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Homework #6 – Performance Measurement and Strategic Information Management

TECH 50000 - Quality Standards

Wednesday, February 16, 2011

## Chapter 8

### Review Questions

#### 1. Define measurement.

Measurement is the act of quantifying the performance dimensions of products, services, processes, and other business activity.

#### 7. What is the balanced scorecard? Describe its four components.

The balanced scorecard was established and openly published by Analytic Devices and was originally referred to as the “Quality Performance Audit.” It is a one-page summary that combines a set of nonfinancial performance goals with key financial goals. Its purpose is to translate an organization's mission and strategy into a comprehensive set of performance measures and provide the framework for strategic measurement and management. Robert Kaplan and David Norton of the Harvard Business School studied Analog Devices and promoted the balanced scorecard concept in Harvard Business Review articles and books. Their version of the balanced scorecard consists of the following four principles:

1. **Financial Perspective** – Measures the ultimate results that the business provides to its shareholders. They include profitability, revenue growth, return on investment, economic value added (EVA), and shareholder value.
2. **Internal Perspective** – Focuses attention on the performance of the key internal processes that drive the business. They include such measures as quality levels, productivity, cycle time, and cost.
3. **Customer Perspective** – Focuses on customer needs and satisfaction as well as market share. This includes service levels, satisfaction ratings, and repeat business.
4. **Innovation and Learning Perspective** – Directs attention to the basis of a future success—the organization’s people and infrastructure. Key measures might include intellectual assets, employee satisfaction, market innovation, and skills development.

#### 21. What do we mean by validity and reliability of data? Why are these concepts important?

Reliability is the degree to which a tool or test measures the same thing (what it is supposed to measure) each time it is used; how well a measuring instrument consistently measures the true value of a characteristic. Validity is the ability of data to reflect what it is supposed (purports) to measure.

### Discussion Questions

2. Under which perspective of the balanced scorecard would you classify each of the following measurements?

- a) **On-time delivery to customers** – Customer Perspective
- b) **Time to develop the next generation of products** – Innovation and Learning Perspective
- c) **Manufacturing yield** – Internal Perspective
- d) **Engineering efficiency** – Internal Perspective

- e) **Quarterly sales growth** – Financial Perspective
- f) **Percent of products that equal 70 percent of sales** – Financial Perspective
- g) **Cash flow** - Financial Perspective
- h) **Number of customer partnerships** - Customer Perspective
- i) **Increase in market share** - Customer Perspective
- j) **Unit cost of products** – Internal Perspective

**3. How might a SWOT (strengths, weaknesses, opportunities, and threats) analysis be of use for identifying measures in a balanced scorecard? What types of questions might you ask?**

Even though Kaplan and Norton outlined four perspectives (Financial, Internal, Customer, and Innovation and Learning) as the key elements of organizational strategies that must be measured, the balanced scorecard remains a tool for effectively measuring strategy. It is not a tool used for deciding what strategies to measure. Since clarifying an organization’s vision and strategy is the first step in implementing the balanced scorecard, employing a SWOT analysis beforehand to define the set of strategies (the key performance indicators (KPI) with the four main perspectives ) to be measured, makes perfect sense. By linking the SWOT analysis with the balanced scorecard, an organization can balance its strengths against its competitors' weaknesses, and optimize its opportunities within the market. I found the following table on the Wikipedia Website. I thought adding it to this answer would help in showing how the four parts of a SWAT analysis work together with the four perspectives of the balanced scorecard in forming a BSC SWOT matrix. The following is my altered version but the source link is listed below the table.

