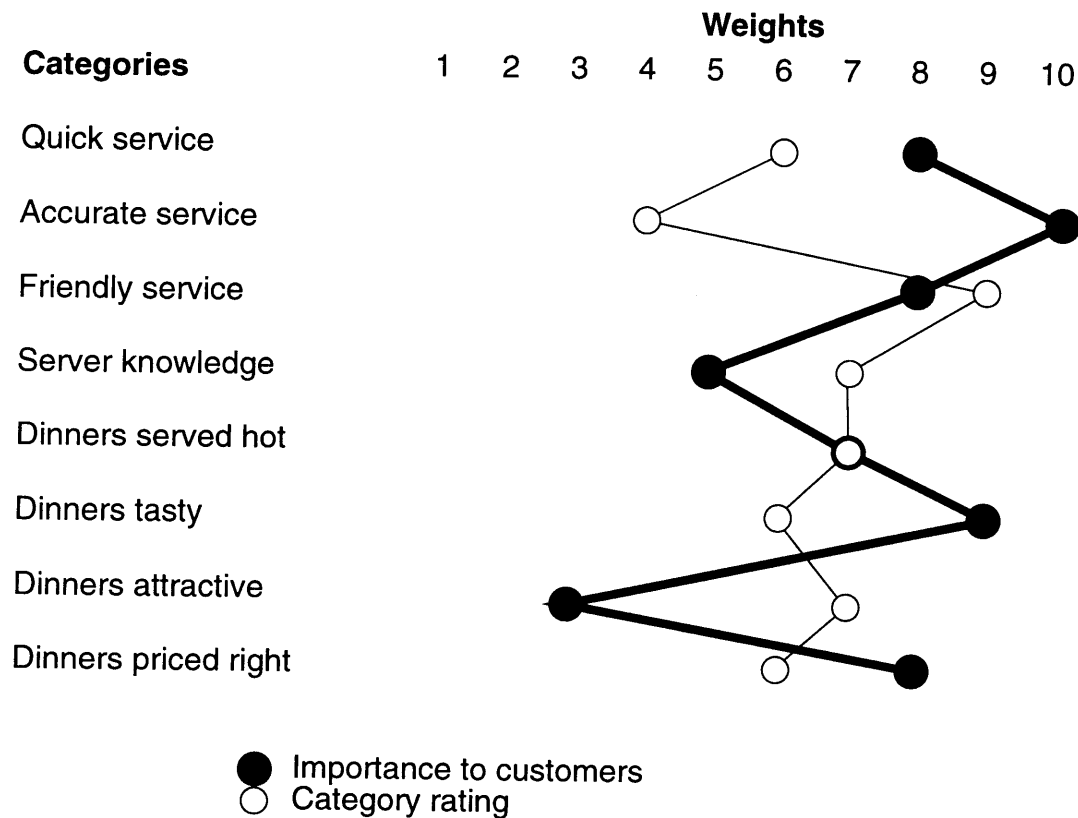
The contribution margin velocity for Critter Crunchers is \$0.30 per production minute while it is \$0.40 for Darb's Drops. Assuming that there is sufficient demand for Darb's Drops, Karob Kandies would be more profitable selling Darb's Drops rather than Critter Crunchers.

- 11.42 a. The setup time performance ratio is calculated by dividing the setup time by the number of setups for each product, as follows:

Product	Setup time		Number of setups		Minutes per setup
1	50 minutes	÷	5	=	10 minutes
2	105 minutes	÷	7	=	15 minutes
3	108 minutes	÷	9	=	12 minutes
4	120 minutes	÷	12	=	10 minutes
5	144 minutes	÷	8	=	18 minutes
6	80 minutes	÷	4	=	20 minutes
7	78 minutes	÷	6	=	13 minutes

- b. Products 1 and 4 provide the lowest machine setup time, at 10 minutes each.
- c. Lower setup times generally result in reductions in lot sizes, work-in-process and finished goods inventories, and production and delivery lead times. These reductions allow a company to be more flexible and responsive to its customers.

