

# *Management, Information and Systems*

by

**ARCHIE DONALD**

**SECOND EDITION**

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## *Introduction to the First Edition*

When Frederick Winslow Taylor died in 1917 the first revolution in management techniques had taken place. Taylor had shown the need for data from which useful control information could be extracted and used as a basis for management decisions. His method and time studies yielded the data to organize and control a process, and also provided a system of payment not without its denigrators yet probably more equitable than the contracting system then current.

The revolution of our own age has consisted of the explosion in data available, the computer to process this data, newer techniques of extracting useful information from the data and a start in finding out how systems work. New approaches to managerial problems—variously termed “cybernetics”, “information technology”, “operational research”, “systems analysis”—have arisen with new terminologies. Progressive concerns, whether business enterprises or non-profit-making units, that adopt these new methods of thinking find themselves at a distinct advantage whether in matters of control of the current situation or in adapting quickly to change arising in the technology of the process or in the environment.

“Control” basically is of two sorts: the maintenance of an existing situation, bringing it back to normal when it deviates, and the introduction of change into a situation, whether by making alterations to the existing situation or by creating a new situation. In both cases the prime need is for information to guide action.

With the increased ease of handling the data flow and more powerful techniques available for extracting useful information from it, the manager’s task has been made both easier and more difficult. This seeming paradox arises from the fact that although additional information may aid his decision-taking, he must know what type of information he requires in a particular situation and select the appropriate technique for the decision he is about to take. He must know the good points

and limitations of the method he is using, what reliance he may place on its answers, and he must know the effect on the system of collecting information. Above all, he must realize that he himself still has to decide on the valuation of any particular method used. Each method of processing data will only give results in terms of the value criteria built into that particular method.

The purpose of this book is to outline these concepts and newer modes of thought, and then to examine the business enterprise and non-profit-making concern in the light of these concepts. Much current writing on management subjects concentrates on one aspect: Line Management or Work Study or Human Relations or Decision Theory or Cybernetics or Computers or Systems Analysis. An attempt is made here to show how these different disciplines overlap, and how an integrated approach will assist the manager in understanding how the undertaking functions and hence in achieving more effective control.

We first examine the objectives of an undertaking, the formulation of its policy, whether explicit or implicit, in terms of value judgements, and consider how fully this policy is understood and accepted by those responsible for implementing it. Next some attention is given to traditional techniques of control whereby management sets out to achieve its objectives; budgetary control, the most useful overall control so far devised, is seen to be deficient in that it may lack the flexibility which is necessary for growth and the best results. In order to understand better the "mechanics" of operation, the undertaking or appropriate part of it is then studied as a system, and the difficulties of successful definition are touched on. The cybernetic approach is then introduced to explain the manner in which an undertaking functions, and the concepts of "control", "feedback", "information" are given a business connotation. "Constraints" on the operation of the business system, influences which help to shape the structure of the enterprise and determine its objectives are then described in considerable detail; these include governmental policy, social environment, financial regulations and legal requirements. The individual undertaking is seen as part of a much larger comprehensive system, with much of the "input" and "output" beyond its control. The second half of the book deals primarily with the subject of information. Firstly we consider how information flows within a system and how it may be subject to "noise" and delay; we examine in turn what

use the manager makes of this information to exercise effective control, in the dual sense discussed earlier. The problems of communication and obtaining adequate but not excessive information are then discussed. Statistical and Operations Research techniques emerge among the useful tools for analysing and presenting the information in a significant form, for deriving the optimum benefit from data, and hence improving managerial skill. In the final chapter the computer is seen in its role of co-ordinating, analysing and presenting meaningful information not only about historical data but also about possible courses of action in the future. Managers are reminded at this stage that with the advent of electronic data processing, they do not abdicate their moral responsibility to the undertaking and society; in the absence of manual intervention and with a more dynamic organization possible, the formulation of the right policy objectives will prove more important than ever. This book is intended for businessmen, industrialists and administrators of all age groups who require a framework into which to fit their reading of the many specialized works on "new management thought". It should prove of value to those attending short business courses, as well as to full-time students at universities and technical colleges.

No one writes in isolation and I would like to acknowledge my debt to the authors listed in the bibliography whose books I have studied. Articles in professional and other journals on this subject increase in numbers yearly and reference to certain of these has been made in footnotes. Others may well have influenced my thought, for information presses in on every side, and to these also would I tender my thanks.

