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Accounting as a Science

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The assertion is often made by practitioners and teachers that accounting is a "science." The statement is assumed to be self-evident, so true that it needs only to be made to be proved. To demonstrate or prove the statement would be to doubt its validity, to admit that it might not be true. It is the purpose of this paper to examine the nature of accounting, to consider whether the subject matter and method of accounting justify the statement that accounting is a science. Probably no one, even the most ardent champion, would assert that accounting writers and practitioners are always strictly objective in their points of view. The fact that much literature and practice have been unscientific in character explains in part the lack of discussion on the thesis, "Accounting is a science." The proponents have preferred not to raise disturbing issues. The opponents have smiled at the humor of the statement, considering it so untrue as not to be taken seriously.

Something must be said as to the nature of a science before the discussion can proceed. If one considers science as a system of results, everybody can see at once what is meant by the name. It is simply those theories and facts that are called physics, chemistry, biology, etc. These sciences are sometimes referred to as the "natural" sciences or physical sciences, because the phenomena are for the most part independent of human relationships. Another group of sciences—the social sciences—comprises the theories and facts of human relationships, to include economics, sociology, politics, etc. It is in the class of the applied social sciences that accounting must be grouped.

Science in the sense of a system of results is a simple concept but an unsatisfactory one, for science would be always changing. Science of today will look as foolish in a century's time as that of a century ago does now, and with as good a reason. Is there then anything really permanent about science? I think there is, and that is the method. Theory may supersede theory and more accurate analysis may demolish apparent facts, but there is a unity and continuity about the method that the mind should be able to grasp, and that is the very essence of science. The kind of

definition that is required, therefore, is that of science as a process rather than a collection of results. These ideas were expressed by A. D. Ritchie in *Scientific Method.* He defines science as the "process of exploring the external world." Other writers could be cited who express the same opinion, namely, that the essence of a science is not to be found in its subject matter but in its method. "The field of science is unlimited; its material is endless; every group of natural phenomena, every phase of social life, every stage of past or present development is material for science. . . . The man who classifies facts of any kind whatever, who sees their mutual relation and describes their sequences, is applying the scientific method and is a man of science." This quotation is from Karl Pearson's *The Grammar of Science.*

Accounting is the science of measuring and interpreting the economic facts of a given enterprise. The method followed in accounting exemplifies the quantitative method of scientific analysis, in that accounting confines itself to those aspects of phenomena which can be measured. Quantitative method is to be contrasted with the genetic or comparative methods which place emphasis primarily upon qualitative analysis without regard to the measurement of the qualities discovered. In the past the quantitative method has been omitted almost entirely from the procedures of the social sciences, because of the difficulty of segregating the phenomena for treatment. The omission has often resulted in the substitution of rules of thumb for gathering the needed data. Rules of thumb are exceedingly useful in practice, when the scientist recognizes their limitations. But they are mischievous when elevated to the category of principles or when applied to unusual cases. Two instances of difficulties arising from indiscriminate use of practical rules appear when instructors use a simple formula to explain the debit-credit theory or practitioners attempt to justify the cost-or-market rule under all conditions.

Quantitative method involves the measurement of phenomena and the interpretation of data. It may be subdivided into two basic steps or processes: measurement and interpretation. These two terms, as will be shown in the following discussion, are broad enough to include such aspects or phases as collection, classification, summarization, presentation, analysis, description. Interpretation, as here defined, involves classification and summarization, followed by comparison of different classes and groups of data.

Recording is not a basic process in the quantitative method. Records are, of course, necessary to the application of quantitative method; in fact, records must be maintained during each phase of its application. Recording, then, is not a single process in quantitative method; it is rather a requirement which must accompany each of the processes, if the data are at all numerous. Much confusion has resulted from a misunderstanding of the place of records in the explanation of the principles of accounting. The bookkeeping records are important, very important in accounting. They serve as evidence of transactions; they summarize economic conditions and events presumably similar enough to be classified under the same account captions. A trial balance indicates that a bookkeeper has followed the double-entry ritual with the respect and deference which it deserves. But the maintenance of a continuous double-entry equilibrium in the ledgers is not one of the basic objectives of accounting when viewed as a type of scientific method. It is merely an arbitrary limitation placed upon the accounting procedure, a practical limitation dictated by the advantages of the system. Double-entry procedure, by maintaining the equilibrium of assets and the ownership in them, facilitates both the placing of responsibility for funds and the administration of the resources themselves. But double-entry record keeping is not the core of accounting method.

