

THE FEEDBACK CHARACTERISTICS OF ACCOUNTING DYNAMICS

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ABSTRACT

Just as the feedback concept is the single most essential characteristic of the system dynamics approach, so accounting feedback is the most crucial basis of Accounting Dynamics (AD), a methodology for modeling and simulating accounting using system dynamics. In this presentation, we focus on accounting feedback.

We should like to emphasize that accounting information has essentially feedback characteristics and that its origin can be traced back to the laws of Hammurabi. Since that time, the concepts of stewardship and accountability, for which accounting measurements are exclusively addressed, have formed the feedback nature of accounting information and effectively controlled resource allocation in social systems.

Conceptually, accounting feedback has three aspects, which correspond to the stages of AD model development. They are the formal requirements of double entry bookkeeping, institutional regulations in financial statements and the real functions of accounting information performing feedback control over the economic resources. Formal feedback is the intrinsic nature of account system. Based on double entry bookkeeping, the account system of an economic entity constitutes a constantly balanced closed system. Data entry into the account system must automatically occur twice so that the system is always balanced. This account system with debtor and creditor sides provides the formal requirements of accounting feedback.

Institutional regulations reflect generally accepted accounting principles. From the viewpoint of society as a whole, they introduce an approach of total optimization into individual accounting feedback. From the feedback viewpoint, one of the most typical accounting principles is the principle of continuity, which forces continuous observance of the same accounting rule over consecutive accounting periods. Once one uses the straight line method of depreciation, for example, one must use it in the next period. Institutional accounting feedback substantially constrains business income.

Finally, the resource allocation feedback aspect of account-

ing information implies the real function of accounting in social systems. Investigating the actual conditions of resource allocation in social systems through accounting feedback control is the very core of Accounting Dynamics. How is resource allocation in our society effected by accounting information? The answer to this question is the ultimate objective of our research.

STEWARDSHIP AND ACCOUNTABILITY

Accounting is an information system used to measure and communicate the social consequences of accountabilities. Here it should be noted that the concept of accountability implies human feedback, a splendid device produced over our long history. The charge and discharge relationship of accountability constitutes a feedback loop between two persons (or parties) and becomes the basic unit of feedback control to the exploitation of economic resources in social systems (Figure 1). The accountability information network as a whole controls resource allocation in the entire social system.

According to Peter Bird (1973), accountability has a close connection with stewardship. Stewardship means the position of a steward who keeps others' resources for them. In our advanced society, almost all important transactions are carried out by stewards represented by business management and public officials. Every steward must account for his profitable use of resources to the person who entrusted with him those resources. This social obligation of stewards is called accountability.

Stewardship and accountability might be one of the earliest feedback relationships found in human interactions. Bird points out that the laws of Hammurabi (about 1800 BC) included a surprisingly extensive consideration of obligations arising when men have possession of property owned by others. He says that about one eighth of the whole code of the laws of Hammurabi was devoted to such issues as the relationships between cultivators and land owners, problems connected with loans, agency problems.

Present day stewardship and accountability have three notable characteristics according to Bird. First is the characteristic of 'Big Stewardship,' as he called it. Today the scale of the corporate operations and consequently the amount of the funds committed into the hands of business management and public officials are far greater than ever before. Certainly this is the age of big business and of big government. In other words, it is the age of big stewardship. This means that the accountability network almost exhaustively governs all the economic resources of the social system.

The second characteristic is the 'Stewardship Standard'. What the steward is expected to do with the resources is also very much more complex and risky than ever before. The stewardship standard of today is quite different from that of an age when this year's events were expected to be the same as those of

previous year. Today's stewards must perform their accountabilities in a highly competitive and fast changing environment. Uncertainty heavily reigns over all stewards and equity owners. Performance evaluation of the steward, which is the same thing as the measurement of accountability, is one of the most significant tasks of today's information network society. The failure of the steward to utilize resources optimally and biased measurements of his accountability have direct repercussions on social resource allocation control.

The third feature of present day stewardship and accountability relates to 'Delayed Consequences.' Most consequences of a steward's current decisions and actions are effected gradually over a long time period, some times far beyond his tenure. Under situations such as going concern in most organizations today, accountability can only be reviewed periodically (usually annually). So it may safely be said that modern accounting theory, concentrating on the determination of periodical income, also has inevitable limits. We have to predict with validity all prolonged consequences of the steward's current decision for measuring his accountability. This is the reason why the system dynamics approach to accounting is needed.

FORMAL REQUIREMENTS OF ACCOUNTING FEEDBACK

We have noted that accountability is an excellent human feedback device which has been used throughout our long history. We also should note that this continuity has been possible because the art of double entry bookkeeping has coincided with it.

