

PART

I

An Overview of the Theories

The domain of organizational control

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Introduction

Organizational control concerns everyone. Whether you are a manager attempting to run a department, a politician trying to frame legislation to control multinational corporations, or just an individual affected by the activities of the many organizations that touch on your life, organizational control is a fundamental concern. In what ways are organizations controlled? By whom and how? And how can we influence what they do? These are some of the questions that this book tries to answer.

We shall approach the topic in a questioning and critical fashion, and primarily from the point of view of a manager working in an organizational hierarchy. What control mechanisms are available to managers, and how can they best operate the levers of power? In trying to answer these questions we need to consider the points of view of other organizational participants and ask how controls affect what they do. Indeed control systems often take on a different complexion when viewed from the perspective of those being controlled rather than those doing the controlling. In addition we shall sometimes step outside the organization and address the issue of corporate governance, or how organizations themselves are controlled by external interest groups. Nonetheless our discussion will centre on the use of controls by managers within organizations, a topic that has become known as management control.

Many people have attempted to define the term management control, and in this and subsequent chapters we shall examine some of the alternative definitions that have been proposed. Let us begin with a simple but widely applied definition: 'Management control is the process of guiding organizations into viable patterns of activity in a changing environment.' Thus

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managers are concerned to influence the behaviour of other organizational participants so that organizational goals can be achieved. Of course this does not preclude managers from taking actions that will advance only their own interests and may even detract from overall goal achievement. Nor does it imply that organizational goals are fixed or even well-understood by most participants. But without some control mechanisms, organizational behaviour would degenerate into a collection of uncoordinated activities that lacked the cohesion required for continued organizational survival.

As can be seen, discussion of organizational control raises fundamental issues in respect of the nature of organizations and the activities that occur within them. These issues cannot be avoided, although it is all too easy to let them prevent discussion of the more practical issue of the design and implementation of control systems. We shall attempt to steer a middle course by pointing out issues and problems as they arise, while continually keeping in mind the central aim of this book, namely to set down some of the principles governing the design and use of managerial control techniques within managed organizations in both the public and the private sector.

The domain of control

When analyzing a controlled system it is first necessary to define the boundaries of that system. These boundaries are not laid down by some external agency, but are open to definition by the analyst. Thus we may choose to consider the control of individuals, either by themselves or by some external agent, the control of a group of people, the control of an organization or the control of a whole society. Secondly, it is necessary to consider who is exercising control. Again this may be an individual or an organization, or it may even be an organization apparently exercising self-control through a set of designed control mechanisms that relate to no easily defined individual or group. The boundaries of the controlled system and between controller and controlled are thus arbitrary, but they are not unimportant. Some ways of looking at a system may be more helpful than others, so it is up to the analyst to make an appropriate choice.

In general we shall draw our systems boundary around an organization as a legal entity, but there will be occasions when we shall include within the boundary groups such as customers or creditors, who would usually be considered as external to the organization. We shall also assume that the controller is to be a manager or a group of managers, such as a board of directors. However we wish to emphasize that these are arbitrary choices that can be varied if a more fruitful analysis can be obtained by so doing.

There is also the question of the system's goals. In what sense do organizations have goals, and how can we establish what they are? This has been an issue of considerable interest to organization theorists, but no conclusive answer has been reached. In a well-known and seminal paper, Cyert and March (1963) assert that 'Individuals have goals; organizations do not', although the remainder of their paper is devoted to discussing how the concept of an organizational objective can be made meaningful. Certainly there is great difficulty in coming to any conclusion on the issue. We can ask a number of questions. Whose goals are we considering, and how stable are they over time? What agreement is necessary between participants before we can accept a goal as belonging to the organization rather than to a group of individuals within it? Indeed who should be regarded as participants, and who are external parties?

One answer to this question has been provided by Barnard (1938), in his construct of the purposive organization. Another is provided by Cyert and March (1963), who speak of the goals of the 'dominant coalition' as essentially being the goals of the organization. While it would be too limiting to believe that any organization had only one purpose, or indeed that the only purposes of members of the organization were those of the dominant coalition, it is a helpful notion to regard organizations as purposive. In that sense control includes both regulating the process of formulating purpose and regulating the processes of purpose achievement. The schools of managerial thought that would claim some of this territory include corporate strategy and policy formulation.

