

INFLUENCE OF THE QUALITY COSTS ON ACHIEVING THE QUALITY GOALS

Pravdić Predrag ¹⁾

Abstract: Many scientists have pointed out the importance of defining the quality that is needed if we are to manage quality in an objective way. The true challenge is ensuring that such compliance consistently adds value to the organization and helps it achieve its quality goals. Part of the difficulty comes from the different types of quality goals, criteria for acceptable performance, and performance specifications that are being recommended. The Balanced Scorecard approach not only provides a measure of non-financial performance; it links the measurement to strategy. An important element of the Balanced Scorecard is identifying the goals of the company and the steps to achieve these goals. Companies use sophisticated analytic tools to review the performance of their strategies, including customer relationship management software and analytic modeling to capture and profile customer behaviour. With the process cost modeling, costs are clearly related to specific areas within a process. Monitoring of a project aimed at improving quality within a process can be conducted using the process cost model to mark the cost before and after the project. Changes in cost within a stable process will be directly related to the project. The process cost modeling provides a report with more detailed costs. This can be used as part of the problem solving processes to select, record, evaluate and monitor areas that are increasingly expensive. This article explains the costs of quality as a more comprehensive concept covering the costs of poor quality and the costs of good quality. In short, any cost that would not have been expended if quality was perfect contributes to the cost of quality.

Key words: quality, quality costs, quality goals, balanced scorecard.

1. INTRODUCTION

Many scientists have pointed out the importance of defining the quality that is needed if we are to manage quality in an objective way. Quality is being relative and we have to be able to compare what we doing with some "standard." Virtually any organization can go through the motions of creating and implementing processes that comply with ISO 9001:2000's requirements. The true challenge is ensuring that such compliance consistently adds value to the organization and helps it achieve its quality goals.

ISO 9001:2000 offers a basic quality management system focused on meeting customer requirements. They can align quality and business objectives, use process management techniques and integrate continual improvement activities into their business plans. Part of the difficulty comes from the different types of quality goals, criteria for acceptable performance, and performance specifications that are being recommended.

Costs do not result from only producing and fixing failures; a high amount of costs comes from ensuring that good products are produced. This article explains the costs of quality as a more comprehensive concept covering the costs of poor

quality and the costs of good quality. In short, any cost that would not have been expended if quality was perfect contributes to the cost of quality.

2. PROCESS COSTS MODELING BY KAPLAN AND NORTON

The financial standing of a business is of great concern to management. Budgeting, fixed costs, accounting departments are all part of day to day business life. Quality, or the lack of quality, results in a cost that requires measuring and reporting on in some form. The traditional approach to quality economics uses prevention, appraisal, internal failure and external failure as the four areas for data gathering. The process cost modeling does exactly what it's title suggests. The costs are based directly on individual processes. These costs include labour, materials, resources, standards etc. The concept of the traditional approach is relatively easy to understand. Teaching managers the theory of the traditional approach takes less time. The process cost model is a relatively new idea. It follows current quality ideas such as identifying and documenting processes. The traditional approach came into use in the 1950's. It therefore has factual data to back up the theory.

1) Pravdić Predrag, Mašinski fakultet Kragujevac, posleddiplomske studije: industrijski inženjering

However this is an old idea. With the process cost modeling, costs are clearly related to specific areas within a process. Monitoring of a project aimed at improving quality within a process can be conducted using the process cost model to mark the cost before and after the project. Changes in cost within a stable process will be directly related to the project. Reports produced using the traditional approach are aimed at budgeting for departments or companies. This allows a holistic view of quality costs. The process cost modeling provides a report with more detailed costs. This can be used as part of the problem solving processes to select, record, evaluate and monitor areas that are increasingly expensive.

Kaplan and Norton introduced the Balanced Scorecard in 1992, because they believed that financial indicators alone were insufficient to measure performance. Managers that rely exclusively on financial measurements are encouraged to sacrifice long-term improvement for short-term performance. The Balanced Scorecard approach supplements financial measurements with non-financial measures that indicate the actions that increase future financial performance.

