

EVOLUTION OF COST ACCOUNTING IN THE UNITED STATES OF AMERICA (II)* **

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VII. *Standard Cost Accounting*

Different Approaches to Standard Costs

It was in the early years of the present century that standard cost accounting was devised in the United States. The new costing device, which has been recognized as the most effective procedure of cost accounting for cost control purpose, is the fruit of efforts made by efficiency engineers as well as accountants of that time. It is interesting to note, however, that efficiency engineers approached the concept of standard costs from the viewpoint of eliminating industrial waste, although accountants arrived at the idea of standard costs from the viewpoint of seeking true costs.¹ The significance of the different approaches has not yet been fully studied. We will here trace the efforts of efficiency engineers first.

F.W. Taylor and His Scientific Management

Frederic W. Taylor was born in 1856. He was employed by the Midvale Steel Works in 1878 first as a laborer, then as a clerk, machinist, gang boss and finally in 1879 a foreman. At that time American business had been suffering from a long depression which began with the panic of 1873. Cost reduction being the only means of survival, business management lost no opportunity to cut the piece rate of wages when workmen worked harder and manufactured more products than the management had expected. As a self-defence measure, workmen pretended to work hard while slowing down their working pace to a poorest and inefficient level.

Thus, "systematic soldiering" became the biggest problem for our new foreman. He believed that the soldiering was a great loss both for the employer and laborers. One of the chief causes which produced this loss to both parties; including the workers, was the "profound ignorance of employers and their foremen as to the time in which various kinds of

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¹ This fact is clearly observed by Professor Solomons. Solomons, D., "The Historical Development of Costing" in his *Studies in Costing* (London: Sweet and Maxwell, Ltd., 2nd Impression, 1959), p. 45.

work should be done (and this ignorance was shared largely by the workmen)."²

He also realized clearly that an accurate, scientific time study of "how long it takes to do work" was essential for the solution of the problem. When the standard amount of time for a job is set on the basis of a scientific time study, a reasonable daily task, which can be accepted both by the employer and workmen, is established. Therefore, he advocated that the coupling of high wages for the workman with low labor cost for the employer could best be attained by including the idea of a "daily task" throughout the field of management.

The Application of Scientific Management Idea in Cost Accounting

Management by exception based on scientific or engineered standards is the essential feature of scientific management. Taylor's views were supported enthusiastically by Frank B. Gilbreth, Henry L. Gantt, Horace K. Hathaway, Sanford E. Thompson, Harrington Emerson and other numerous efficiency engineers. They developed engineered standards for plant layout, product quality, manufacturing operations and, of course, for product costs. Soon they found, however, that the elimination of waste could not be attained by their standard costs alone. Harrington Emerson wrote as follows:

"Efficiency engineers have also found to their sorrow that unless predetermined costs are tied into current costs by the comptroller it is impossible to attain accuracy in their statement, and there is also no available proof to convince those whose support is essential that the methods used are really producing the results promised."³ Thus, efficiency engineers needed a new cost accounting method which ascertain standard costs and compare actual costs with standard costs.

Old and the New Methods of Costing As Contrasted by Harrington Emerson

It is a famous fact in the history of cost accounting that Emerson distinguished clearly between standard cost accounting and actual cost accounting:

"There are two radically different methods of ascertaining costs: the first method, to ascertain them after the work is completed; the second method, to ascertain them before the work is undertaken. The first method is the old one, still used in most manufacturing and maintenance undertakings; the second method is the new one, beginning to be used in some very large plants, where its feasibility and practical value have already been demonstrated."⁴ Since then, costs have been classified into actual costs and predetermined costs (namely, estimated costs and standard costs) on the basis of the time when costs are ascertained. This classification is problematic in that estimated and standard costs are both computed, in fact, after the work is completed although cost estimates and cost standards are set before the work is undertaken.⁵

Therefore, standard costs are not predetermined, but *ex post facto* costs. Nevertheless,

² Taylor, F.W., *Shop Management* (New York: McGraw-Hill Book Company, 1911), p. 1348.

³ Emerson, H., "Efficiency as a Basis for Operation and Wages" (New York: *The Engineering Magazine*, 1911), pp. 160-161.

⁴ Emerson, *ibid.*, p. 133.