J. D. Thompson (1967) has suggested that these problems can be understood by considering three major themes: the establishment of purpose, the pursuit of effectiveness and the struggle for efficiency. The establishment of purpose refers to the general problem of giving shape and meaning to the patterns of activity and resource allocation within the organization. Purposes are not necessarily stable over time, for they may be formulated in ways that are contingent upon changes, both within and without the organization.

If we define effectiveness as a measure of the achievement of purpose, an effective organization is one that achieves a substantial number of its purposes in any given period. Of course it is possible that an organization's effectiveness will be weaker in the long term than in the short term, or *vice versa*. It appears, then, that the notion of effectiveness can be rather inexact, in that some measure of the achievement of a set of fuzzy purposes may itself be fuzzy. Figure 1.1 illustrates this point.

Given that one might locate a boundary for an organization and test, at that boundary, whether a purpose has been achieved and therefore establish the notion of effectiveness, we might also create a boundary around the notion of effectiveness and within that boundary discuss the question of

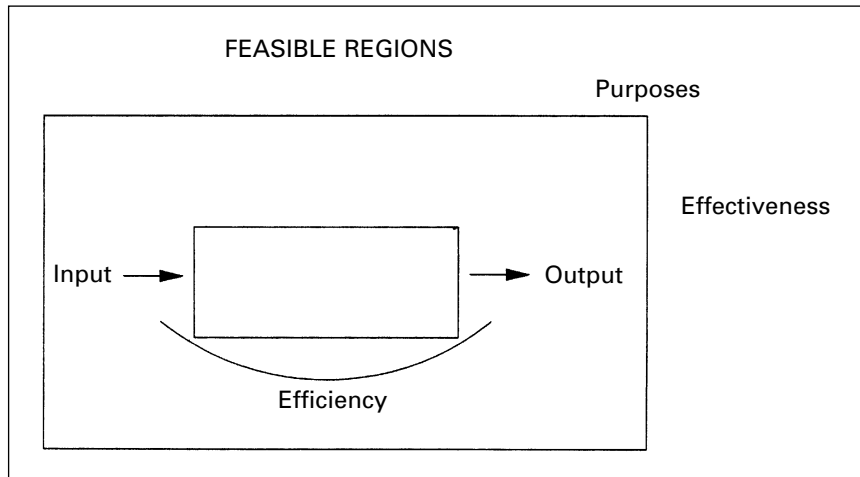


Figure 1.1 Bounding domains for purpose, effectiveness and efficiency

efficiency. Here efficiency is the relationship of outputs to given sets of inputs. These relationships can be expressed in many ways. For example accountants often relate the value of outputs in a market place to the value of inputs in the factor market place, and conclude that efficiency gains will occur either if the value of the outputs rises per unit of input, or if the cost of the inputs falls per unit of output. It is helpful to note that technical efficiency gains measured in this way might be a confusion of relative price changes and gains in technical efficiency in the transformation process. Thompson argues, and we agree, that technical efficiency can only be discussed in a bounded system where the boundaries are closed for analysis, and that effectiveness can only be discussed in a differently bounded system (Figure 1.1). Purpose, however, by its very nature will tend to be unbounded, and the product of social interaction.

These notions of purpose, effectiveness and efficiency lie at the heart of the task of controlling an organization. Regulation of the processes of formulating purposes is an area of considerable interest, as is regulation of the processes of achieving effectiveness. It is a common observation that most accounting control has tended to focus on the processes of achieving efficiency. However recent developments in, for example, strategic accounting have begun to move the focus to the more general problems of organizational management. In this sense the control model offered by Robert Anthony (see for example Anthony & Govindarajan, 2004, that we shall discuss this in Chapter 2 in some depth), talks of strategic control, managerial control and operational control, is clearly a mirror of the layering of purpose, effectiveness

and efficiency. These three problems will be with us as we pursue the general puzzles of control, especially goals and their achievement.