Strategy maps and Balanced Scorecards help companies translate, communicate, and measure their strategies. Companies also employ TQM methodologies – six sigma, kaizen, and assessment methodologies from the Malcolm Baldrige and EFQM award programmes – to promote continuous improvements in the efficiency and responsiveness of their operating processes. For radical process improvements, they deploy reengineering approaches. - (taken from [3])

The Balanced Scorecard approach not only provides a measure of non-financial performance; it links the measurement to strategy. An important element of the Balanced Scorecard is identifying the goals of the company and the steps to achieve these goals. The Balanced Scorecard also reflects the change in technology and competitive advantage that came about in the 20th century. An increase in the importance of intangible assets, such as customer relationships and skills and knowledge of employees, has created the need for non-financial measurements. It is very difficult to measure the value of intangible assets. The value of intangibles is indirect and cannot be identified as separate from the context of the organization. The value arises from the collection of intangible

assets and their implementation strategy. The Balanced Scorecard approach does not try to “value” an organization’s intangibles, but it does measure these assets in units other than currency. The Balanced Scorecard was introduced as one of the newest management tools. The purpose was to allow organizations to be better able to use their intangible assets. The balanced scorecard is to be used as a supplement to traditional financial measures. The scorecard can help top-level management link the long-term strategy with the short-term actions.

Kaplan believes that the direct costing approach is misleading for most other product related decisions. Traditional direct costing can predict short-run results in organizations because it focuses on the fluctuations in products’ volume and mix, keeping some expenses fixed.

According to Kaplan, the so-called fixed costs can be explained by the diversity of the company’s products, customers, distribution channels, and product lines. The activity-based approach attempts to penetrate the big blob of “fixed costs” and show that most if not all of these costs are really variable.- (taken from [2])

Kaplan sites situations where many overhead resources are not consumed in proportion to the number of units produced , but are consumed by product-related activities. Managers rarely think of measurements as part of their strategy even though they recognize their importance for evaluating performance. New strategies and processes are being introduced to improve performance without examining whether old measures of performance are relevant or whether new ones are necessary.

The balanced scorecard combines an effective measurement system that helps solidify a company’s strategic objectives with a management system that can help drive change in key areas such as product, process, customer, and market development. The scorecard gives managers four different perspectives to choose measures from (financial, customers, internal processes, and innovation and improvement activities). The measures of the balanced scorecard helps focus a company’s strategic vision, encourages thinking about current and future success and helps provide a balance between external and internal measures.

An example scorecard is provided for a company called Electronic Circuits Incorporated (ECI) – table 1. - (taken from [1])

| Perspectives | Questions | Goals | Measurements |
|-----------------------|--|---------------------------|---|
| Customer | How do customers see us? | New products. | Percent of sales from new products. |
| | | Responsive supply. | On-time delivery as defined by the customer. |
| | | Preferred supplier. | Share of key account's purchases. |
| | | Customer partnership. | Number of cooperative engineering efforts. |
| Internal business | What must we excel at? | Technology capability. | Manufacturing geometry versus the competition. |
| | | Manufacturing excellence. | Cycle time, Unit cost and Yield. |
| | | Design productivity. | Silicon efficiency and Engineering efficiency. |
| | | New product introduction. | Actual introduction schedule versus planned introduction. |
| Innovation & learning | Can we continue to improve & create value? | Technology leadership. | Time to develop the next generation. |
| | | Manufacturing learning. | Process time to maturity. |
| | | Product focus. | Percent of products that equal 80% of sales. |
| | | Time to market. | New product introduction versus the competition. |
| Financial | How do we look to shareholders? | Survive. | Cash flow. |
| | | Succeed. | Quarterly sales growth and operating income by division. |
| | | Prosper. | Increased market share and Return on Equity. |

Table 1.- ECI 's Balanced Scorecard

The Balanced Scorecard helps form a strategy for this implementation, but it is not designed to be used as a blueprint because every company is different. Companies have different goals, different customers, and different industries. This is precisely the reason why the Balanced Scorecard is needed to help form one strategy for the business and bring all areas of that business to work in harmony for the achievement of that one goal. The structure and strategy of an organization must be reflected in the Balanced Scorecard. It is possible that an organization consists of strategic business units that have their own scorecard, and these individual scorecards cannot be combined into one larger scorecard. In that instance, overall performance of the organization usually provides the measurement of how well the individual scorecards are doing. It is best to try and find a common theme or strategy that can traverse all units of business. When this occurs, the role of the larger scorecard would be to police the individual scorecards and measure how effective they are in achieving the common strategy. The Balanced Scorecard is designed to bring together a company

to focus on the structure of the company and to achieve the overall goal.