<b>BSC SWOT Matrix</b>	<b>SWOT</b>				<b>BSC Perspectives</b>
	Strengths	Weaknesses	Opportunities	Threats	
	Financial Strengths	Financial Weaknesses	Financial Opportunities	Financial Threats	Financial
	Customer Strengths	Customer Weaknesses	Customer Opportunities	Customer Threats	Customer
	Internal Strengths	Internal Weaknesses	Internal Opportunities	Internal Threats	Internal
People Strengths	People Weaknesses	People Opportunities	People Threats	Innovation & Learning (People)	

**NOTE: Opportunities and Threats should be considered from the external perspective as well.**

Source: [http://en.wikipedia.org/wiki/BSC\\_SWOT](http://en.wikipedia.org/wiki/BSC_SWOT)

Types of questions an organization might ask when conducting a SWOT analysis are listed below by category.

**Strengths**

1. Are there any unique or distinct advantages that make our organization stand out in the crowd?

2. What makes the customers choose our organization over our competition?
3. Are there any products or services in which our competition cannot imitate (now and in the future)?
4. What are our internal strengths?

### **Weaknesses**

1. Are there any operations or procedures that can be streamlined?
2. What and why does our competition operate better than our organization?
3. Is there any avoidance that our organization should be aware of?
4. Does our competition have a certain market segment conquered?

### **Opportunities**

1. What and where are the attractive opportunities within our marketplace?
2. Are there any new emerging trends within the market?
3. What does our organization predict in the future that may depict new opportunities?

### **Threats**

1. What is our competition doing that is suppressing our organizational development?
2. Are there any changes in consumer demand, which call for new requirements of our products or services?
3. Is the changing technology hurting our organization's position within the marketplace?

**7. In making cheese, companies test milk for somatic cell count to prevent diseases. They also test for bacteria to determine how clean the milk is and perform a freezing-point test to see whether the milk was diluted with water (milk with water in it freezes at a lower temperature, which increases production costs because all the excess water must be extracted). Final cheese products are subjected to tests for weight, for presence of foreign elements or chemicals, and for taste and smell. What customer-related measures might interlink with these internal measures?**

I would say that measures of customer perceived value, complaints, loyalty, and positive referral would interlink with the internal measures of making cheese. Reason being, if the making of cheese is not completed as it should, customers may complain of sickness, bad taste, or just overall bad quality and the business will suffer. Since it seems like all these processes that are included in making cheese are very important, these customer-related measures should be seriously taken into consideration. Not only might the company lose market share from making a bad product, they may end up with a law suit on their hands if someone gets sick. I have to mention, I knew a family that lived close to my parents who had a huge milking farm. I had the pleasure of getting to spend a day helping them milk the cows. Thanks to electronic milkers, we were able to milk 125 cows in three hours flat. I will tell you one thing, the testing of milk starts before the milkers are even connected to the cow's udders. The udders have to be squeezed by hand first to make sure that the cow doesn't have mastitis. You can tell if they do because it comes out like cottage cheese curds. Ewe! Anyway, the milk from all cows travels through the tubes connected to the electronic milkers and empties into the same huge tank. If one infected cow gets through, the entire tank is contaminated! What a waste, wouldn't you say? It was a good experience other than I left there smelling like you know what. I thought I'd never get that smell off of me! LOL! Just thought you'd find that story interesting!

## Problems

4. Analyze the following cost data for Product B. What are the implications of these data for management? Chart these data. Calculate the quality indices as a relationship to the cost of sales. How do these data differ from those given in problem 1?