11.43 a. The following is a graph of the survey results using a snake chart:



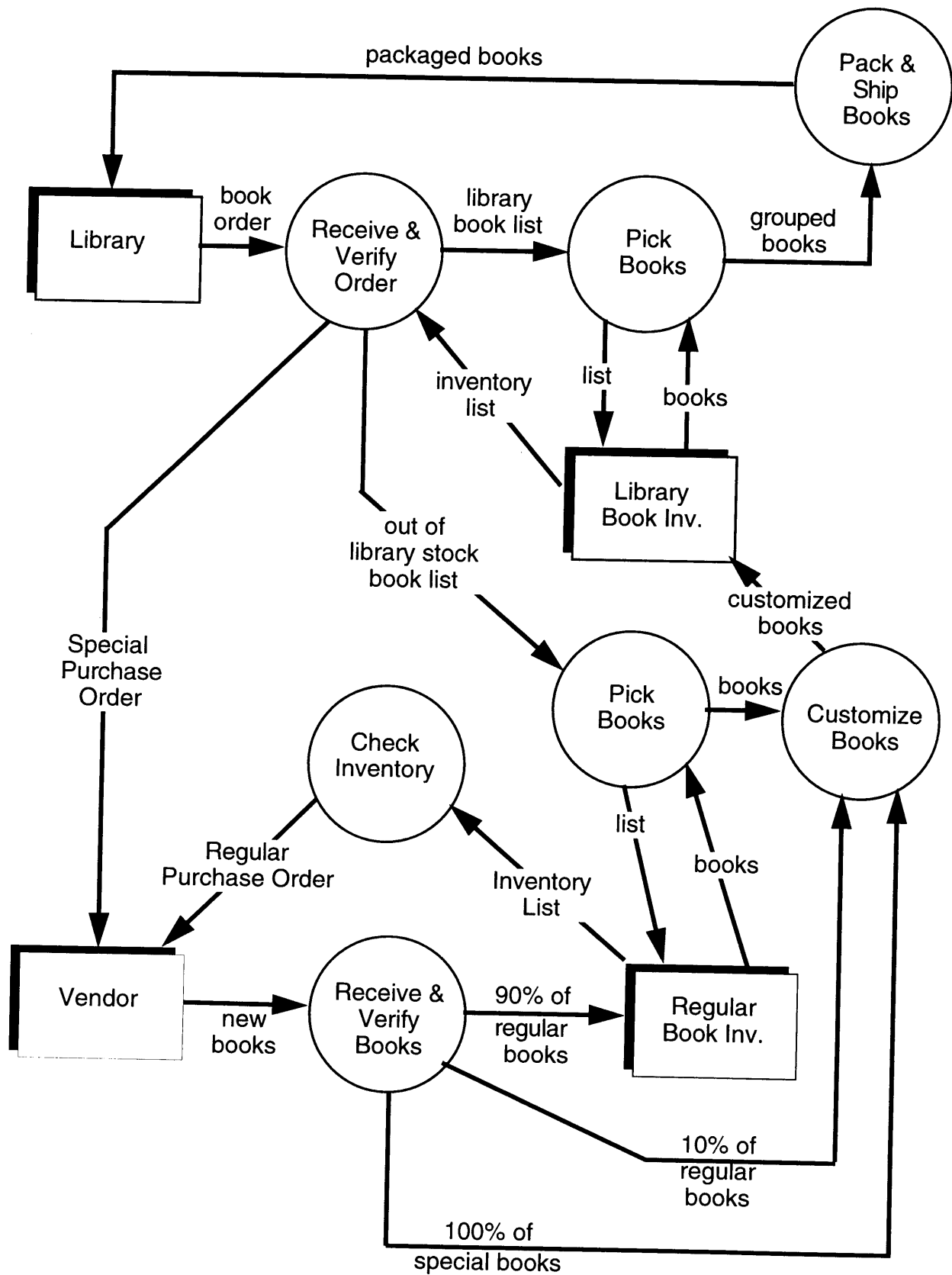
- b. The company should focus on improving the following areas: quick service, accurate service, tasty dinners, and pricing dinners right, since the rating snake falls below the customer importance snake in these categories. However, the Eatery Shop should be aware of any interdependence between categories. For example, if the taste of the product is improved, it may diminish the unfavorable effects of a lack of quick service and high prices.