The process of developing a good Balanced Scorecard gives an organization, usually for the first time, a clear picture of the future and a path for getting there. Every step of the way provides insight on how to improve the business process of achieving the one strategy. According to the Kaplan and Norton, "This distinction between a measurement and a management system is subtle but crucial. The measurement system should be only a means to achieve an even more important goal - a strategic management system that helps executives implement and gain feedback about their strategy."

The scorecard allows managers to introduce four new processes;

1. translating the vision,
2. communicating and linking,
3. business planning, and
4. feedback and learning. - (taken from [10])

Translating the vision is a means of expressing the mission/vision statements with an integrated set of objectives and measures. This forces the top

management to develop operational measures, which requires them to discuss, and eventually agree on, a means of achieving the goals of the company. Communicating and linking is a process that facilitates the communication of strategies throughout the entire organization. Departmental and individual objectives must be aligned with the strategy through evaluation procedures and incentives. To have goal congruence between the individual employees and the company, scorecard users engage in three activities: communicating and educating, setting goals, and linking rewards to performance measures which are in turn linked to the overall strategy. Communicating and educating is achieved by maintaining policies that ensure all employees are aware of the strategies of the organization. Also, it is important for the lower level employees to be able to communicate upwards about whether or not the strategies are realistic from the competitive or operational perspective. Setting goals alone is not sufficient to change employee's mind-set. Linking rewards to performance is an important incentive to help an organization achieve its purpose. What the balanced scorecard adds to the traditional means of linking rewards to financial performance is that it takes a more holistic look at the organization. It

ensures that the correct criteria are used as a measure of performance before rewards are given. Business planning is the third process used by managers with the balanced scorecard. By using the scorecard, businesses will integrate their strategic planning and budgeting processes. This makes sure that the budgets support the strategies of the company. The users of the scorecard pick measures that represent each of the four perspectives, and then set targets for each. Then they will decide which specific actions will help them in reaching those targets. Using short-term milestones to evaluate the progress toward the strategic goal is what results from using the balanced scorecard. The fourth, and final, process is feedback and learning. With the balanced scorecard in place managers can monitor feedback and relate this to the strategy.

Companies that have a program of measurement installed in their organizations typically also have better teamwork and communication. The following illustration (table 2.) shows that, on average, a "balanced measurement company" seems to have more alignment than a "non-balanced measurement company". - (taken from [11])

| Elements of Alignment and Awareness | Balanced Measurement Companies | Non-Balanced Measurement Companies |
|--|--------------------------------|------------------------------------|
| Agreement among senior management strategy | 90% | 47% |
| Good cooperation and teamwork among management | 85% | 38% |
| Open sharing and communication | 71% | 30% |
| Effective communication of strategy | 60% | 8% |
| High levels of self-monitoring by employees | 42% | 16% |

Table 2. – Elements of Alignment and Awareness

Some companies have difficulty implementing the BSC because of transitional, design, and process issues. Transitional issues occur when the company wants to down-size or cut costs. They look at the BSC as part of the problem. They throw out the ideas the BSC offers, and try to ingrain their own ideas into the organization. Design failure is when the BSC has too many or too few measures or objectives. The measures can't be linked to the BSC, or the BSC doesn't have enough linkages. Process failure occurs when any of the following are present:

1. Lack of senior management commitment.
2. Too few individuals involved.
3. Keeping the BSC at the top.
4. Too long a development process; the BSC as a one-time measurement project.

5. Treating the BSC as a systems project.
6. Hiring inexperienced consultants.
7. Introducing the BSC only for compensation.

The BSC should be used as a tool of communication and linking strategy. It would be wise to try and avoid the pitfalls discussed in the above summary in order to reap the rewards of the BSC.