Osker Becker (1959) describes that in ancient Babylonian (including the age of Hammurabi) advanced mathematics, algebra and even geometry already existed and that they were produced to train the officials who managed large state or private properties, namely stewards. We think these facts are sufficient to assume the use at that time of double entry bookkeeping, which is in a sense a branch of algebra. Furthermore we can conjecture that double entry bookkeeping, which has no notion of subtraction and add at opposite side of the same account when subtraction is needed, existed far back in time when man possessed only a natural number, a set of closing under only addition and multiplication.

Bird stresses to perform accountability, stewards, had an obligation to render an 'account'. Figure 1 shows the relationship between accounting feedback and setting up an account. It should be noted that setting up an account is not only setting up a mere format on the books, but a mapping of a social relationship between two persons (parties), steward and owner. The amount of property entrusted to the steward is entered (charged) on the debtor side of the account and the amount of equity belonging to the owner is entered (discharged) on the creditor side.

In a large organization, the steward himself entrusts part of his stewardship resources to a subordinate steward and the latter further to a lower level steward. For example, a company director

delegates part of his resources to a division manager and a division manager delegates part of his entrusted resources to a department manager and so on down the ranks.

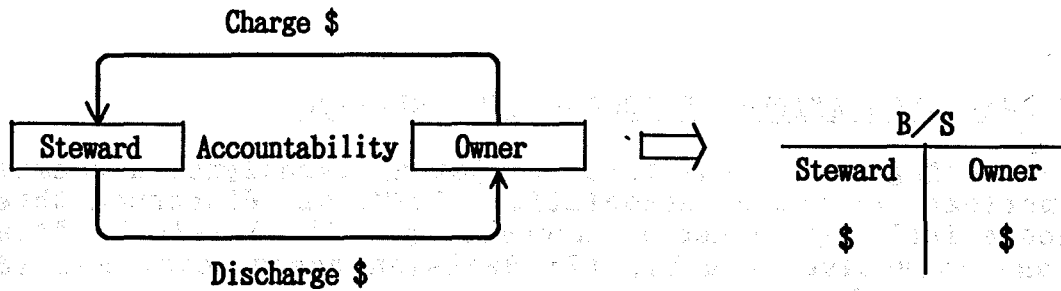


Figure 1 Formal Requirement of Accounting Feedback

Yuji Ijiri (1976), who thinks that the nature of accounting derives from accountability, names the steward as the accountant or the person who perform accountability and the owner as the accountee or the person who is the beneficiary of accountability. We think that the accountant becomes the budgetor when he delegate part of his resources to subordinates, and those subordinates become budgettees. Thus, the accountant-accountee relationship becomes a budgetor-budgettee relationship at the lower levels of accountability. These delegations of authority for managing entrusted resources form an accountability network. Figure 2 shows such an accountability network in an organization.