THINK-TANK PROBLEMS:

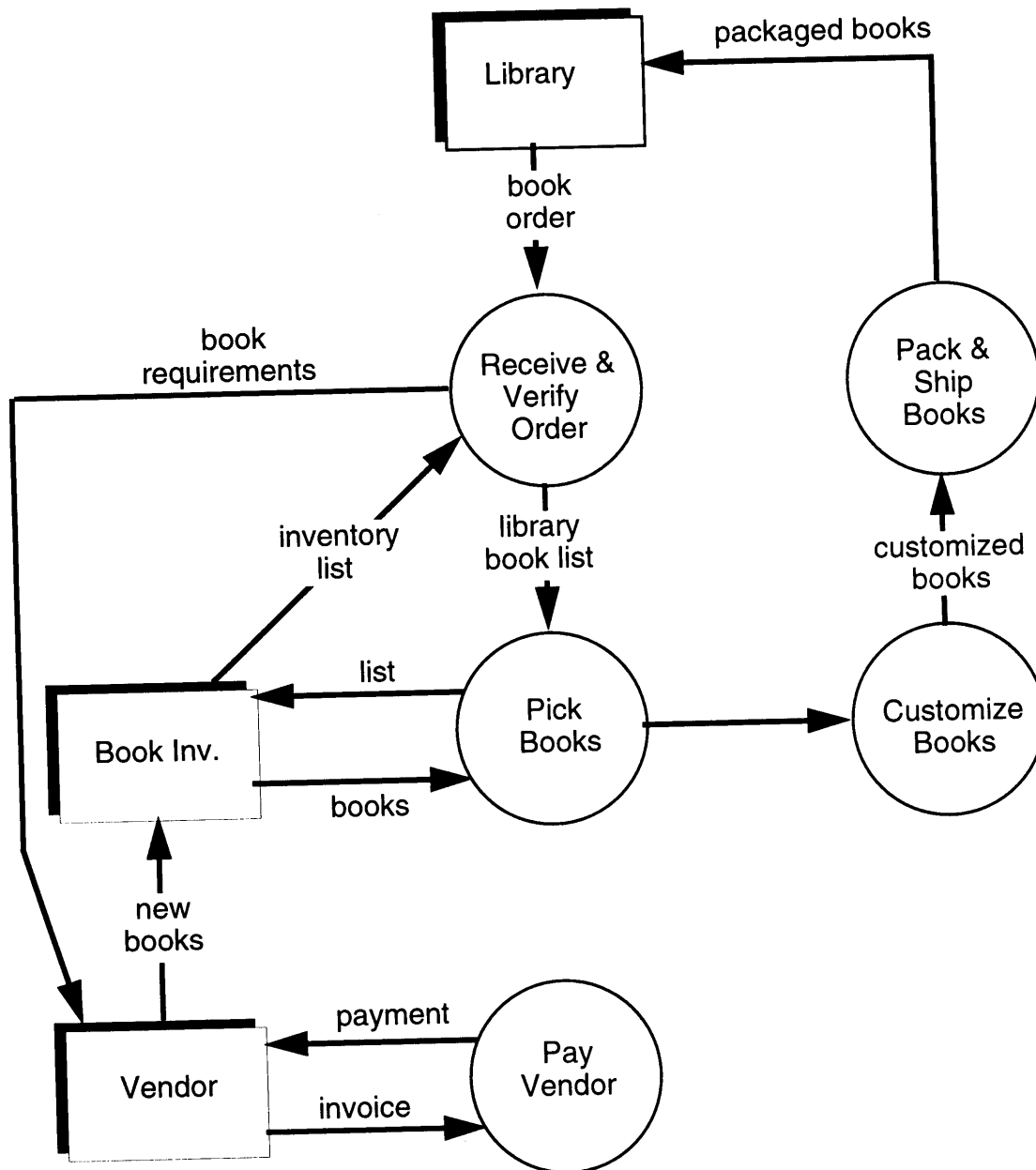
11.44 Some possible answers are:

<u>Value-added activities</u>	<u>Nonvalue-added activities</u>
Product engineering	Inventory auditing
Product design	In-house inventory movement
Providing customer service	Production wait time
Problem-solving sales calls	Developing public service announcements
Product shipment	Presenting product workshops/seminars
Parts manufacturing	Conducting internal audits
Product packaging	Setup time
Product assembly	Machinery repair time
Parts preparation	Product training
Market research	Product invoicing
Paying employee payroll	Machining off excess material
Employee training	Dealing with product liability claims

11.45 a. "As is" activity flow diagram:



b. "Reengineered" activity flow diagram:



Our reengineered process directly addresses management's concerns

- we have eliminated Library Book Storage entirely. This will eliminate the additional space requirements for the storage, as well as eliminate the "spoilage" of unused library books.
- our responsiveness to our library customers will also be increased as we should be able to fill orders without as much nonvalue-added processing time, and by streamlining the flow of books.
- we have also eliminated the dual order classification which should increase our throughput and reduce our nonvalue-added processes.

- we will have a WCM relationship with our vendors (utilizing EDI) which will reduce the verification and quality checking previously needed. Part of this relationship involves sharing all book requirements with our vendors. The vendors are responsible for sending the necessary books at the required time.

c. Performance Measurements:

There are a variety of performance measurements we could use for our reengineered process. At the CEO level, net income should be measured. At the VP of Warehouse Operations level, inventory turnover and books sold per square foot can be used. At the Warehouse Manager level, we should use inventory amount, on-time delivery, "production" lead time, various machine uptime, and customization process lead time measurements should be used.

d. Management Concerns:

As can be clearly seen on the "as is" activity flow diagram, there are a number of areas that need to be addressed. First, management has already expressed a concern over the rising storage costs of our Library Book Inventory. As shown, this is a direct result of maintaining our customization activity at capacity by directing 10% of all regular book purchases through this activity. Although this results in a highly efficient customization process, the drawbacks are an ever increasing inventory of library books. The makeup of the inventory is also a concern as some of the customized books never get sold and have to be "scrapped" at a loss.

With management's push to move our company to world-class manufacturing (WCM) status, our response to customer needs and wants has to be improved. The convoluted process where some new books have to be ordered from vendors, or to have "special expediting" for customization of books in our regular book stock, all result in a lack of responsiveness to our library customers. We need to be able to quickly ship 100% of our library orders.

Finally, there is a great number of warehouse functions that cannot be tolerated in WCM. We need to improve our relationship with our vendors so that incoming books can be quickly ordered and delivered. The checking and verification functions need to be reduced or eliminated as much as possible. Our current process of having two types of orders, and having to separate them internally, takes a lot of time and causes increased handling and paperwork processing time. This duplication of work needs to be eliminated.

- 11.46 ElectroKing has a number of complexities, mostly due to the way the company has evolved over time. The below listed management action suggestions are consistent with the world-class manufacturing philosophy, but should not be considered the only actions possible as others may exist depending on other circumstances. It would be difficult to only correct one or two of these complexities since the potential actions can have effects on other complexities. A synergistic effect could be realized by seriously considering the actions as a whole.

Complexity - Excessive number of vendors.

Potential Actions - ElectroKing needs to reduce the number of vendors. One method would be to initiate a certified vendor program. The benefits would be an increase in quality and a reduction in the number of vendors. ElectroKing cost decreases would result from less accounting overhead, less inspection, less storage of parts, and less spoilage from poor quality parts.