Solomons, *ibid.*, p. 43.

⁵ For example, standard costs are computed by the cost standard (that is, the predetermined target costs of a unit of an operation or a product) multiplied by the actual volume of production.

we might say that no one had described more clearly the characteristics of standard cost accounting in comparison with actual cost accounting than did Emerson at that time.

Limitations of Actual Cost Accounting

As to the limitations of actual cost accounting, Emerson pointed out that the objections to the old method were not only that it delayed information until little value was left in it, but it was wholly and absolutely incorrect, mixing up with costs items that did not have the remotest direct connection with them so that an analysis of cost statements, as in the case of repair costs per locomotive mile, did not lead to elimination of wastes.⁶

The delay of getting cost information due to the combining of costs with actual data and the accidental character of actual costs were, indeed, real problems in actual cost accounting. Efficiency engineers considered these to limit the usefulness of actual costs in cost control. Accountants, on the other hand, considered the same characteristics to limit the usefulness of actual costs for the purpose of pricing and income determination. Next, we will trace the work of accountants in standard costs.

Whitmore's Approach to Standard Costs from the Angle of True Costs

In the preceding chapter we have reviewed the development of the theory of normal burden. While A.H. Church and J.R. Wildman tried to apply an unabsorbed burden to products with their supplementary rate, most of the cost accountants at that time disliked the reapplication because of the troublesome work involved. Moreover, they soon found that the greater part of the unabsorbed burden was accounted for by the costs of idle capacity which became enormous in a slack period. If they reapply the enormous amount of idle costs to the lower volume of production produced under depression conditions, they will get actual unit cost which is an entirely useless for pricing and income determination. Therefore they began to doubt whether idle costs were a legitimate part of product costs.

In 1908, John Whitmore gave a lecture, titled "Shoe Factory Cost Accounts" at New York University. The following argument made him one of the early pioneers in standard costs.

"I would say that true or correct cost does not necessarily include every expense incurred in the course of producing an article. Accidents or blunders occur and the cost, as in some instances the cost of unused factory capacity, may be so great that it would be absurd to state it as part of the cost of the product. If this is established, it establishes the principle that improper cost may be separated and stated under a heading which will distinguish between these and manufacturing expenses properly and necessarily incurred.... It is possible to carry the application of distinguishing between proper and improper cost so far as to use calculations of proper cost, and then to direct the cost accounting to showing the variations of actual from calculated costs. This involves the setting up of complete standards for quality in materials and efficiency in working, and is not to be confused with estimates of probable cost which are arrived at by any superficial method or except with the idea of continuously testing actual and calculated costs by each other."⁷

Thus, Whitmore arrived at the idea of standard costs, and he tried to apply the standard cost principle in his shoe factory cost accounting. It is quite strange that he spent nine pages

⁶ Emerson, *ibid.*, pp. 133-134.

⁷ Whitmore, J., "Shoe Factory Accounts", *The Journal of Accountancy*, Vol. VI., May 1908, p. 14.

for material costing, one and half pages for labor costing and only a half page for the costing of manufacturing expenses and confessed that he had not yet succeeded in applying the principle to the field of manufacturing expenses. As a matter of fact, his costing method remained within the range of actual cost accounting although he adopted a standard price for materials issued.⁸ As to why he adopted standard price, he explained that the use of the material cost based on the standard price was both simpler and safer than if every cost price depended upon whether the particular lot of upper leather used had been sorted advantageously or the particular lot of sole leather had been cut up advantageously.⁹ In other words, his purpose of using standard price for material costing was to get a safer cost for pricing in a simpler way, not for cost control.

The List-Percentage Plan of Webner

Along the same line of thought, Frank E. Webner advocated standardized costs in his list-percentage plan. We shall begin our analysis with the origin of this peculiar costing name. He explained that the list-percentage plan of cost determination took its name from the distinguishing fact that the charges for each element of production cost in each department, determined in advance, were expressed as a percentage of an arbitrary list price.¹⁰

Suppose the list selling price of a product is \$12.50 which is then set as 100%. Then, the percentage of the various constituent elements of cost in each department are estimated and expressed as percentages of the list price. In department A, for example, the cost of material is fixed at 7% of the list price of \$12.50 for the unit of completed product, labor is placed at 3% and expenses at 2.5%. Thus a hundred units of the finished products of the department A are transferred to the department B by the following journal entry.