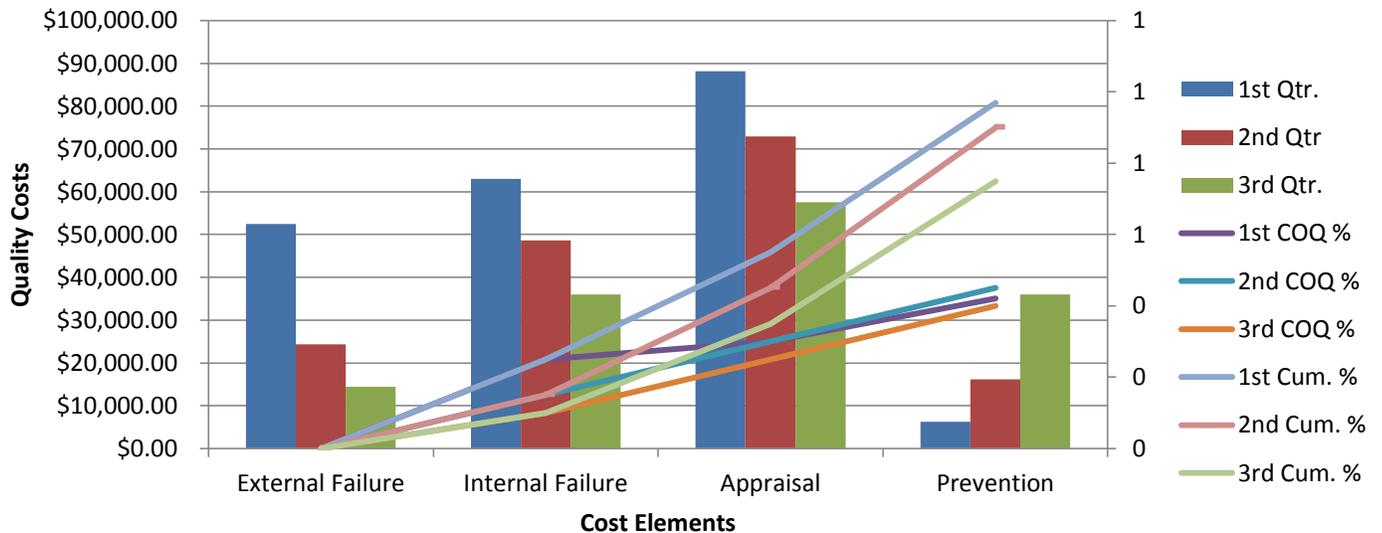
Product B			
	1 Qtr.	2 Qtr.	3 Qtr.
Total Sales	\$1,000,000	\$900,000	\$1,200,000
Quality Categories as a percentage of Quality Cost			
External Failure	<b>25%</b>	<b>15%</b>	<b>10%</b>
Internal Failure	<b>30%</b>	<b>30%</b>	<b>25%</b>
Appraisal	<b>42%</b>	<b>45%</b>	<b>40%</b>
Prevention	<b>3%</b>	<b>10%</b>	<b>25%</b>
Total Quality Costs	\$210,000	\$162,000	\$144,000
<i>Note: Bold figures represent percentages of quality costs by product.</i>			

This problem is different than problem #1 in that it contains time-phased data, which makes it possible to calculate an index base and quarterly indices for the various cost categories. The data show that the external and internal failure indices, as well as the appraisal index, are declining, while the prevention index is increasing. The overall quality cost index as a percent of sales is also declining. This is an ideal situation in which managers of the B product line are continuing to put more emphasis on prevention and attempting to reduce costs in other categories. Using the information listed above which was taken from the question in the book, the following page contains my chart with an excel sheet. It's probably not what you were expecting, but as much as I researched, I could not find a way to show the data for each quarter in the same chart any other way, although I am sure there is a better way. Please forgive the page breaks. I did it that way to keep the contents of the charts and graphs together.