Specific thanks are due to Professor Tom Lupton who gave me much encouragement in the early stages; to Arthur Henderson of the Welsh College of Advanced Technology who dissected in detail my first three drafts; to D. B. Candlin of Leicester Regional College of Technology who helped with the final draft and to John N. Gibson, my colleague at Constantine, with whom I had many stimulating discussions in the later stages. Responsibility for what is written rests with the author alone.

## *Introduction to the Second Edition*

The systems approach of viewing the world has become increasingly useful to us at the present time. Firstly, as a way of explaining the *interaction* of phenomena, and so increasing our knowledge of and insight into their working. Secondly, as a *planning and/or control methodology*, particularly in the area of constructed systems.

Because of the type of model that has been developed both for technical use, for example control engineering, and for abstract conceptual use and because of the type of problem-oriented and multidisciplinary questions we now find it interesting to ask, a particular world view is developing. In reply to questions we now ask within the constraints of this worldview the systems approach can provide “sensible” answers.

Attitudes to organization have passed through several stages in the last thousand years. The early Church attitude tended to regard with distaste the amassing of money capital through business operation. A reversal took place once the Protestant ethic praised thrift and the economic use of resources exemplified by the businessman who was successful, amassed and invested capital. Now, in a rapidly changing world, the systems viewpoint appears to gain ascendancy. The world environment has changed:

- (i) We have vastly increased ability to handle (mainly numerical) data and information.
- (ii) There has been a technological breakthrough enabling us to produce goods in vast quantities with less effort.
- (iii) There appears to be some appreciation of our limited basic resources and of the need to rethink our world model.

In this new world situation, we have an incoming systems ethic in organizational life that operates on the assumptions (overt or covert) that,

Advancement is obtained by stating goals and solving problems, with implications that:

- (i) Goals can be stated.
- (ii) Problems can be solved.
- (iii) Data (information) is required as a basis for problem solution and that this data requires quantification for easy manipulation.
- (iv) The attainment of goals and the solution of problems is advantageous.

This standpoint is *part* only of the overall theory of systems; but it is the part that at present is receiving the most attention in organizational life. Where the "Systems Ethic" has penetrated an organization the managerial aspects emphasized are:

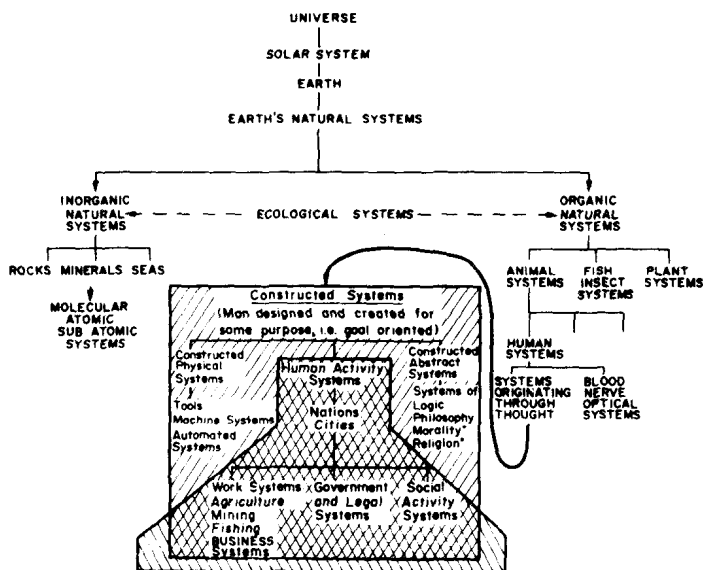
- (i) The seen need to state (in writing) the organization's goals and objectives from which strategic and tactical plans of action are developed.
- (ii) The designation of decision areas within the organization (sub-systems) and the allocation of decision-makers to those areas.
- (iii) The creation of data- (information) collecting systems. Most such systems admit specific types of data only.
- (iv) The creation of communication channels through which the collected data may flow.
- (v) The regular checking of the organization's present system state with that state anticipated in the plan and the initiation of action to bring the two into coincidence.

Organizational management falls into the category of Human Activity Constructed Systems (Fig. 0.1) where some of the "rules" are different to those of natural systems, and it is useful to consider the organization as carried on within the context of earth natural systems. Natural systems, shown outside the shaded area on Fig. 0.1, tend towards a position of "balance" whereas human activity systems have a "purpose" or seek a "goal". Laszlo<sup>1</sup> asks "Are we yet ready for intellectual acceptance

<sup>1</sup> E. Laszlo, *Introduction to Systems Philosophy*, pp. 4, 5 and 288-90, Harper Torchback, 1972.