For the moment we shall sidestep the complexities arising from the problem of defining goals in a precise manner and substitute 'accepted plan of action' for 'goal' in most control applications. For example many organizations seem to move between periods of relative stability, when agreed plans of action are pursued, and more turbulent periods when various interest groups engage in negotiating and bargaining to establish new agreements. Perhaps the minimum overall goal we need to consider is that of survival. This goal is less problematic in that most organizations seem to have a fundamental commitment to remaining in existence (Lowe and Chua, 1983). Beyond that, the importance assigned to various subsidiary goals appears to be largely a function of the relative power of interest groups espousing particular concerns.

We are thus taking a stakeholder view of an organization, where by various interested parties exert pressure to ensure that the plan of action reflects their individual concerns to the greatest possible extent. The plan finally settled upon will depend on the relative power and influence of the groups involved. Yet it is usually in the interest of most groups that the organization continues to survive. From this perspective it is the feasibility of a plan (that is, its acceptability to disparate groups of interested parties, given their respective bargaining power) that is the fundamental guiding principle upon which subsequent control actions are based. Ideas of optimality are very much the icing on the cake, for identifying and operating within such a feasible region is difficult enough. We are therefore adopting a 'satisficing' (Simon, 1957) approach, where the attainment of satisfactory results is regarded as adequate, rather than pursuing some concept of the best possible result. However this is not to understate the importance of the cultural and symbolic significance of goals. Individuals may be committed to an organization because of its espoused goals, even when these goals do not necessarily guide many of its actions. Indeed it is probably more helpful to think of goals in this symbolic manner, rather than as their being the guiding feature of a control process.

However different organizations exhibit significant differences in the nature and the use made of their goals. Etzioni (1961) has developed a useful typology. He distinguishes between three ideal types of organization; normative, utilitarian and coercive. Normative organizations exist when most participants share the same goals; here the concept of an overall organizational goal is helpful and can be considered as the aggregate of the goals held in common. Utilitarian organizations exist when the goals of participants are irrelevant to the activities of the organization; participants' involvement is on a contractual or instrumental basis. Here some form inducement/contribution analysis (Barnard, 1938) is appropriate, but the derivation of overall organizational

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goals is not possible or helpful. It can be argued that most business organizations are predominantly of this type. Finally, in coercive organizations the values of the participants are opposed to those of the organization (or perhaps more precisely, to those of the ruling coalition within it). It is the power of this coalition that enables the organization to impose its values on unwilling participants.

Mechanisms of control differ significantly in each of these sets of circumstances. Thus the relationship that exists between individual and organizational goals can be seen as one determinant of the control processes that will be used, rather than the definition of the object of control. One task of the management control system is to assist the organization to identify a feasible set of activities that will provide acceptable inducements to all participants to carry them out. In this way the organization will continue to exist as a viable entity.

However in practice the issue is considerably more complicated than the preceding ideas suggest. Not only do different organizations have different characteristics, but also different parts of the same organization may behave differently. The norms and values prevalent in one part are often quite dissimilar to those found in another. Different forms of involvement also occur at different hierarchical levels, with senior managers exhibiting (or being expected to exhibit) normative involvement, and lower-level workers exhibiting instrumental or coercive involvement.

The study of organizational control therefore involves considerable complexity and has to take account of the vagaries of human behaviour. Nevertheless it is possible to analyze and has been approached in a number of ways. In Chapter 2 we shall take up the approaches of organization theorists. Here we turn to a discussion of the approaches to organization and control in the literature on cybernetics and systems theory.

Cybernetic and systems approaches to control

This section outlines and examines the concept of control from the perspective of cybernetics and general systems theory. The term cybernetics was coined by Norbert Wiener (1948) to denote an area of study that covered 'the entire field of control and communication theory, whether in the machine or the animal'. More recently Pask (1961) has defined it as the study of 'how systems regulate themselves, reproduce themselves, evolve and learn'. Thus cybernetics has merged into the wider field of general systems theory; the aim here is to draw out those concepts which are useful to understanding the process of management control in organizations.