II

Before proceeding to a further discussion of accounting as a science of measurement and interpretation, it might be well to contrast accounting with statistics, when the latter term is used in the sense of statistical method, rather than as a mass of collected data. Sometimes the expression "statistical method" is used as synonymous with quantitative method. Both statistics and accounting, however, may be regarded as applications of the same general method of analysis. Accounting usually limits its measurement of economic phenomena to the aspects which can be expressed in terms of money; statistics may deal with economic phenomena in any of their aspects, selecting any unit of measure (including money) which may be of use for the purpose at hand. Accounting classifies and summarizes the data from the point of view of a specific enterprise; statistics, on the other hand, need be subject to no such limitation. It may deal with data from the

point of view of the entire economic order of which the enterprise is a part.

Statistical data are often very important in the administration of a specific enterprise and should be used by the managers whenever they can be secured. Statistical analysis may carry on beyond the point where accountants usually stop in their analysis of business data.

Attempts have been made to differentiate statistics and accounting by the fact that workers in statistics have developed the technique of measurement and interpretation further than have the accountants. This distinction is purely historical and can not be regarded as basic. The special technique of statisticians is the common property of all workers in quantitative method. The failure of accountants to use more refined methods in measuring phenomena and interpreting data is not evidence of a difference in accounting and statistical method. It merely indicates that such technique has not been considered necessary by accountants—mistakenly enough, in some cases—for dealing with the financial data of an economic enterprise.

In so far as the accountants have used technique accurate enough for the purposes at hand, they have been scientific in their practices. It is just as unscientific to use methods which are more accurate than necessary as methods not accurate enough. It is a waste of effort to carry out analyses further than is necessary to give the required result. Probably many accountants have erred in not developing their valuation and interpretation practices to keep pace with the needs of modern enterprise. Methods which will suffice for small-scale enterprise, or for expanding business on a frontier offering abundant resources and high profits, will not suffice for big business in a commonwealth where competition narrows the rate of profit.

The relation between accounting and statistics is one on which writers do not agree. Either can be made a subdivision of the other, depending on the meanings given to the general terms. When accounting is described merely as the "account of" certain conditions or events it may be subdivided into various aspects. The account may be rendered in literary or numerical terms. If in numerical terms the fact may be expressed by financial or non-financial records. The term statistics is then used to characterize the non-financial data. But when the term statistics is used as equivalent to quantitative method, accounting is some-

times said to be a particular application of general method applied in gathering statistics. Neither point of view is entirely wrong or right, for the simple reason that one contrast emphasizes the variations in the results, the other recognizes the similarity in the method. In the last analysis it is unnecessary to try to make either accounting or statistics subordinate to the other. It is sufficient to recognize that they both apply the quantitative method of scientific analysis.

III

Measurement involves the selection and application of a unit of measure. The adequacy of a unit depends on the nature of the phenomena to be treated. The phenomena with which accounting deals are the economic conditions and transactions of an enterprise—business capital and business income. It measures and interprets those events which change the status of an enterprise, such as investment of funds, purchase of materials, payment of wages, sale of merchandise, or use of supplies in manufacturing operations. The measurement of business capital and income is usually discussed under such captions as "asset valuation" and "income determination," and it is these procedures which comprise the measurement phase of accounting as a scientific method.

The length of an article of furniture is usually measured in terms of some well known unit of linear measure, such as the inch or centimeter. The measurement of the amount of food a person has consumed may be made in terms of volume, weight or heat content. The measurement of a man's labor may be made in terms of hours of employment or pounds of material handled. No single unit, however, would serve to compare the different important characteristics of furniture, food and labor. The relative linear dimensions of furniture and food are obviously of no significance for most purposes; moreover, labor can not be expressed in terms of linear measure. Similarly, the other units for measuring physical characteristics (such as volume, weight, heat content) do not usually provide the basis for comparing widely different phenomena.

Accounting, in its treatment of economic phenomena, typically selects money as the basis of measurement. Exchange value is the characteristic which identifies economic phenomena, and it serves to compare the economic significance of furniture, food

and labor. Accounting would conceivably be necessary even in a barter economy, particularly if time elapsed between different phases of the barter transactions.

Money as a unit of measure is, of course, subject to certain limitations. It will not measure the loyalty of an employee, the power factor of an electric motor, or the heat of a blast furnace; yet these items often are very important in deciding whether an enterprise will be a financial success or failure. The accountant can measure such important factors as these only by an indirect appraisal of their effects on the money costs of a final product. Money value is widely applicable to a large number of different economic phenomena, but it does not deal with all the important aspects of these phenomena. A beautiful city hall is an important factor in the economic status and operations of a community and of the individual enterprises there. To say that it is not easily measured in terms of exchange value is not to say that it has no economic significance.