## SCHEMA OF NATURAL AND CONSTRUCTED SYSTEMS



Constructed Systems exist  
within the context of  
Natural Systems

\*Placed here in the schema  
for convenience only

Fig. 0.1.

of the overriding rules of world natural systems?" for ultimately there is no way for managers to avoid their constraints.

Since the first publication of *Management, Information and Systems* in 1967 there has been wider dissemination and acceptance of systems theory. The author has been encouraged by the translation of the first edition text into both Swedish and Japanese and in this enlarged second edition opportunity has been taken to rewrite and expand those parts dealing more particularly with systems.

*Halstead, Kent 1978*

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## CHAPTER 1

### *Management Objectives and Control*

Within our society a business enterprise strives to produce an article or provide a service at a price that enables it to show a profit on its working. A non-profit-making concern will similarly attempt to reduce its costs and operate efficiently. All users of assets in our society are working within a financial context. In the long run these users will be measured by some financial standard, although it must be realized that many important aspects of life, for instance the benefit to be derived from an enlightened personnel policy, may not be fully susceptible to money measurement and thus may often be ignored, unless imposed by government legislation.

In most cases the financial context will deserve prime consideration when setting goals, as it is the universal unit of measurement. Businesses are expected to make a profit in the long run, and administrative departments which provide a service are similarly subject to control regarding the cost of that service. All aspects of business decisions, including those which may be termed the secondary aims (but which may in fact run a very close second to financial considerations), reflect the overall financial context: the size of the profit in relation to the scale of operations carried out.

#### **Profit Motives**

In businesses, the return on the total capital employed in the enterprise is the key figure and at least three attitudes towards the size of this profit can be distinguished.

(i) *Maximizing profit.* This is an amoral concept of obtaining as much

## 2 *Management, Information and Systems*

profit as possible, more or less regardless of the consequences. It is a rather short-term view, most likely to be met with in areas of very rapid economic expansion.

As sections of an economy get older and settle down, the vested interest in the continuance of the enterprise as a unit becomes important to its members, and hence a longer-term view is more likely than the one of quick profits. The policy of maximizing profit at all costs may be acceptable legally, unless the position is monopolistic, but is seldom acceptable socially.

(ii) "*Satisficing*" profit. A word coined by economists to indicate a rate of profit on capital employed, considered "satisfactory" taking into account the risk involved and what could be earned elsewhere. The satisfactory rate tends to be kept down to such a level that it does not attract too many competitors into the same field and also does not attract legislation aimed at curbing the profits.

(iii) *Minimaxing*. In following this policy, the maximum profit obtainable is sought, but not at all costs as in (i): the necessity to guard against possible losses is taken into consideration when making decisions. So a description runs "maximizing the minimum expected gain whilst minimizing the maximum expected loss, taking into account competitors' actions".

In choosing its profit policy a business is usually concerned with "survival". Once created, there is a strong tendency for a system to adapt to internal changes and to changes in its environment in order to ensure continued survival. The system may even be seen to modify its goals, the better to survive and continue in existence. For this reason, there should be no expectation of finding rigid and unchanging goals when the business system is examined. At the same time a too frequent change in the goals is likely to cause confusion to managers and others carrying out the policy.

The administrative unit chooses its scale of operations in relation to the funds available to it. Efficiency in use of those funds will be a large factor in determining how effective its operations are. The allocation of funds may parallel that of the business:

(i) The lowest possible cost.

(ii) A satisfactory allocation in the light of public opinion.

- (iii) As the administrative department is often in a monopolistic or semi-monopolistic position, there may be no real equivalent here. Perhaps the nearest parallel is the exposure of a department to have its services carried out by others on a "contract" basis.

*Non-profit motives.* Within the financial context, managers will also be motivated by other objectives which, although they may be evaluated financially, can be described as objectives of technical efficiency and of social standing. Often an enterprise will be found to pay particular attention to one of the objectives below and be proud of its reputation in this field, though each one of the objectives must have some consideration if the enterprise is to be well balanced.

- (i) Customer satisfaction or user satisfaction of a service.
- (ii) Position in the market, often linked with a desire for market leadership, which gives power.
- (iii) Consideration for employee welfare and development of good personnel relations.
- (iv) Public responsibility and corporate image.
- (v) Technical efficiency; a high rate of productivity. Emphasis on research and development.