## Product B

Cost Elements	1st Qtr.	2nd Qtr.	3rd Qtr.
External Failure	\$52,500.00	\$24,300.00	\$14,400.00
Internal Failure	\$63,000.00	\$48,600.00	\$36,000.00
Appraisal	\$88,200.00	\$72,900.00	\$57,600.00
Prevention	\$6,300.00	\$16,200.00	\$36,000.00
<b>Total Quality Costs</b>	<b>\$210,000.00</b>	<b>\$162,000.00</b>	<b>\$144,000.00</b>
% of COQ	1st COQ %	2nd COQ %	3rd COQ %
External Failure	25%	15%	10%
Internal Failure	30%	30%	25%
Appraisal	42%	45%	40%
Prevention	3%	10%	25%
<b>Total % of COQ</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
Cumulative % of COQ	1st Cum. %	2nd Cum. %	3rd Cum. %
External Failure	25%	15%	10%
Internal Failure	55%	45%	35%
Appraisal	97%	90%	75%
Prevention	100%	100%	100%
<b>Total Sales</b>	<b>\$1,000,000.00</b>	<b>\$900,000.00</b>	<b>\$1,200,000.00</b>
<b>Total Profit</b>	<b>\$790,000.00</b>	<b>738,000.00</b>	<b>\$1,056,000.00</b>

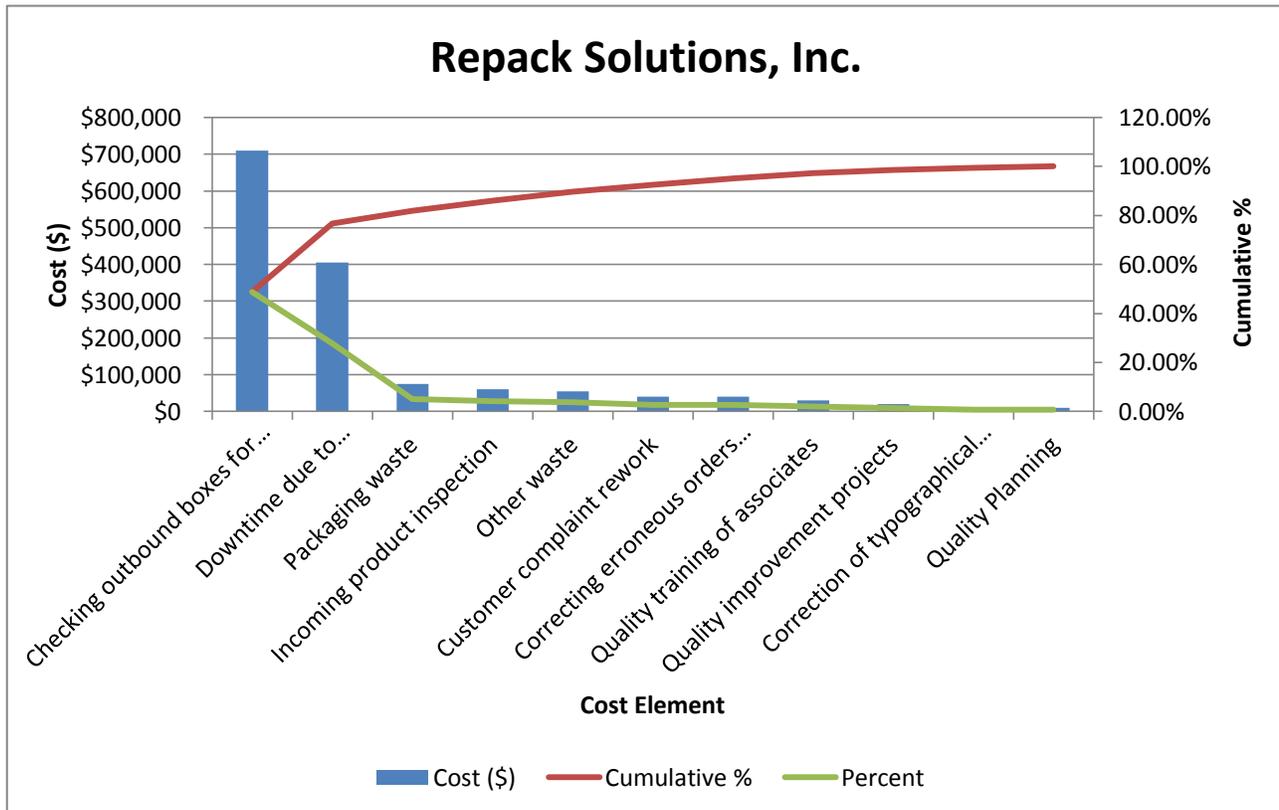
## Product B



10. Repack Solutions, Inc. has a distribution center in Cincinnati where it receives and breaks down bulk orders from suppliers' factories and ships out products to retail customers. Prepare a graph or chart showing the different quality cost categories and percentages for the company's quality costs that were incurred over the past year.

