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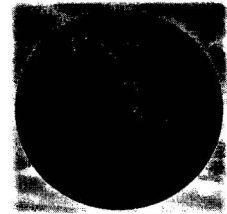


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# History of Business Performance Measurement



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## Glossary

**cash flow** Cash receipts minus cash disbursements.

**economies of scale** The reduction in the cost of producing goods and services because of increasing size of the producing organization.

**effectiveness** A measure of the relationship of outputs to goals or objectives.

**efficiency** A measure of the relationship of inputs to outputs.

**performance** Behavior that leads to a measured value outcome in the future. It is context specific.

**therbligs** A set of actions defined by Frank and Lillian Gilbreth for use in time and motion studies.

This history of performance measurement focuses on the development of performance measurement in commercial organizations over the past 500 years. As would be expected, performance measurement over the centuries has been directed at providing stakeholders with a picture of their organization. As the model of business and technology shifted, so did the need for the information to understand the performance of the organization. Models that are viewed as having significant defects today, such as return on investment, did provide useful information for the organizations for which they were designed. There is a continuing challenge to develop a measurement system that effectively and efficiently captures organizational performance in a timely fashion. The highlights of the evolution of performance measurement covered here exemplify changes to performance measurement that have occurred over the centuries. Other examples could have been used. The examples chosen, in the

authors' view, capture the spirit of the times and the evolution of performance measurement.

## Early Measurement Systems

Luca Pacioli is probably best known for his contributions to accounting. The ideas and processes described in his *Summa de Arithmetica, Geometrica, Proportioni, et Proportionalita* from 1494 are still applied by many in the accounting profession today. However, he can also be characterized as a pioneer in the area of performance measurement. The *Summa* also includes discussions of the topic of performance measurement as well as internal controls, such as numbering and dating ledgers, journals, and memorandums. In addition to describing the double-entry accounting system, Pacioli led businessmen through the necessary steps to account for all of their transactions. He identifies three things that are required to operate a successful business. First, there must be some sort of market need or justification for the endeavor. Second, the businessman must be a good accountant and mathematician. Third, the affairs of the businessman must be arranged systematically so that he may understand the business at a glance. Fundamentally, this means that the businessman must have an orderly record of the performance of the business. For the merchants of the time, this meant understanding the gain or loss for any particular venture. Pacioli described the specific entries required to recognize a profit or loss. Basic financial measures provided a means to evaluate the performance of the individual enterprise.

From the period of Pacioli into the 18th century, businesses tended to be family-run organizations; their primary focus in the area of performance measurement centered on the calculation of profit and loss for projects undertaken. The owners were staking their assets on specific endeavors. The fundamental question was whether the investment (i.e., running the family business) generated sufficient cash flow to continue the venture.

As transportation and technology improved, the focus on the management and measurement of performance evolved. In the 18th century, Josiah Wedgwood, faced with the competition in the pottery industry, realized that the old methods of manufacturing and employee management would no longer suffice. He sought alternative approaches to managing his operations. Wedgwood, through his systematization of production, division of labor, and disciplining of labor, is one of the pioneers of English factory organization. Wedgwood appointed foremen and managers and established what would now be defined as workgroups, or individual workers specializing in each area of manufacturing, from making the pottery through painting. As the organization continued to grow, Wedgwood created the *Potters' Instruction of 1780* to define rules and regulations for manufacturing along with guidance for the foreman regarding rewarding employees and reprimanding employees who were not performing according to expected standards. Additionally, Wedgwood paid piece rates and had bonus schemes to stimulate productivity. His innovations provided a basis for measuring performance at the operational level.

About 40 years after *Potter's Instruction* was printed, one of the first uses of the term "accountability" appeared in a report published for the Springfield Armory. The 1819 report addressed innovations in two specific areas: (1) processes used for manufacturing and inspecting production work and (2) the use of double-entry bookkeeping for every transaction by the employee, related to the manufacturing of items within the armory. The specific transactions recorded information about the physical amounts and value of material used as well as the amount and value of scrap and good inventory received at the end of the workday. In 1834, the Ordnance Department of the Springfield Armory published its own official document, *Ordnance Regulations*. Included in this publication were two objectives related to accountability and management structure: (1) the careful delineation of lines of authority and communication (2) setting standards of uniformity for accounting and manufacturing practices. Daniel Taylor, a West Point graduate who wrote the document, introduced into the manufacturing process within the Armory a new standard for performance measurement and discipline. Taylor's innovations at the Springfield Armory have been traced to studies conducted at West Point under the guidance of Sylvanus Thayer to establish a merit system for student evaluation. Taylor, a student at West Point

just prior to the arrival of Thayer, was a part of the transition to a system of grading students and holding them accountable for their performance. It has been proposed that Taylor adapted the accountability and performance measurement ideas from West Point to the armory.