The cybernetic paradigm has underlain much work in management

control. For example Hofstede reports that 'a review of nearly 100 books and articles on management control theory issued between 1900 and 1972 reflects entirely the cybernetic paradigm'. From the beginning, cyberneticians have been concerned with the common processes of communication and control among people and machines to attain desirable objectives, and have attempted to map the self-regulating principles found in human biological systems onto machine systems. Others have attempted to extend the self-regulating principles found in the human brain to organizations. Notable works in this area are Stafford Beer's *Decision and Control* (1966) and *Brain of the Firm* (1972). Finally, systems theorists have approached systems as wholes, rather than merely as the sum of their parts. Such approaches have not always been suited to organizational systems, leading to the development of the 'soft systems' approach, which was pioneered by Checkland and expounded in his book *Systems Thinking, Systems Practice* (1981).

We shall begin by outlining the cybernetic approach to the study of controlled systems and then extend it by considering the contribution of general systems theory in general and soft systems theorists in particular. This section will conclude with an evaluation of the contribution that these approaches can make to the study of management control.

The cybernetic concept of control

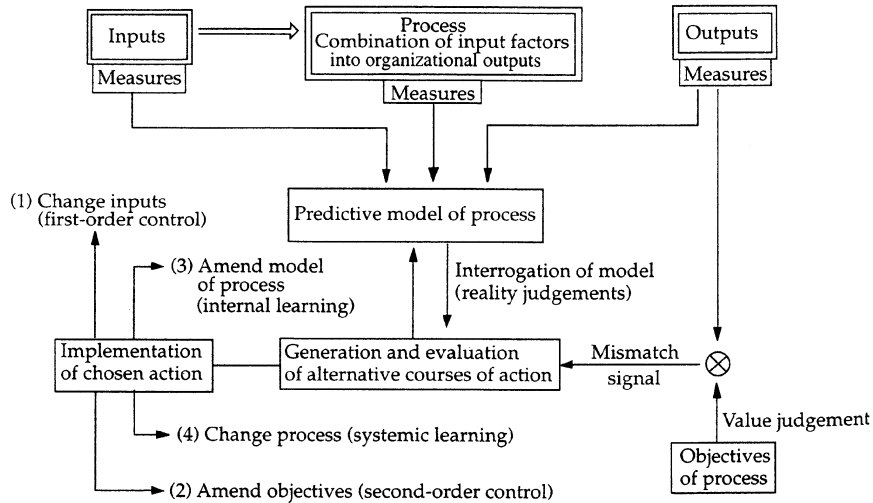
Cybernetics is intentionally not specific about the nature of the process being controlled; in this way it hopes to derive general principles of control that can be applied to different situations. The basis of controlled activity is seen as reducing deviations between actual process outputs and those which are desired; that is, it focuses on negative feedback. Although this may seem to be a very restricted point of view, part of the usefulness of the cybernetic framework is that the negative feedback mechanism is able to explain much of purposive and adaptive behaviour.

Following the general definition of control put forward by Tocher (1970, 1976) a basic model of a cybernetic control process can be derived. Four necessary conditions must be satisfied before control can be said to exist:

- j The existence of an objective.
- j A means of measuring process outputs in terms of this objective.
- j The ability to predict the effect of proposed control actions.
- j The ability to take action to reduce deviations from the objective.

These conditions are schematically represented in Figure 1.2.

The advantage of this particular scheme over similar models – which are often presented in the early pages of management control texts in terms of a



Source: Otley and Berry (1980).

Figure 1.2 Outline scheme of necessary conditions for a controlled process

detector, a comparator and an effector – is that it emphasizes the central role of the predictive model. This is reinforced when anticipatory (or feedforward) control is considered in addition to reactive (or feedback) control. Whereas reactive control waits for the occurrence of an error and then takes action to counteract it, anticipatory control predicts the likely occurrence of an error and takes action to prevent it occurring. Thus control is most effective when the process never deviates from its desired state. In the context of business enterprises, anticipatory controls essentially reflect the operation of planning systems. The more complex the system, the more likely it is that reliance will be placed on anticipatory controls rather than reactive controls. According to Ashby (1956) a lesson that can be drawn from biological systems is that it is advantageous to control not by error but by what gives rise to that error.