Complexity - Excessive number of parts.

Potential Actions - Each ElectroKing product should be redesigned to utilize the latest manufacturing engineering techniques and materials. As some of the products are very old (>20 years), new designs and materials should drastically reduce the number of parts. ElectroKing cost decreases would result from less accounting overhead, reduced manufacturing leadtime, and less part storage requirements.

Complexity - Excessive number of products.

Potential Actions - Although ElectroKing has the right attitude in trying to meet customer needs by continuing to produce old products for repeat customers, but a reduction in the number of products may be necessary for ElectroKing to become a world-class manufacturer. After evaluation, ElectroKing should consider the "mushroom" concept of manufacturing different product lines to reduce the production lead-time. An example would be for ElectroKing to use only one production line to produce the electrical plug, line, and internal connection for all its products.

Complexity - Excessive number of options.

Potential Actions - Again, because of increased competition by upcoming world-class manufacturers, ElectroKing is trying to meet customer needs by having a variety of optional features for each of its products. Unfortunately, this leads to increased overhead (e.g. accounting) costs, material handling costs, and increased production leadtimes, among others. ElectroKing should consider redesigning each product to reduce the number of potential options, and should investigate ways of providing options more effectively and efficiently. For example if one of the options is three different electrical cord lengths, instead of stocking each product with three different cord lengths, ElectroKing should consider either selling the electrical cords separately (thereby preserving the option), bundling all three cords in each product (also preserving the option), or eliminating the option.

Complexity - Complicated or outdated production activities.

Potential Actions - Since ElectroKing has not modernized its older product lines, there is undoubtedly much room for improvement. ElectroKing should modernize the factory floor, potentially with the introduction of a kanban system with U-shaped work areas. Significant cost and production leadtime reductions should be realized.

- 11.47 a. The machine uptime is calculated as follows:

$$\begin{aligned}
 \text{Machine Uptime} &= 1 - (\text{Hours machine not ready} \div \text{Hours machine is needed}) \\
 \text{Hours machine not ready} &= 0.25 + 2.75 + 1.50 + 2.00 + 3.75 + 2.50 + 0.75 \\
 &= 13.50 \\
 \text{Hours machine is needed} &= 9.50 + 16.25 + 12.50 + 14.00 + 13.75 + 19.25 + 10.75 \\
 &= 96.00 \\
 \text{Machine uptime} &= 1 - (13.50 \div 96.00) \\
 &= \underline{\underline{86 \text{ percent}}}
 \end{aligned}$$

- b. No, this percentage would not be acceptable to a world-class manufacturer. A world-class manufacturer typically expects 100 percent uptime when a machine is required in production. Emphasis is placed on having equipment in peak operating condition all the time.
- c. The foreman has a number of available alternative courses of action which he can implement to increase the machine's uptime percentage, such as:
- Installing a comprehensive preventive maintenance program
 - Training production personnel to perform minor daily preventive maintenance
 - Possibly replacing the machine with a more up-to-date model
 - Overhauling the machine
 - Scheduling replacement parts to be installed before parts in the machine wear out and cause machine downtime
 - Establishing an immediate feedback process when any suboptimal performance is noted in the machine by anyone

- 11.48 a. The only facts that Mr. Wendellson can be sure of are: sales are up 8 percent over last quarter, and actual sales are 3 percent less than the budgeted amount. What are some of the possible causes for the sales increase (List 10) and the variance between actual sales and budgeted sales (List 10)?