Spreadsheet data and the Pareto chart for Repack Solutions, Inc. show that the company is spending too much on appraisal and internal failure cost and too little on prevention. Checking boxes, machine downtime, and packaging waste need immediate improvement to have the greatest impact on quality costs because they constitute almost 82% of quality costs. However, it should be done with caution because "checking boxes" represents appraisal costs designed to screen out poor quality and prevent it from reaching the customer.

Cost Element	Cost (\$)	Percent	Cumulative %	QC Category
Checking outbound boxes for errors	\$710,000	48.80%	48.80%	Appraisal
Downtime due to conveyor/computer problems	\$405,000	27.84%	76.63%	Internal Failure
Packaging waste	\$75,000	5.15%	81.79%	Internal Failure
Incoming product inspection	\$60,000	4.12%	85.91%	Appraisal
Other waste	\$55,000	3.78%	89.69%	Internal Failure
Customer complaint rework	\$40,000	2.75%	92.44%	External Failure
Correcting erroneous orders before shipping	\$40,000	2.75%	95.19%	Internal Failure
Quality training of associates	\$30,000	2.06%	97.25%	Prevention
Quality improvement projects	\$20,000	1.37%	98.63%	Prevention
Correction of typographical errors – pick tickets	\$10,000	0.69%	99.31%	Internal Failure
Quality Planning	\$10,000	0.69%	100.00%	Prevention
<b>Total</b>	<b>\$1,455,000</b>			



**12. Given the following cost elements, determine the total percentage in each of the four major quality cost categories for the HiTeck Tool Company.**

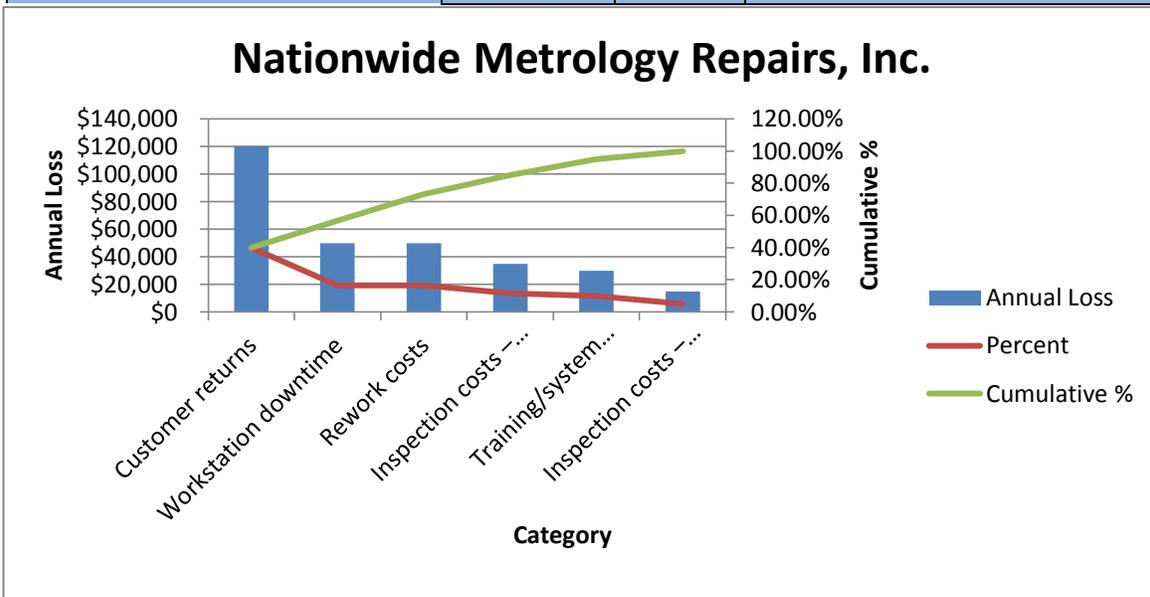
For HiTeck Tool Company, the largest costs are internal failure (56.6%) and appraisal (27.1%). More must be done in quality training, a component of prevention (currently 7.8%), if failure, appraisal, and overall quality costs are to be controlled. External failure costs are 8.6% of quality costs, so screening methods are working fairly well.