Process, Department B	\$ 156.25 ¹¹
Material, Department A	87.50
Labor, Department A	37.50
Expense, Department A	31.25

On the other hand, each cost element account in department A is debited with the actual costs of each element so that actual costs and list-percentage costs can be compared.

Accountants' Standard Costs vs. Engineers' Standard Costs

Webner claimed that the list price and its percentages under the list percentage plan were "standardized costs" and advocated their advantages by quoting the following famous words of Emerson.

"Standard costs are the mariner's compass of a business enterprise, showing as they do from month to month the proper course of the business ship."¹²

It is evident that his standardized costs are quite different from those advocated by Emerson. We had better review here how the list-percentages were set in order to understand the difference of the two types of standard costs.

⁸ His material costs were calculated by the standard price multiplied by the actual quantity of the materials consumed. From our viewpoint these are not standard material costs, just as a normal burden is not standard burden, although the normal burden is calculated by the normal burden rate.

⁹ Whitmore, *ibid.*, p. 20.

¹⁰ Webner, F.E., *Factory Costs* (New York: The Ronald Press Company, 1911), p. 270.

¹¹ \$ 156.25 = \$ 12.50 × (7% + 3% + 2.5%) × 100

¹² Webner, *ibid.*, p. 276.

The cost percentages for the various departments were, according to Webner, obtained from the records of past cost experience. Tests were made from time to time first to demonstrate the accuracy of the estimated percentages and thereafter to show any variation of cost from the percentages as fixed. If the tests showed any variation which were due to permanent changes in basic conditions, the percentages were correspondingly changed. No change was made, however, for any temporary variation. Thus, the percentage once properly fixed gave "a fair average of costs under normal conditions."¹³

Since the list percentage costs are averages of past performance, it should be pointed out that inefficiency included in actual costs is not eliminated from these standardized costs; rather, a certain inefficiency creeps into them. One may argue that such costs are far from standard costs; they are merely estimated costs. This argument is true in the engineering sense. However, the cost accountants of that time, including Whitmore and Webner, believed that they were standard costs because these costs were standard costs for product costing. Webner's main purpose in using standardized costs was to smooth accidental variations included in actual costs for pricing and income determination. He believed that actual costs were true costs. It is not fair, however, to charge all the amount of actual costs incurred in a period to products manufactured in the period. Therefore, he thought that the variances from standardized costs should be absorbed evenly into products manufactured over a long period. Emerson's main purpose of using standard costs, on the other hand, was to locate wastes. Hence, he needed standard costs that did not include any inefficiency.

The differences between standard costs for costing and those for cost control were later realized clearly by William B. Castenholz. He pointed out that cost accountants very often spoke of standards in connection with factory operations without clearly defining their language which caused great confusion between author and reader. There are two distinct standards which he called "cost standards" and "production standards."

He explained his cost standards as follows. "That past cost experience are the best bases for the formulation of present cost standards is quite undeniable. Unless cost standards are constructed on such bases the cost figures will not register the true present status of factory operations but instead will reflect hypothetical cost. Cost at any and all times should portray the actual operating conditions of a plant even though these latter may be far from desirable. The fetish of an ideal cost is a production rather than a cost matter. A cost standard is therefore not necessarily representative of the lowest possible costs but expresses merely assumed normal experience results."¹⁴

Production standards, on the other hand, are based upon an operating ideal and become indices of operating efficiency. Therefore he concluded that production standards could not be utilized for the same purposes as cost standards although it was desirable that the two merged into one another as closely as possible.

His comment is quite right. Nevertheless, he did not add any detailed explanation on how to combine the two distinct standards in a cost accounting system.

Overhead Cost Control by Flexible Budget

One of the differences between the two standards is found in the field of overhead costing.

¹³ *Ibid.*, p. 275.

¹⁴ Castenholz, W.B., "Cost and Production Standards," *The Journal of Accountancy*, Vol. 33, No. 2, February 1922, p. 82.