Unfortunately these concepts of control cannot be applied in any straightforward manner when analyzing organizational control, an issue explored in some depth by Otley and Berry (1980). Nevertheless the most important contribution by cybernetics may well be the idea that error avoidance can do much to explain apparently goal-seeking behaviour. This point of view is put forward strongly by Morgan (1979): 'Organisms in nature do not orient themselves towards the achievement of given purposes or ends; they do not orient themselves towards the goal of survival. Rather they adopt modes of behaviour and organizational forms which help them avoid certain undesirable states.' Such an approach certainly explains much of organizational and

economic behaviour, but it must be recognized that the feedback process is often highly imperfect. As stated by Geoffrey Vickers (1967), one of the most cogent administrative writers informed by a cybernetic perspective, 'In the management of human organizations, feedback is often absent, ambiguous or uninformative and [the cybernetic concept of control] points to the complementary process of mental simulation which enables management to function in such conditions.'

This process of mental simulation is essentially one of attempting to predict the possible outcomes of alternative courses of action. In this context it should be noted that the cybernetic control model presented here allows for the possibility of adaptation and learning. Indeed this is one of the most important features of a viable control system operating in an open system, and will be explored further when general systems theory is considered. It is this cybernetic perspective that informed Lowe (1970) when he defined a management control system as:

A system of organizational information seeking and gathering, accountability and feedback designed to ensure that the enterprise adapts to changes in its substantive environment and that the work behaviour of its employees is measured by reference to a set of operational sub-goals (which conform to overall objectives) so that the discrepancy between the two can be reconciled and corrected for.

The cybernetic approach is thus a logical and abstract approach to the study of management control systems. It can give some powerful insights into the operation of control systems. However it lacks specificity, and it also tends to assume that control is exercised from outside the system. Therefore self-controlled systems can be better approached by means of the general systems theory framework.

The general systems theory approach

The central concept of the systems approach is that of a system itself. That is, it seeks to explain behaviour by studying the interrelationship of parts rather than the nature of those parts. Therefore it is essentially holistic in nature, in contrast to the reductionist character of much scientific activity. The approach stresses the importance of emergent properties, that is, properties that are characteristic of the level of complexity being studied and may not have meaning at lower levels of analysis. (An example from a physical system is the concept of temperature, which is a property of an assembly of molecules and has no meaning in relation to a single molecule.) Systems can be arranged in a hierarchy of complexity (Boulding, 1956):

1. Static frameworks.
2. Dynamic systems with predetermined motions.
3. Closed loop control or cybernetic systems.
4. Homeostatic systems, such as biological cells.
5. The living plant.
6. Animals.
7. Humans.
8. Organizations.
9. Transcendental systems.

Most control systems theory is derived at a relatively low level of analysis, and an attempt is then made to transfer it to a much higher level of analysis, probably with adverse consequences in terms of applicability.

As noted earlier, a major contributor to the application of cybernetics and general systems theory (GST) to the management of organizations is Stafford Beer. In his book *Brain of the Firm* (1972) he takes the human brain and nervous system as a model for organizational control. He identifies five levels of control, labelled Systems 1 to 5. Systems 1–3 are concerned with the transformation processes required by the whole system and the maintenance of internal stability. System 4 is concerned with the maintenance of dynamic equilibrium with the external world, and system 5 with the self-conscious determination of goals. The interactions between these systems are modelled directly from the neuro-physiological system and are interpreted in terms of managerial situations. Beer's work is intuitive rather than carefully argued, and while it contains much stimulating material it is difficult to assess how much of this derives from the models propounded, and therefore its validity is not demonstrable.

GST is primarily a tool for dealing with very high levels of complexity, particularly in the case of systems that display adaptive and apparently goal-seeking behaviour. That this approach to complexity can be of value to the study of management control is perhaps best illustrated by a definition of accounting put forward by Weick (1979): 'Accounting is the attempt to wrest coherence and meaning out of more reality than we ordinarily deal with.' Although borrowed from a definition of art, this is a good portrayal of the central problem faced in accounting, and in management control more generally. Indeed approaching management control via accounting, as exemplified by Anthony (1965), can be seen as an attempt to deal systematically with the control of a complex, interconnected human activity system. The problems with the approach summarized in Weick's definition can be appreciated by adopting a systemic viewpoint. Thus accounting controls are the result of a great deal of systematic effort being put into the development of organizational controls; the result of putting a similar effort into being systemic remains to be seen.