3. MODELING THE QUALITY COSTS – ABC AND BSC

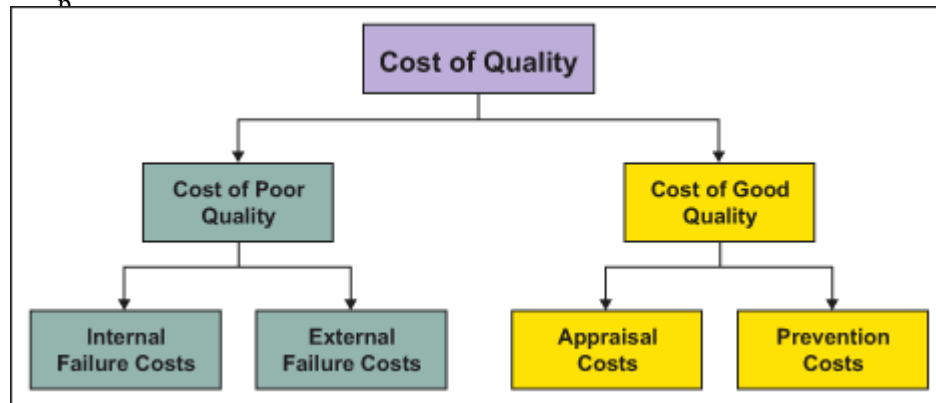
As defined by Philip B. Crosby in his book "Quality Is Free", the cost of quality has two main components: the cost of good quality (or the cost

of conformance) and the cost of poor quality (or the cost of non-conformance). As picture 1. shows:

- The cost of poor quality affects :
 - Internal and external costs resulting from failing to meet requirements.
- The cost of good quality affects :
 - Costs for investing in the

ntion of non-conformance to requirements.

- Costs for appraising a product or service for conformance to requirements.



Picture 1. Cost of Quality

Internal failure costs are costs that are caused by products or services not conforming to requirements or customer/user needs and are found before delivery of products and services to external customers. They would have otherwise led to the customer not being satisfied. Deficiencies are caused both by errors in products and inefficiencies in processes. Examples include the costs for :

- Rework
- Delays
- Re-designing
- Shortages
- Failure analysis
- Re-testing
- Downgrading
- Downtime
- Lack of flexibility and adaptability.

External failure costs are costs that are caused by deficiencies found after delivery of products and services to external customers, which lead to customer dissatisfaction. Examples include the costs for :

- Complaints
- Repairing goods and redoing services
- Warranties
- Customers' bad will
- Losses due to sales reductions
- Environmental costs.

Prevention costs are costs of all activities that are designed to prevent poor quality from arising

in products or services. Examples include the costs for :

- Quality planning
- Supplier evaluation
- New product review
- Error proofing
- Capability evaluations
- Quality improvement team meetings
- Quality improvement projects
- Quality education and training.

Appraisal costs are costs that occur because of the need to control products and services to ensure a high quality level in all stages, conformance to quality standards and performance requirements. Examples include the costs for :

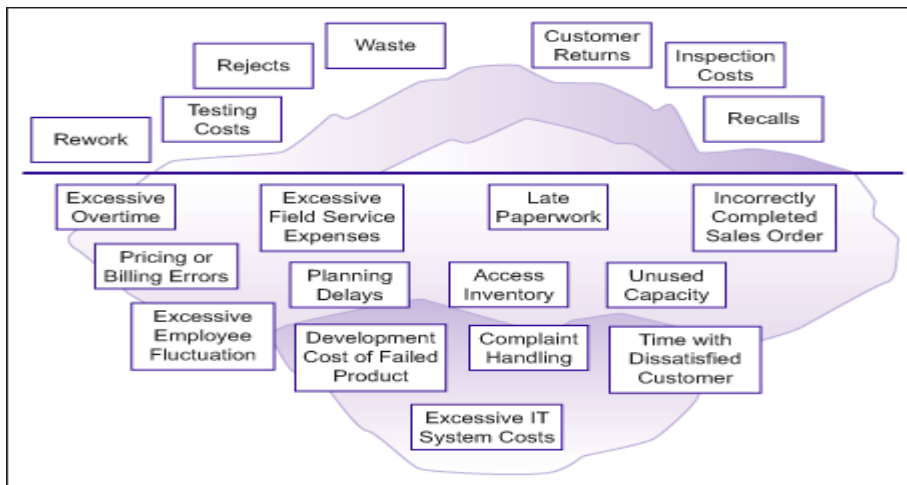
- Checking and testing purchased goods and services
- In-process and final inspection/test
- Field testing
- Product, process or service audits
- Calibration of measuring and test equipment.

The total quality costs are then the sum of these costs. They represent the difference between the actual cost of a product or service and the potential (reduced) cost given no substandard service or no defective products.

Many of the costs of quality are hidden and difficult to identify by formal measurement systems. The iceberg model (picture 2.) is very often used to illustrate this matter: Only a minority of the costs of poor and good quality are obvious –

appear above the surface of the water. But there is a huge potential for reducing costs under the water.