## Late 19th–Early 20th Century

As the 19th century came to a close, the U.S. Congress identified a need to eliminate the restraints on trade and competition in the United States. To address the issue, Congress passed the Sherman Anti-Trust Act of 1890. The act was established to protect trade and commerce against unlawful trusts and monopolies. The act also influenced performance measurement. As Thurman Arnold noted in *The Bottlenecks of Business*, when the act was first passed, many interpreted it to be an attack on big business, purely based on their size, perhaps even prohibiting organizations from taking advantage of mass production or distribution. However, there were those who saw the Sherman Anti-Trust Act not as simply a tool to use against any large organization, but rather as a tool to address abuses that might result from the economic power of large organizations. Thurman W. Arnold, who held the office of the head of the Anti-Trust Division of the U.S. Justice Department, took the position that it was not size in and of itself that needed to be controlled, but rather the use of market power to unreasonably restrain trade.

From a production point of view, if organizations could not use their power to restrain trade, competition was more likely to flourish. Given the potential for competition, the leaders of large organizations faced the need to be more competitive. One way to do so was to find more efficient ways to produce their goods and services. Economies of scale became increasingly important. The measurement of performance now more than ever was a necessary part of managing a business. The continuing advances in technology and distribution systems helped transform the manufacturing environment.

With the changes came problems. One was determining performance expectations for individual workers. Frank B. Copley, in his book *Frederick W. Taylor*, explains how Taylor's theory of scientific management resulted from his attempts to address the problem of the appropriate amount of work that any given person ought to complete on any given day with the right tools and materials. Taylor had published a book in 1911, *Scientific Management*, in which he described his methods of gathering and providing to management the knowledge that had traditionally been in the domain of the workers. The process by which he did this included recording and tabulating data and, when appropriate, identifying the relevant rules, laws, and mathematical relationships.

Taylor's work introduced the concept of time standards for processes as well as the need for a standard set of tasks to be completed. A difficulty in using his method of managing the work being performed lies in the ability to collect meaningful data. Getting the workforce to provide information that was surely going to affect their piece-rate system was no easy task. In addition, the machinery might not function properly, or could break down altogether. Taylor applied common sense to decide on which acts to focus to yield the largest return. The focus was on the measurement of performance of the task or tasks that would most likely have an impact on the overall production process, rather than on the measurement of everything.

The standards developed by Taylor were based on a scientific method of gathering data and mathematical formulas, and as such provided a control mechanism to manage the unit. Taylor saw the need for both financial and nonfinancial measures. The blend of information from the time studies, as well as the cost data, provided a set of information that could be used to measure the performance of a given production unit. Taylor's view of cost accounting was that it was not useful unless it was combined with the accurate measurements of the work performed.

In a book written in 1964, *Efficiency and Uplift*, Samuel Haber discussed the establishment in 1911 of the Taylor Society; this group of Taylorites, an informal but exclusive group of individuals, included Frank Gilbreth and Henry Gantt. Both men would soon be cast out of the Taylor Society for their additions and revisions to the "scientific management" way of thinking. Haber describes how Gilbreth concentrated his efforts on the "scientific" aspect of Taylor's work. In 1912, Gilbreth introduced the motion-picture camera as a means of obtaining more exact measurements of work performed by an employee in the manufacturing process. Taylor refuted the process by claiming that it was only an aspect of scientific management, undoubtedly good for investigating the minutiae of motion. Early on, Taylor approved of the experiments, but later he became concerned that the concentration on motion studies was part of a more grandiose scheme and that Gilbreth's focus neglected the broader scope of scientific management.

Gantt's attempt to introduce revisions to the scientific management approach included introducing a focus on social reform and attempting to get at inefficiency in work methods by looking at management, not just the workers. Taylor found these ideas to be unacceptable. Taylor's approach to the work in the factory centered on the problem of setting the tasks of the worker. Gantt, on the other hand, argued that the place to attack inefficiencies was not with the laborer, but with management. Most of Gantt's innovations in the area of management came from his search to set performance standards for management

similar to those set for the workers—using a stopwatch. Idleness of man or machine was an indication of management malfeasance. In Gantt's system, costs associated with idleness were not added to product. They were deducted directly from profits. This approach was designed to have a direct effect on those individuals in a management role and to focus performance measurement at a higher level of the organization.