An important distinction has been made between 'hard' and 'soft' systems approaches. The former tend to relate to physical systems with relatively clear objectives and decision processes, with quantitative measures of performance. The latter tend to relate to systems that include human beings, where objectives are vague and ambiguous, decision processes are ill-defined, possibly irrational and at best only qualitative measures of performance exist. From this distinction it appears that the soft systems approach has most to offer the study of management control.

The leading proponent of this approach, Peter Checkland (1972), claims that systems ideas are used primarily in a process of inquiry, an exploration of the meanings actors attribute to that which they observe. Thus the soft systems methodology deals with the central problem of objectives in a subjective manner. First, an analysis is deliberately conducted in non-systemic terms and the analyst becomes familiar with the rich complexity of the system being studied. Second, a root definition – that is, a fundamental statement of purpose from first principles – of the basic nature of the system that is thought to be relevant to the problem situation is sought. Third, a conceptual model of the system is constructed using the minimum necessary elements to achieve the root definition; this is validated by the data gathered at the analysis stage. The crucial step in this process is obviously the construction of the root definition, and this is also the most subjective part of the process. Smyth and Checkland (1976) have attempted to build some safeguards into the formulation of root definition by using checklists and suggesting that definitions are presented to the participants in the situation for their views. Both safeguards are designed to facilitate what Vickers (1965) would call the process of appreciation, that is, the development of a rich and insightful way of viewing a real-world situation. Such an appreciative judgement requires both factual and value judgements, and therefore any assessment of its validity is itself appreciative.

Despite such safeguards the application of systems methodology to organizations is dependent upon the subjective judgement of the analyst. Whether this is a strength or a weakness depends on your point of view; however it signals a substantial shift away from the methodologies of the physical and biological sciences. The model of scientific activity used in this type of systems approach is quite distinct from that used in the natural sciences.

It may therefore be argued that the systems approach carries with it a conservative ideology (Lilienfeld, 1978) as the analyst works within a framework of cooperative people who agree with the aims of the system. It has been suggested that systems analysis is in the same philosophical tradition as sociological structural functionalism. Although this is clearly true of cybernetics and the hard systems approach, it is less true of the soft systems approach,

which is more in the *verstehen* tradition of thought. This tradition takes its name from the German verb 'to understand' and seeks through detailed knowledge of the system to understand how the participants within the system understand it. As Berry (1983) observes, in this school great stress is laid on the accuracy and honesty of observation, the sensitivity and perception of the observer and the imaginative interpretation of observations.

While there has been much academic criticism of the functionalist approach it is important to recognize that it is less limiting than is often supposed. Burrell and Morgan (1979) point out that organization theorists have often mistakenly equated open systems theory with the use of an organismic analogy. There are also wider perspectives that have been much less fully explored. These involve either taking a more subjective stance (moving to an interpretive position) or being more concerned with radical change than with regulation (regulation refers to the maintenance and continuity of system relationships that have been established or emerged over time). From the perspective of the study of control systems, the subjectivist position poses no particular problems; however regulation is evidently of central importance, although the study of regulatory processes does not necessarily preclude the use of more radical perspectives.

The contribution of systems thinking and cybernetics

GST and cybernetics can contribute to the study of management control systems (MCSs) in various ways. First, a systems point of view can be adopted in MCS analysis. This is the least controversial approach and may constitute little more than analyzing at the organizational level and making a conscious attempt to be holistic rather than reductionist in approach. The most insightful use of this approach has been made by Vickers (1965, 1967), who as a practising administrator has attempted to codify his experience in more general terms by adopting a systems point of view and using cybernetic terminology. In particular he argues for a systemic view point that explains organizational behaviour in terms of ongoing relationships rather than by the imputation of objectives.