Identifying and improving these costs will significantly reduce the costs of doing business.

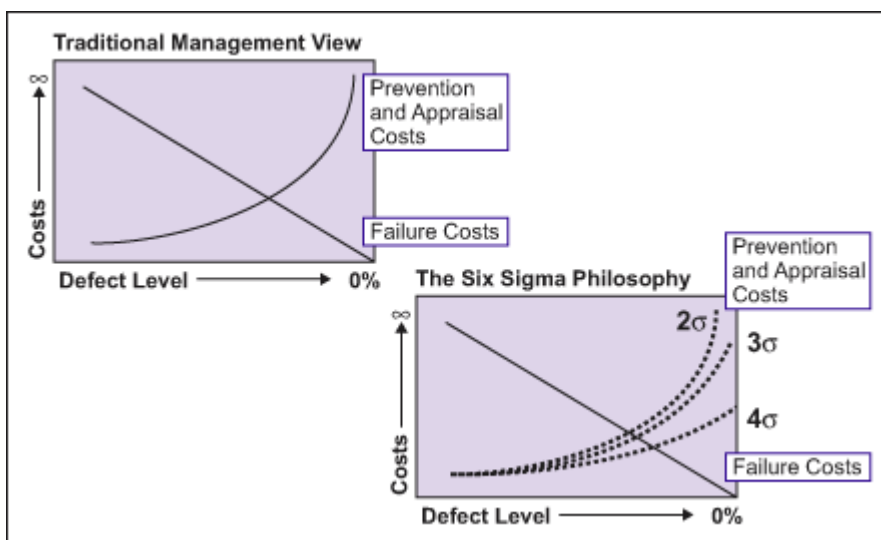


Picture 2. The Iceberg Model of Cost Quality

What is the relation between the cost of good quality and the cost of poor quality ? The traditional view would be to conclude that if a company wants to reduce defects and by this reduce the cost of poor quality, the cost of good quality would have to be increased, meaning higher investments in any kind of checking, testing, evaluation, training of operators, etc. Following the Six Sigma philosophy, however, of building quality into process, service and products and doing things right the first time, the increase of

the cost of good quality, while striving for zero defect performance, can be smoothed if processes get better.

As picture 3. shows, business processes with better process sigma will have significantly lower prevention and appraisal costs. Although you will never fully eliminate appraisal and prevention costs (as opposed to failure costs that in an ideal zero defect world would also be zero), their reduction due to better process performance will be significant.



Picture 3. Traditional Management View vs. Six Sigma Philosophy

Table 3. shows how dramatically the cost of quality as a percentage of sales decreases if the process sigma improves. - (taken from [6])

| Sigma Level | DPMO | Cost of Quality as Percentage of Sales |
|-------------|---------|--|
| 2 | 298,000 | More than 40% |
| 3 | 67,000 | 25-40% |
| 4 | 6,000 | 15-25% |
| 5 | 233 | 5-15% |
| 6 | 3.4 | Less than 1% |

Table 3. – Sigma Level and the Cost of Quality

Assuming that the average performance of a company is 3 sigma, 25 percent to 40 percent of its annual revenue gets chewed up by the cost of quality. Thus, if this company can improve its quality by 1 sigma level, its net income will increase hugely.

In many circles, the term “quality” is understood as shorthand for Total Quality Management (TQM), or its close cousin, Continuous Quality Improvement (CQI). Some may believe that these fads peaked and retreated in the last century; however, recent modeling and examples of the pursuit, by individual institutions, of the Malcolm Baldrige Awards or ISO 9001 recognition that TQM still has a foothold in management of the companies. - (taken from [6])

The International Standards Organization makes the central principle of the pursuit of quality clear—to establish processes that will maximize service to customers. The first iteration of TQM/CGI provoked a debate about its social as well as technical implications, and demonstrated the disconnect between the philosophy of the management process and the purposes of the companies for which it was being proposed.

It is good that companies now have a large number of strategic and operational tools to choose from, but they still lack a theory or framework to guide the successful integration of the many tools. Companies struggle with the question of how to make these various strategy planning and operational improvement tools work together in a coherent system. The implementation of the tools is ad hoc, with little interchange and coordination. As a consequence, the tools don’t work coherently to drive results through the organization. Much of what we advocate is common sense; it’s a system that connects the dots among all a company’s myriad current tools and methodologies so that they can all be focused on an over-arching goal: successful execution of a company’s strategy.