During the same period of time that Taylor was developing his work in scientific management, and continuing after Taylor's death in 1915, Alexander Hamilton Church wrote articles with a focus on areas that included accounting, management, and performance measurement. Richard Vangermeersch, in his authoritative book, *Alexander Hamilton Church* (1988), describes how the foundation of Church's writings centered on the increasing complexity found in the manufacturing environments, focusing on the control of the operation. In the first work that Church published, he concentrated on the increased competition and the necessity for coordination and quick presentation of results. For control to be a reality for Church, inputs and financial results needed to be both forecasted and compared after the fact. Church recognized that scientific management had been around for decades, but also realized that the evolution of this concept was certain to take place as industry continued to go through changes. His view was that scientific management was more a set of principles than a system, and that it provided a means to view the entire production process. Church argued that because scientific management focused only on the human element of management but did not address issues such as capital and labor, it was not a complete system. Vangermeersch traces L. P. Alford's work with Church to develop what they viewed to be the scientific art of management, which focused on more than just one system. In 1912, Alford published an article titled *The Principles of Management*, which presented the foundation for their views. Three basic principles of management were presented:

1. Systematic use of experience.
2. Economic control of effort.
3. Promotion of personal effectiveness.

Each principle was to be measured and analyzed by leadership in conjunction with the workgroups. The resulting information provided a means to capture the performance of the workgroups.

The early 1900s also brought about a systematic identification of critical performance variables; with the publication of a return-on-investment model, Donaldson Brown, working for DuPont at the time, formulated a model to analyze the various components of return on investment. The model provided for a comprehensive series of financial indicators. Brown was later moved to General Motors, a company experiencing a significant

upturn in the market in terms of performance. General Motors (GM) was faced with the problem of managing product variation while maintaining production standardization. Ford Motors, on the other hand, lagging behind in the market, sacrificed product differentiation for production volume. While GM measured performance using the model developed at DuPont, Henry Ford had little consideration for the evaluation of financial performance of Ford Motors. Not only did he not develop measures to evaluate such performance, he appeared unconcerned about return rates or other financial measures. His focus was on nonfinancial measures tied directly to the shop floor. This difference in the approach to measuring performance continued for years, not only across organizations but also within organizations. Essentially, Ford was looking at causality from the perspective of a process-based model. GM had what can be described as a results-based model that was more remote from the actual production process. In a 1993 field study of highly successful organizations, Euske and co-workers found that a key midmanagement role was translating or finding a way to tie the top-level financial measures to operational measures of performance.

In the environments in which Brown operated, return on investment was a useful tool. Return on investment, both in nominal and in discounted forms, was a useful form of measurement for organizations that experienced the kind of growth and prosperity that GM saw during the early 1900s. However, return on investment as a measure of performance has a number of weaknesses that are well documented in the literature.

## Middle to Late 20th Century

By the mid-1940s, everyone from engineers to social scientists was studying various aspects of control, including performance measurement. Norbert Wiener, a mathematician, coined the term "cybernetics" as a theory of control systems based on communication. It was the work of a number of individuals, including W. Ross Ashby and C. West Churchman, that expanded the idea to complex systems. Their work uses the decision as the unit of analysis. The decision variable then becomes an important element in the system design for performance control (SDPC) model.

The SDPC model, using cybernetics and systems theory as its basis, can be described as a model for guiding the actions of organizational planners using the following seven phases:

1. Identifying the goal: Defining the variables and parameters.
2. Formulating the strategy: Composing the controlled and uncontrolled variables.

3. Organizing the structure: Décomposing the dependent and independent controlled variables.

4. Training the decision makers: Amplifying regulatory capacity over the dependent and independent controlled variables.

5. Coordinating the firm: Recomposing the dependent and independent controlled variables.

6. Monitoring the environment: Synchronizing the controlled and uncontrolled variables.

7. Valuing the performance: Evaluating the variables and parameters.

For the SDPC process to be effective, it must be part of an ongoing planning cycle, continuously applied to the organization. Of particular interest is the last phase of the SDPC process, which addresses the need to evaluate the past performance of the system and the value of that information as it applies to future applications. This phase requires reliable data from various sources. Given a systems theory basis for the SDPC process, the data gathered, once analyzed, can be used as part of an overall evaluation of the entity. First, the data can be used to ensure that the design and decision processes are working properly. Second, the data provide information to stockholders for determining the appropriate resources to allocate to specific processes or systems. Finally, the data can be used to communicate results to the nonstockholders regarding the performance of the organization. Although designed within a systems theory framework, SDPC relies heavily, but not exclusively, on accounting data.