The monetary unit may itself change in value, because of fluctuations in international exchange rates, changes in the general price level, or changes in the political system under which economic values are established. Likewise changes in the political system under which certain values are established may modify or entirely destroy the property rights and contractual privileges of individuals. The present Fascist political system has necessitated a complete reconsideration of the old methods of accounting valuation in Italy. The values of inventories, receivables, long-term securities, land and buildings have all been greatly affected by the special relationships of the owners to the government. The accountant typically assumes that the dollar is of constant value, although there are many cases where this assumption is not justified. The current argument over the recognition of appreciation caused by rising price levels is evidence of the accountant's awareness of the limitations of money in accounting valuation.

After a satisfactory unit of measure has been selected, it must be applied correctly to the phenomena, a task which is often exceedingly difficult. In the first place, the measurement may be affected by bias on the part of the persons securing the data. For example, a business man may tend to understate the amount of his profit when preparing an income-tax return and overstate it when applying to a bank for accommodation. The direction

of personal bias is affected by the uses to which data are to be placed, sometimes tending to overstatement of measurement, sometimes to understatement. One type of bias which has dominated accounting valuation is the conviction that "conservatism" is a good thing. To the extent that conservatism prevents unwise business policies based on measurements that are liable to error, it is a good thing. To the extent that it conceals facts important for management, it can not be approved by practical people.

In the second place, the accuracy of measurement may be affected by the adequacy of the technique used for securing the data. For example, a person measuring the height of a mountain above sea level will ordinarily apply the principles of trigonometry to his task, thus obtaining data more accurate than his opinion expressed without such aid. A person can not correctly estimate the population of a city by walking about the streets and getting an "idea" of the size of the town. Census enumeration requires an elaborate technique of interviewing individuals properly to account for non-residents, transients, recent arrivals. Personal observation may be satisfactory for counting the number of sacks of sugar on the shelf of a grocery store; it would be inadequate for calculating the number of pounds of sugar sold in a given city during a certain period of time. A person unfamiliar with the principles of trigonometry might say that it would be impossible to measure the height of a mountain; likewise a person unskilled in dealing with large numbers might assert that the population of a city or the amount of sugar sold therein could not be determined. Complex and numerous phenomena require special techniques for their measurement. Failure to select or inability to apply proper technique may result in measurements no more accurate than the crudest type of personal conjecture.

In the third place, the measurement of economic phenomena is conditioned by the intended uses for which business assets are owned or business operations are carried on. A motor truck may be worth $2,000 if utilized in the transportation of goods; it may be worth only $1,000 if offered for immediate sale in the second-hand automobile market. Yet each amount may properly be said to indicate the value of the motor truck; in other words, an asset may have several values, depending upon the use to which it is to be placed.

IV

Interpretation involves classification and summarization, and also the comparison of classes and groups of data. The interpretation of quantitative data—of which accounting data are a type—is the second basic process in accounting method. The process of interpretation begins with classification—with the attempt to segregate data into fundamentally similar classes; it follows with a summarization of these classes into larger, more significant groups. It is carried forward by comparison—the search for measurable relationships among the classes and groups of data, particularly those relationships which are important for purposes of administrative control. The basis for classification of quantitative data will vary with the purpose of the measurement and the technique available for the classification. For example, one hundred persons may be classified according to their heights, measured in feet and inches. The persons may also be classified according to such characteristics as their weight, age, experience, education or race; the purpose of the classification will determine which basis or combination of bases is most useful.

So, also, in the accounting field, the classification of economic data is conditioned by the purpose of the analysis. Accounting data are assembled to express in financial terms the economic capital and income of a specific enterprise; consequently the accounting data of an enterprise are first of all classified as to those which appear in the balance-sheet and those which are set forth in the statement of profit and loss. Each major class of accounting data—assets, liabilities, proprietorship, income, expense—are accordingly subclassified into smaller groups, the bases of classification varying with the accountant's views as to what are appropriate. The advantages and limitations of various bases of classification are important factors in establishing the accounting records of a business enterprise. In practice at least four different bases underlie the grouping of accounting data used by private and public accountants. They are: (a) intended uses or purposes (current assets, fixed assets, investments); (b) inherent qualities or properties (salaries, supplies, depreciation); (c) administrative responsibility (production expenses, selling expenses); (d) financial appropriations (general funds, special funds). The problem of classification is frequently encountered when a valuation is to be attempted; in fact, one reason for classification of business

assets is to make it easier to establish correct values for them. The general notion that classification as well as valuation is purposive and not an end in itself finds expression repeatedly in the literature of the natural sciences.

Summarization is the process of classifying established groups under larger and more inclusive headings. In one sense it is reclassification, although this latter term could apply equally well to mere shifting of data from one class to another of equal rank, or to subdivision into still smaller classes. The practice of summarization, as the process of bringing under general headings the related data of various types, seems to the writer to be prevalent enough and important enough to justify its mention as a separate phase of quantitative method. The type of summary that will be prepared varies with the use it is to serve. For example, a report may show the various items of merchandise owned by an enterprise at a given time, or the various types of expenses incurred during a period of time. In some cases the reports may, of course, consist of complete financial summaries of status or operations, known as balance-sheets and statements of profit and loss.