<i>HiTeck Tool Company</i>	<b>Quality Cost Categories</b>		
<b>Cost Elements</b>	<b>Cost (\$)</b>	<b>Subtotal</b>	<b>% of Total</b>
<b><u>Appraisal</u></b>			
Inspection	\$25,000		
Setup for test and inspection	\$10,750		
Formal complaints to vendors	\$10,000		
Incoming test and inspection	\$7,500		
Test	\$5,000		
Inspection equipment calibration	\$2,500		
Laboratory services	\$2,500		
Laboratory testing	\$1,250		
Design of quality assurance equipment	\$1,250		
Material testing and inspection	\$1,250		
		<b>\$67,000</b>	<b>27.08%</b>
<b><u>Prevention</u></b>			
Maintenance of tools and dies	\$9,200		
Quality control administration	\$5,000		
Quality audits	\$2,500		
Writing procedures and instructions	\$2,500		
Quality training	\$0		
		<b>\$19,200</b>	<b>7.76%</b>
<b><u>Internal Failure</u></b>			
Rework	\$70,000		
Scrap	\$35,000		
Rework due to vendor faults	\$17,500		
Quality problem-solving by product engineers	\$11,250		
Correcting imperfections	\$6,250		
		<b>\$140,000</b>	<b>56.58%</b>
<b><u>External Failure</u></b>			
Adjustment cost of complaints	\$21,250		
		<b>\$21,250</b>	<b>8.59%</b>
<b>Total Costs</b>		<b>\$247,450</b>	<b>100.00%</b>

**13. Nationwide Metrology Repairs, Inc. has a thriving business repairing and upgrading high technology measuring instruments. The following are costs of quality that they have collected over the past year. Use Pareto analysis to investigate their quality losses and to suggest which areas they should address first in an effort to improve their quality.**

The Pareto analysis below show that Nationwide’s total loss for the year is because of customer returns due to workstation downtime and rework cost. They need to put more into their training and system improvement in terms of all company processes. Improving the workstation and all its components will cut back on rework costs due to customer returns.

Category	Annual Loss	Percent	Cumulative %	QC Category
Customer returns	\$120,000	40.00%	40.0%	External Failure
Workstation downtime	\$50,000	16.67%	56.7%	Internal Failure
Rework costs	\$50,000	16.67%	73.3%	External Failure
Inspection costs – outgoing	\$35,000	11.67%	85.0%	Appraisal
Training/system improvement	\$30,000	10.00%	95.0%	Prevention
Inspection costs – incoming	\$15,000	5.00%	100.0%	Appraisal
<b>Total</b>	<b>\$300,000</b>	<b>100.00%</b>		



I hope I did ok on these charts. I haven’t worked with charts for a while. I did really put a lot of work into them, and I’m glad because it helped me learn new things that can be done with charts and excel sheets. I did all the formula calculations within Excel. It took a lot of time, but I had fun doing it. I found a really cool program that performs just about every type of analysis you can think of. I downloaded the trial version and it is great! However, it is very expensive. I didn’t use it for these as you can see. If you’d like to check it out, just visit the link below.

<http://www.tableausoftware.com/>