The use of financial data was important during this period not only in models such as SDPC, but also in the return-on-investment model. One variation of the return-on-investment model that had been used for decades was residual income. Although the use of the measure had waned during the latter part of the 20th century, during the 1990s, the use of residual income experienced a resurgence in the form of economic value added (EVA), promoted by Stern Stewart & Co. in publications such as G. Bennett Stewart's *The Quest for Value*.

Return on investment and SDPC proved very useful through the mid-1900s. However, problems began to arise with the use of shorter-term financial measurements. Managers realized that during difficult times, when sales were on the decline and margins were not as acceptable as they had been, profit and return on investment targets could still be met by working a little harder in the finance office. For example, the discretion that existed for the timing of revenue and expense recognition for the current accounting period could affect the outcomes measured by the accounting system.

A different approach addressed the problem of the short-term focus and the ability to manipulate financial measures. In this approach, the focus on performance measures shifted toward nonfinancial measures.

Measures that focused on an organization's strategy and evaluated areas such as research, development, and manufacturing became increasingly important in the 1980s and 1990s. As an example, a company might choose to measure productivity information in order to become more efficient in the manufacturing process, thereby becoming more competitive in the marketplace. Other approaches recognized the need for flexibility in both design and manufacturing and the need to develop ways to measure product design implications as part of the overall research and development process.

The introduction of both financial and nonfinancial measures had the potential to impose on an organization the overwhelming task of trying to manage too many different measurements. Nevertheless, the approach offered the opportunity to capture multiple aspects of performance. However, at any one point in time, it is likely that only a few of the measures would be significant to an organization. The need for a mix or balance of measures was not a new idea. The *Tableau de Bord* used by the French at least since the early 1900s is just such a mix of measures.

The 1990s saw a continuation of the discussion of the relevance of both financial and nonfinancial measurements, but with an emphasis on the employee's role in improving the organization, based on data gathered in the measurement process. In *Relevance Regained* (1992), Johnson, focusing on the global marketplace, argued that if an organization is to be successful, it is essential to capitalize on the potential of the employees and to eliminate any performance measures or other management information that do not support behavior congruent with the imperatives of global competitiveness. Johnson stated that the imperatives for a globally competitive organization create an environment that allows employees to use their skills and talents to the fullest. The globally competitive organization creates an environment such that employees can then begin to understand how the entire organization impacts the way that customers view performance, and to understand their individual responsibilities to meet those customer needs.

The different models that appeared during the 1990s incorporated both financial and nonfinancial measures. For example, in 1991, Lynch and Cross introduced the performance pyramid. The pyramid contained four levels of objectives and measures to link strategy and operations by translating strategic objectives from the top down and measures from the bottom up. The top level of the pyramid is the vision for the organization as stated by the senior management of the company. The second level contains objectives for each business unit in terms of markets and financial data. The third level represents the core processes supporting the organizational strategy, with tangible objectives and priorities as they relate to areas such as customer satisfaction and productivity.

Finally, the base of the pyramid represents the conversion of the objectives into specific criteria, such as quality and cycle time for each department or organizational component. The Lynch and Cross model enables the members of the organization to communicate to employees those measures that are important and also provides for an understanding of how those measures relate to the objectives of the organization.

In 1992, Kaplan and Norton popularized a tool developed at Advanced Micro Devices (AMD). The tool was designed to provide managers with the information they deem necessary to be successful in today's business environment. Kaplan and Norton, on the opening pages of their book, *The Balanced Scorecard*, argued that "the Balanced Scorecard translates an organization's mission and strategy into a comprehensive set of performance measures that provides the framework for a strategic measurement and management system. The scorecard measures organizational performance across four balanced perspectives: financial, customers, internal business processes, and learning and growth." The approach to develop a performance pyramid and balanced scorecard are slightly different. Although both models provide for input from employees at all levels of the organization, the balanced scorecard has more of a top-down approach, compared to the pyramid.

As business and technology continue to shift, the need for information to understand the performance of organizations will continue to change. The evolution of performance measurement is a continuing effort to model performance in a fashion that helps the stakeholders understand the organization.

## See Also the Following Articles

Critical Views of Performance Measurement • Intangible Assets: Concepts and Measurements

## Further Reading

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