When the costs are direct costs, the standard amount for cost control varies proportionately with the number of units produced. Therefore, the unit cost standards can be used both for product costing and for cost control provided that their tightness is the same. On the other hand, indirect or overhead costs cannot be controlled with standards in unit form because not only variable costs but fixed costs are included in overhead costs. As a result, the standards for product costing should in this field be separated from those for cost control. This had led to the device of the flexible budget. We will trace, then, the development of the flexible budget.

In the earlier period, departmental manufacturing expenses were controlled by a periodic comparison of actual amounts incurred. However, this method was useless because of the influence of volume fluctuation on actual costs. With the adoption of the predetermined burden rate, cost accountants began to compare, item by item, the actual amounts incurred with the amounts which they had estimated at the time of calculating the predetermined burden rate. In other words, they used a fixed budget for controlling overhead costs. This method is, of course, useful only when the actual volume and the estimated volume of production are the same.

Although the basic idea of the flexible budget was already expressed by Henry Hess in 1903,¹⁵ such a budget was quite rare in American firms before World War I. The separation of costs into fixed and variable costs, which is essential for a flexible budget, had been accelerated by the necessity of fixing a predetermined burden rate. Webner classified manufacturing costs into annual charges, whose totals are fixed irrespective of fluctuations in the use of machines, and operating charges, whose totals are variable with the use of machines for the purpose of setting the predetermined machine rate.¹⁶ Scovell also classified them in the same way. The fixed charges, in his case, were composed of rent and equipment charges while the operating charges were composed of repairs, indirect labor, supplies, power and steam.¹⁷ He argued, then, that the operating charges were directly under the supervision of department heads although the fixed charges were under the control of the executives. Therefore he proposed to set standards for departmental operating charges and compare actual costs with the standard scheduled costs.¹⁸ However, his standard still remained within the fixed budget.

In 1921 G.H. Williams addressed the annual convention of the National Association of Cost Accountants on the actual use of the formula type of flexible budget. He argued as follows: if cost accountants use the method of charging a fixed overhead regardless of the actual overhead so that they may determine the effect of volume upon profits and losses and be able to compare costs of similar items between different periods, they must, on the other hand, provide a means of judging the actual overhead. For this purpose he suggested the setting of a standard on the basis of fixed items which do not fluctuate with the volume of business, and variable items, which do fluctuate with the volume of business. His illustration was that the budget allowance for \$1,000,000 of sales should be \$200,000 when the amount

¹⁵ Hess, H., "Manufacturing: Capital, Costs, Profits and Dividends," *Engineering Magazine*, December 1903.

Solomons, *ibid.*, p. 48.

¹⁶ Webner, *ibid.*, pp. 301-304.

¹⁷ Scovell, C.H., *Cost Accounting and Burden Application* (New York: D. Appleton and Company, 1916) p. 73.

¹⁸ *Ibid.*, pp. 191-193.

of fixed items for a given period is \$100,000 and the variable rate of variable items is 10% of sales. Therefore his flexible budget was of the formula type.¹⁹ He also suggested an application of his budget for cost-volume-profit analysis although not expressed in technical terms.²⁰ Two years after Willsams, the columnar type of flexible budget was supported by George H. Bates. Bates had the part of Secretary treasurer in the Staten Island Shipbuilding Company. He showed in his paper a flexible budget for the machine shop in which the budgets for the semi-fixed or step costs were considered. He pointed out that the standards for manufacturing expenses did not all vary proportionately, as could be seen by examining the item of supervision which varied by having one foreman for a certain number of employees and then adding assistants as the number increases.²¹ To our surprise, his budget was used not only for overhead cost control, but also for differential cost analysis.²² Thus, flexible budgets began to be used among cost accountants.

(to be continued)

¹⁹ Williams, J.H., "The Attitude of the Engineers to Cost Accounting," *NA(C)A Year Book*, 1921, p. 113.

²⁰ *Loc. cit.*

He explained his budget by lantern slides which showed a number of forms actually used. As the slides were reproductions of actual records, he didn't want to reproduce them in permanent form.

²¹ Bates, G.H., "Actual Examples of the Advantageous Use of Operating Budgets," *NA(C)A Year Books*, 1923, p. 141.

²² *Ibid.*, p. 145.

His illustration was one of the decision making involved when a business executive decides whether the firm can afford to take business at a low price.