Sales increase over last quarter:

1. Seasonality in product sales
2. Product price decreases
3. Competitor price increases
4. Entry into a new geographic market
5. New use in same market
6. Addition of field sales staff
7. New sales training program
8. New sales compensation program
9. Better delivery process
10. Improved advertising program

Actual sales not meeting budgeted sales:

1. Product price increases
2. Competitor price decreases
3. Overly aggressive sales goals
4. Poor delivery process
5. New competitor in the market
6. Product delivery problems
7. Sales staff personnel changes
8. Overly aggressive goal setting
9. New, poorly designed, compensation program for sales force
10. Product shortages

- b. What additional information could be of value to Mr. Wendellson in determining the noted variations (List 10)?
1. What changes have occurred in company and competitor pricing?
 2. Have there been any product shortages?
 3. What percent of the sales staff met its sales goal?
 4. Has there been any change in sales staff compensation?
 5. How was the sales goal developed?
 6. What recent sales staff changes have occurred?
 7. Have there been any changes in the product delivery process?
 8. Is the company expanding its sales territory?
 9. Are the company products subject to seasonal variations?
 10. Has there been any change in corporate advertising?

11.49 WCM Factors:

To become a WCM, SlimCo must adopt and implement a formal customer service performance measurement program. The two significant WCM customer service factors we are concerned with are:

- Delivery of the right products in the right amount at the right time.
- Promptness and willingness to help customers.

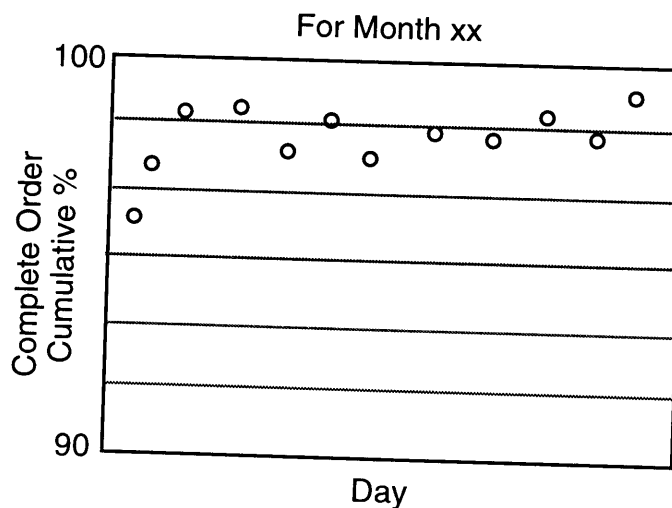
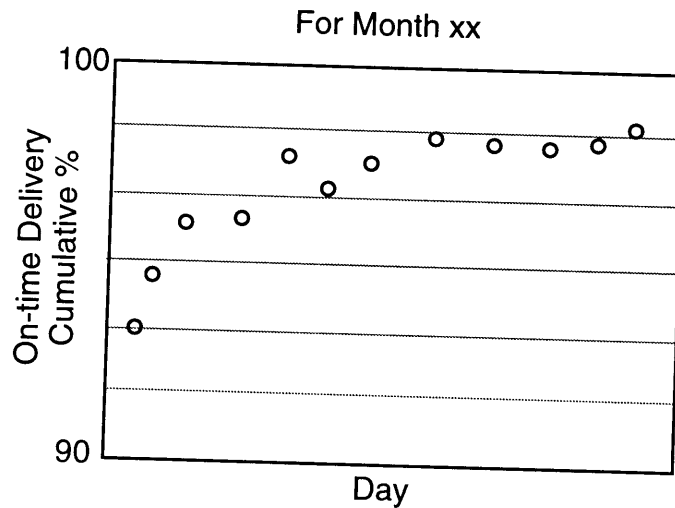
Performance Measurements:

The important performance measurements are:

- On-time delivery
- Complete order filling percentage
- Assistance response time
- Correct order percentage

Visual Factory:

As a WCM, we will need to keep our workers informed of our continuous improvement program. As such, we will encourage the visual factory approach and have some of the following conceptual displays on the factory floor:



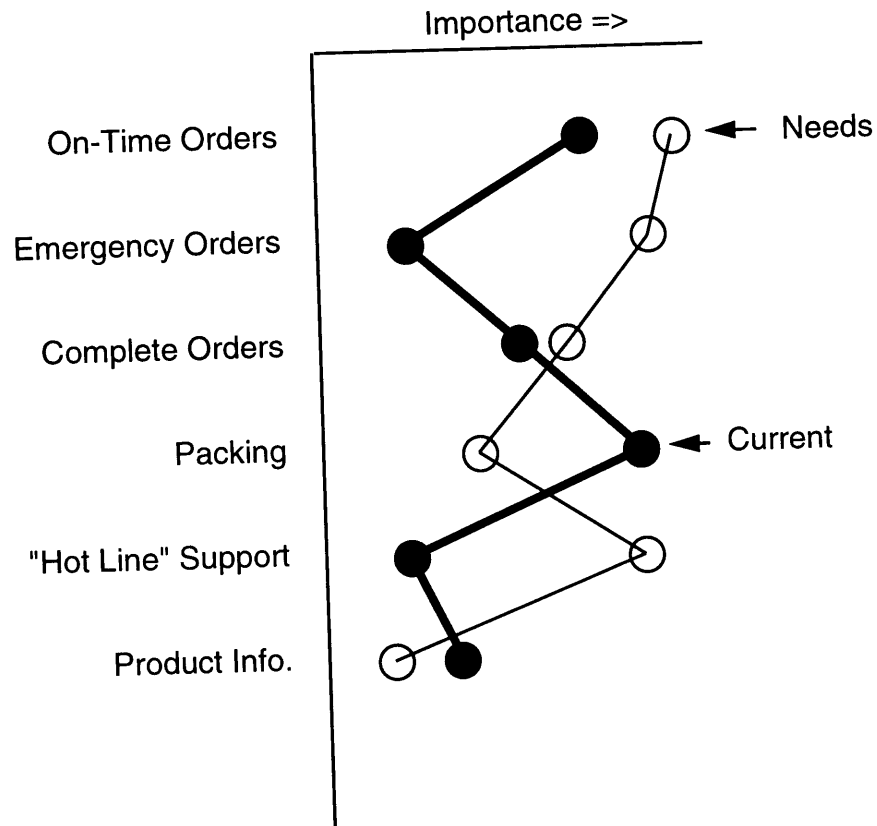
Consumer Input:

Since SlimCo has not had any official or reliable input from our customers, we should send out a customer survey form, like the one following, so that we can determine what performance measurements we need to focus on.

Customer Survey Form:

A suggested survey form is given below. Initial reaction to the form by our customers should be used to improve it.

After receiving the results, we would construct a snake chart, as follows:

Timing

WCM drives us to continuous customer service improvements, and to be aware of our changing customer requirements. We should therefore send our survey each quarter and maintain a close partnership with our customers for continuous feedback of our performance.

SlimCo Customer Survey

Customer: _____ Date: _____

As a valued customer of SlimCo RAM boards, we care about our service to you. In our continuing efforts to improve our service, we ask that you candidly answer the following few questions. If possible, we also greatly appreciate any additional comments on how we specifically can better meet your needs. Your answers will be held in the strictest confidence.

Please circle the appropriate number to indicate our performance. Please place a box around the appropriate number to indicate your requirements.

(0 = not important to 10 = very important)

1) Please rate our ability to make on-time deliveries:

0 1 2 3 4 5 6 7 8 9 10

2) Please rate our ability to handle emergency orders (if you have not had any emergency orders, just indicate your requirements):

0 1 2 3 4 5 6 7 8 9 10

3) Please rate our ability to fill each order completely without any back-orders:

0 1 2 3 4 5 6 7 8 9 10

4) Please rate our ability to provide adequate labeling and packing of orders:

0 1 2 3 4 5 6 7 8 9 10

5) Please rate our ability to provide "Hot-Line" assistance:

0 1 2 3 4 5 6 7 8 9 10

6) Please rate our ability to provide product information with each order:

0 1 2 3 4 5 6 7 8 9 10

7) Please list additional needs, wants, or desires:

If you have any questions, please call Kevin on our toll-free customer support number (800) 555-TALK.