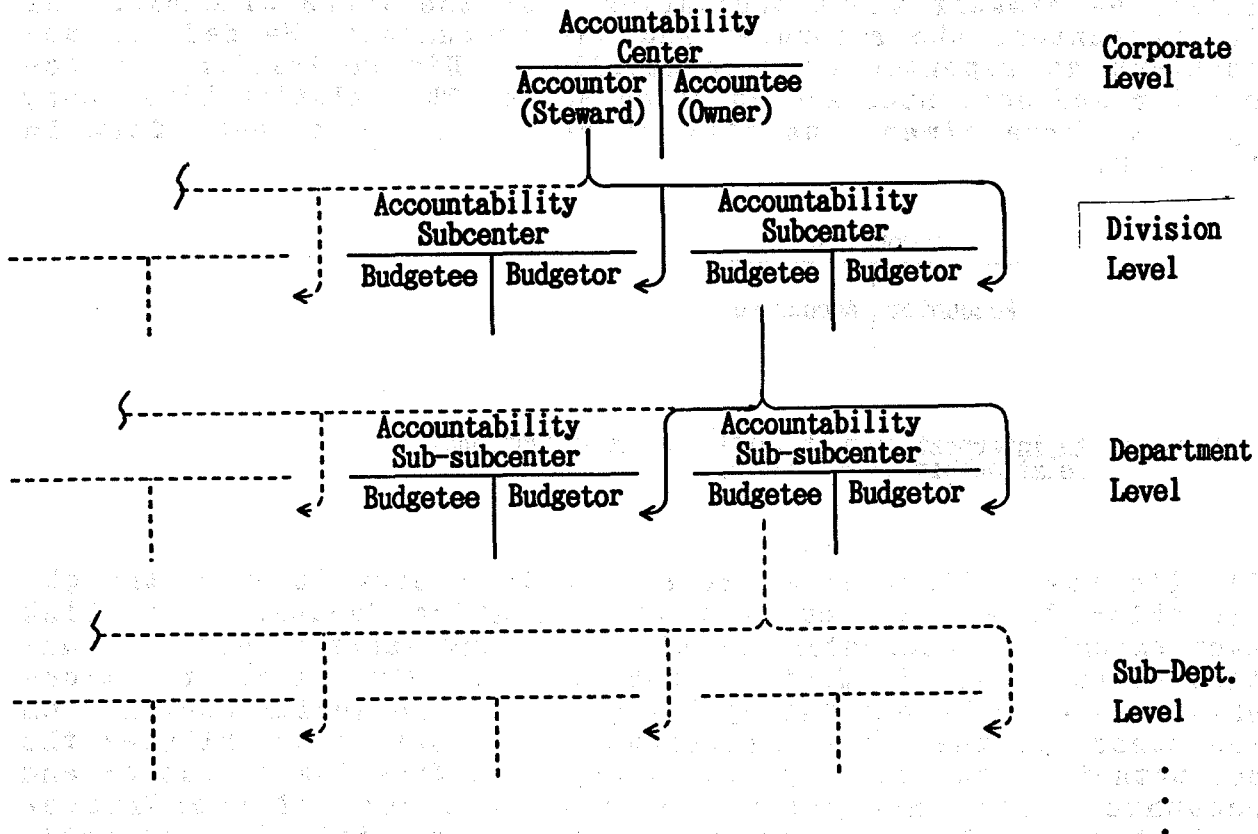


Figure 2 Accountability Network in an Organization

Each accountability center represented by an account form represents a level of entrusted resources and the accountability network as a whole constitutes the structure of the Accounting Dynamics model.

INSTITUTIONAL REGULATIONS IN ACCOUNTING FEEDBACK

Modern accounting theory has three competing paradigms. A committee of American Accounting Association (1977) has discerned three basic theoretical approaches to accounting; (1) classical ("true income" and inductive) models; (2) decision usefulness; and (3) information economics.

Classical models of accounting take a serious view of accountability and think measurement of "true income" for reporting accountability is the essence of accounting. We primarily advocate this school. Decision usefulness models emphasize accounting as an information system, which was advocated by another committee of American Accounting Association (1966). This school is very prosperous today. So far, the information economics school has had no fruitful outcome.

Ijiri, who is seen to belong to the classical school, claims that whereas the decision usefulness approach views accounting from the two dimensions of the decision maker (user of accounting information) and the accountant (preparer of accounting information), he himself views accounting from the three dimensions of the accountant, the accountee and the accountor. He defines accountant as reporter of accountability. His definitions of accountor and accountee are as cited above. The relationships among Ijiri's three dimensions will be shown on the account form in Figure 3.

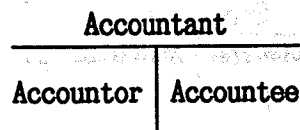


Figure 3 An interpretation of Ijiri's three dimensional relationship in accounting

Ijiri's three dimensional relationship theory is very thought provoking from the viewpoint of accounting feedback. We think even though the accountant supplies maximum satisfactory information to the specific decision maker, a two dimensional relationship ensures only partial optimization in the social context. On the contrary, the three dimensional relationship establishes the accountant as the third position separate from the accountor and accountee. The accountant can play the role of coordinator against the other two parties from the view point of total optimization in the social context. It should be noted that adding the accountant as the third party extends the relationship from

that of two interested parties into one involving the whole society, as a whole.

Because of the weaker position of the owner, the law has been closely involved with problems of accountability, as Bird points out. But today this involvement should try to control resource allocation to realize total optimization of the social system rather than try to protect the weaker party from the stronger. This means that we must, as Forrester (1968) notes, recognize a hierarchy of accounting feedback. Generally accepted accounting principles (GAAP) were formulated as a social institution in the USA during the 1930s and the in Japan during the 1940s. The accountant's intervention in the accountant-accountee relationship, as per GAAP guidelines, implies accounting feedback from the upper level of the social system.

CONCLUSION

We have explained that the charge and discharge of accountability form the basic unit of accounting feedback. Institutional regulations in the measurement of accountability lead us to recognize the hierarchy of accounting feedback. But so far we have no accounting models that include GAAP, on which institutional regulations are based, as endogenous variables. Yet, it is in such macro-accounting models that we can really talk about the control of resource allocation in social systems.

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