Companies need to translate their strategic plan’s revenue targets into a sales forecast. Whether done annually or quarterly, any operating plan is launched from a sales forecast, a task facilitated by analytic approaches such as driver-based planning. Anticipating the need to derive a

detailed operating plan, the sales forecast should incorporate the expected quantity, mix, and nature of individual sales orders, production runs, and transactions.

Companies use sophisticated analytic tools to review the performance of their strategies, including customer relationship management software and analytic modeling to capture and profile customer behaviour. Activity-based costing is used to assess product and customer profitability, key indicators of strategy success.

Companies can use a time-driven activity-based costing (TDABC) model to translate detailed sales forecasts into estimates of the resource capacity required for the forecast periods. Activity-based costing has been widely promoted as a tool to measure the cost and profitability of processes, products, customers, channels, regions, and business units. But its “killer app” is for resource planning and budgeting. Because a TDABC model uses capacity drivers, typically time, to map resource expenses to the transactions, products, and customers handled by each process, such a model can easily translate the forecasts of sales and process improvements into the quantity of resources – people, equipment, and facilities – required to fulfil the plan.

Activity-based costing (ABC) was developed to correct another defect in financial systems—the inability of traditional costing systems to identify the drivers of indirect and support costs (Kaplan and Cooper 1998). ABC operates by relating organizational spending to activities and processes that support the design, production, marketing, and delivery of products and services to customers.

- The first linkage between ABC and the BSC occurs in the operational measures of the BSC’s internal process perspective. Three parameters—cost, quality, and time—usually define the operating performance of any process. Quality and time are relatively easy to measure since they are based on physical measurements. Cost, however, is an analytic concept that cannot be measured by a stopwatch or a laser-gauging instrument. Only with an ABC model can organizational expenses be accurately traced to processes of product

development, marketing and sales, manufacturing, distribution, and service delivery.

- A second linkage occurs when an ABC model is used to measure the profitability of individual customers. The BSC customer perspective typically includes customer outcome measures such as acquisition, satisfaction, retention, account share, and market share. But companies also need to measure whether their loyal, satisfied customers are profitable. Balancing measures such as customer profitability or percentage of unprofitable customers help managers ensure they are not improving their customer measures at the expense of high-level financial profitability measures.
- A third linkage arises when the ABC model is used for activity-based budgeting: combining information on the forecasted volume and mix of products and services with anticipated activity and process efficiencies to construct a bottom-up budget for forthcoming periods. With the BSC providing the management process for defining the strategic budget, and activity-based budgeting used to develop the operational budget, managers have powerful analytic tools for their budgeting processes.

ABC can also be combined with shareholder value management by applying ABC principles to assign assets to activities and then to cost objects. This enables capital costs and residual income to be calculated at the individual product and customer level.

4. CONCLUSION

As magnitude of the conformity of products to the desired level increases, money incurred because of the imperfections in the products decreases. In short, as costs of achieving good quality rises, costs of poor quality falls. Therefore in a quality cost model, a relationship exists between conformance and nonconformance costs. Increased conformance costs will lead to a reduction in nonconformance costs. On the other hand, excess spending in conformance costs will lead to high total quality costs because they will exceed the reduction in failure costs. As a result, this brings one to the conclusion that when the costs of conformance are balanced with the costs of nonconformance, total quality cost may pass through a near optimum point.

The balanced scorecard combines an effective measurement system that helps solidify a company's strategic objectives with a management system that can help drive change in key areas such as product, process, customer, and market development. The measures of the balanced scorecard helps focus a company's strategic vision,

encourages thinking about current and future success and helps provide a balance between external and internal measures. This broad view helps managers see what trade offs they are making among their key success factors. The organization's measurement system affects the behavior of managers and employees. But many senior managers recognize that no single measurement can provide enough information about the critical areas of the business. Therefore, a balanced set of measurements is needed.

Organizations today use decentralized business units that focus on intangible knowledge, capabilities, and relationships created by employees. Some organizations understand that strategy must become a continual and participative process. The change from centralized command, and financial measures that come from past actions can no longer measure the objectives that need to be addressed. We must measure the strategy and the best tool to do this is balanced scorecard.

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