Second, there are systems approaches to handling real-world MCS problems, which are perhaps best exemplified by Checkland's (1972) methodology. But although such an approach may provide a means to deal with real-world problems, it does not offer any theoretical basis for the study of management control. Indeed it discounts the possibility of any general theory, arguing that each problem situation is unique and must be dealt with on its own merits.

Third, there are concepts developed in cybernetics and GST that can be used to study MCSs and develop a theory of management control. However there seems to be a gulf between these concepts and their application to the study of management control. For example Schoderbeck *et al.* (1975) lucidly describe the basic concepts of systems theory and their application to management systems, but run into difficulty when applying these concepts to any particular topic. Admittedly this is partly because of their hard systems orientation, but their conclusions are disappointingly diffuse and vague after the initial excitement offered by the concepts. Similarly Amey's (1979) analysis of budgetary planning and control systems ignores the behavioural, organizational, forensic, strategic and political elements of control (McCosh, 1990). Perhaps the most successful text in this area is that by Maciariello (1984), who makes a consistent attempt to apply the cybernetic paradigm to management control systems, but even so achieves only mixed results. Perhaps we shall do no better; the reader is the best judge of that.

Finally, systems ideas have been used in other disciplines related to the study of MCSs, such as the open system and sociotechnical system movements in organization theory. It is notable that all the open system theories considered in this book adopt, explicitly or implicitly, an organismic analogy, drawing on concepts such as survival and functional factors related to that end, such as differentiation, integration and purposive rationality.

In summary, the application of systems thinking and cybernetics to the study of management control raises more questions than it answers. Yet the very fact that these approaches raise questions may be valuable in a field that has been preparadigmatic in its development. In the West the discipline that has probably had the greatest influence on management control to date is accounting, which is a clear application of a systematic approach. The systemic approach of systems theorists may provide a useful countervailing force in the development of more comprehensive theories of management control.

A social system consists of numerous components, each of which is self-controlling and contains models of the behaviour of the whole. In organizational control, the system's environment is also complex, as noted by Buckley (1968): 'The environment of the enterprise is largely composed of other equally groping, loose-limit, more or less flexible, illusion ridden, adaptive organizations.' If management constitutes an attempt to control situations with a greater degree of complexity and uncertainty than the available techniques can cope with, then the systems approach to studying management control at least has the potential to reveal some of the fundamental problems. For example it may indicate areas in which the wrong questions are being asked and inappropriate concepts adopted. It is no sense a complete theory, but it is the most developed one we have and it deserves serious consideration for that reason alone.

Summary

This chapter has introduced the idea of organizational control and some definitions of management control. It has discussed the domain in which control might be exercised, raising interesting questions about purposes and goals and using them, following J. D. Thompson (1967), to connect organizational control to the ideas of purpose, effectiveness and efficiency.

Based on a review of the cybernetic and systems approaches to organizational control, it has been argued that these approaches are not limited to mere description, but offer a systemic frame of thought in which ongoing relationships are the foci of analysis. As Checkland (1981) has demonstrated, there is also value in these approaches for the understanding of real world problems. While the step from the abstract idea to the concrete event is considerable, these approaches do offer possible routes to practical and intelligent theory development and problem solving.

Far from using general systems theory to argue managers are not important we argue that the part played by the manager is still central to organizational control. Also it is possible, as we have seen, to relate theories of learning to the cybernetic concepts of control to show that these approaches are not static. Finally, it should be noted that the classical systems theories discussed in this chapter still have currency. Chapters 13 and 14 will provide overview of contemporary systems issues; that is, control in networks and supply chains. These issues can be usefully explored by retaining an appreciation of the ideas of systems thinking.

Discussion questions

1. What is the difference between systematic and systemic thinking?
2. To what extent can the complexity of organizations be captured by systems thinking (relate your answer to the hierarchy of systems described in this chapter)?
3. Describe a control system in an organization that you know well. To what extent is it able to deal with the complexity it seeks to control?
4. Using Tocher's (1970, 1976) description of a control system, evaluate the extent to which the following can be controlled: (a) the national economy, (b) a two-year-old child, (c) a team of footballers playing an international match and (d) your bank balance.