The technique of presenting the summarized data also varies with the purposes for which reports are prepared. Graphic presentations are very common; they include curves, pictures, maps. The graphic form of presentation is easily comprehended and is very useful in the expression of general facts; it is not well adapted to reports which must show a great amount of detail. Another method of presenting accounting facts is the tabular method, which consists of assembling the numerical data into rows and columns, with groups and subgroups. This method is exemplified in the accounts of a business enterprise as ordinarily kept, also in the orthodox statements of financial condition and operations. This method of presentation is well adapted to accounting data and is capable of expressing a great amount of important detail, but it is not as easily comprehended as graphic presentation. Both graphic and tabular methods of presenting data are useful in accounting, although accountants have in the past confined themselves almost entirely to the preparation of tabular reports.

The interpretation of data extends beyond classification and summarization. Interpretation also includes comparison—discovery and measurement of important relationships between the data in reports. It is here, of course, that the refined technique

arising out of statistical theory performs one of its most important functions, by defining and suggesting the advantages of ratios, averages, variations and trends. A banker may be interested in the ability of an enterprise to repay a sixty-day loan. He would thus wish to know the ratio between the resources which could be realized upon promptly on the one hand and the existing obligations which must be met in the near future on the other. A sales manager of an enterprise may be interested to know that the average monthly sales for a year were $15,000. He would also be interested to know that the sales for individual months showed a variation from an amount as low as $5,000 to an amount as high as $25,000. Knowledge of this average and of the variations therefrom might serve as the basis for action designed to obtain more regular income from the sale of merchandise. Important relationships may also be revealed by the discovery of trends in the economic conditions during a season, a year, a business cycle or a long period of economic development. Study may reveal, for example, that the average sales per month of an enterprise have increased annually for a number of years. The technique of discovering trends in economic activity requires the use of some of the most elaborate devices of interpretation. Throughout all interpretation of summarized data, the particular ratios, averages, variations and trends to be sought for will vary with the purpose for which the data are to be used.

V

This discussion can not close without contrasting briefly the viewpoints of economics and accounting. It might be argued that everything which has been said of accounting could also have been said of economics. Economic analysis deals with value phenomena, capital and income. It includes the measurement of economic transactions, the classification of their effects and the interpretation of the classified and summarized data. Accounting may be defined as "applied economics," in much the same way that the term "applied mathematics" is used. But I do not believe such a concept is satisfactory. The proper contrast is more analogous to the contrast between the terms "metaphysics" and "science," when the subjects are discussed in terms of their objectives. It is the aim of metaphysics to give an account of everything all at once—or at least within the compass of a large book. The economist holds himself responsible for explaining the

interworkings of all economic phenomena. The accountant goes to work upon a small fragment of things. He applies his method to a special situation, viewing all economic phenomena from the point of view of a profit-seeking, continuously operating, privately controlled enterprise. He does not attempt to experiment with or observe the whole universe. He makes assumptions as to the general economic conditions which underlie his own particular task of accounting valuation and interpretation. He assumes, for example, that business policies will be carried out, that business transactions are economic (not philanthropic), that the prevailing economic order will continue, that business conditions can be predicted. The assumptions are tentative and can be changed when they turn out to be wrong or inconvenient. If an accountant refuses to take seriously the orthodox economic explanation of the theory of interest or profit, it need not imply that he is ignorant of the method and advantages of economic theory. It may mean merely that he is too busy imputing income to individuals in terms of contracts to concern himself with the classical grouping of factors of production. If he establishes the values of assets by considering their original cost, such action does not mean he has never heard that the essence of an asset's value is its future net income. It may indicate merely that life is too short to use a complex formula to capitalize the future income inherent in a lathe or a motor truck.

The processes of measurement and interpretation are not mutually exclusive in the sense that one precedes the other or that either can be carried on independently. In practice accurate valuation must wait upon significant bases for classification of the accounting phenomena under consideration; the processes merge into each other to such degree that they are at times almost indistinguishable. That accounting, properly conceived of, is a type of scientific method can not be doubted. The opportunities for the accountant to adopt a scientific point of view and to utilize scientific technique are endless; in fact, such viewpoint and technique are necessitated by the importance of the phenomena—business capital and income—with which the accountant deals. Accounting has been described as a "pragmatic" science by A. S. Dewing, in his *Financial Policies of Corporations*, rather than a pure or abstract science. This characterization challenges the scientific integrity of every student, teacher and practitioner concerned with the profession of accounting. The practical

problems to which the method of accounting are applied require careful measurement and interpretation for their solution. They must be approached by men whose attitude is impersonal, whose viewpoint is objective, who comprehend the meaning of the statement, "Accounting is a science."