### **Evolving a Policy**

When a "best" course of action is to be chosen out of, say, half a dozen possible courses open to the enterprise, a weighting system will be applied, perhaps unconsciously, to the profit and non-profit motives listed above. Having thus decided on the relative importance of the various criteria, the enterprise will be in a position to select which course of action appears to it to be most suitable at that time, i.e. "best". Another enterprise in a similar position might well choose differently. The objectives are all important and not necessarily exclusive, but it is seldom possible to follow all of them assiduously at the same time. It might well be that two business firms in the same trade emphasize different objectives and hence the whole character of the two is different. Similarly the administration of Welfare Services in different countries

can have very different emphasis. These are *value decisions* and often reflect the personal values of the founding members. These values may persist until in due course it is necessary to effect a reappraisal of the situation with a possible change of emphasis.

Within the overall need to make a sufficient profit to survive in a competitive situation, or to disburse funds under the criterion of efficiency in the case of an administrative department, there is considerable scope for decision on what objectives are to be considered important and what are not. The costs may be obtainable, but how are the benefits to be measured; to whom do they accrue? This confronts one with the difficulty of measurement in the social sciences in the absence of a control group against which to measure the effect of a particular course of action. But the enterprise can only choose or follow *one* particular course of action, and when it does so it is first forced to consider its objectives, and their relationship to its local environment and the overall total environment.

### **Stating a Policy**

Often firms have felt no need for an explicit statement of priorities of their objectives. Consequently the goals of many enterprises are held solely in the minds of senior management and may not be properly known to the staff. When the policy changes, as a result of the Chief Executive reassessing priorities, his decisions may be misunderstood and inadequately supported. With the increasing use of mathematical techniques to determine the "best" course of action, however, such a fault in management is rapidly exposed. The manager will need to be able to state his problem objectively and give his goal priorities explicitly enough both for his staff to gather relevant data and for the mathematician to work on the problem.

### **Carrying Out the Policy**

The operations being carried out within a business enterprise or administrative unit at any given time can be classified in two groups, those that are considered to be working satisfactorily and those that require

review. Management is faced with a continuing problem of control within the laid-down policy framework: to maintain the *status quo* in those areas of the enterprise that are considered to be running efficiently, and to introduce changes in those areas that are felt to be running inefficiently in order to give better service or to provide new products and markets.

The problems of controlling stability and change are common to business enterprises and non-profit-making concerns alike, and from now on the word organization will be used to cover both these managerial fields.

### **Control**

Within the overall policy most managers and executives find themselves working to a plan designed to reach certain determined objectives. This plan may be no more than a tentative one of their own devising, or it may be a plan devised by members of the organization and laid out in detailed budgets. The plan may be worked out for only a month or two ahead or, again, it may be budgeted in detail for up to 3 years or more ahead.

Wherever there is a plan related to long- or short-term objectives, it is desirable to have some means of measuring divergence from the plan so that control may be exercised and corrective action taken as required otherwise the objectives may never be achieved.

How is the executive manager to keep his organization running on the lines that have been laid down?

### **The Role of The Controller**

The controller by whatever name he may be known is the chief intelligence officer to top management. He marshals the necessary information on which the decisions are made. Such a person is necessary in an organization to guide and collate the thinking of departmental managers who may see their own departmental objectives as at least as important as the overall objectives of the organization.

*Unless departmental information is integrated each department may be*



trying to achieve its departmental budget when conditions have changed from those obtaining originally. In so doing they may be upsetting the system as a whole and throwing the organization out of balance.

But in spite of his name the controller of the organization has not only to measure deviations from a plan. He must see that information is available to top management to enable them to formulate the "best" plan. This means presenting information in such a way that the effects of alternative courses of possible future action can be seen and judged. The controller must also ensure that others do take corrective action once divergence from the agreed plan is known.

Thus there are planning, interpretive and controlling functions bound up in the task.

In the United Kingdom, the person carrying out these control functions in an organization may be variously styled: Company Secretary, Director, Accountant, Financial Adviser or perhaps Chairman of the Board. Often the function of control is divided between two or more persons, acting individually, but in close liaison.

Where control is divided, each separate controller exercises control over his particular function. This is the piecemeal approach, allowable under budgetary control which acts as the co-ordinating influence and in which the allowed limits of the variables have been strictly defined. Control may, however, be better co-ordinated if all operational results are channelled through a single officer, the controller, who can co-ordinate and integrate the results, submitting possible courses of action to the Chief Executive for his decision in the light of *all* information. The Chief Executive as decision-maker may exercise his control at intervals and perhaps on the "management by exception" principle. That is, he is only brought in to make a decision when divergence from the plan exceeds a stated limit. He will attempt to bring balance to the system when it tends to go out of balance, and this should be done long before there is any chance of a complete breakdown.

### **The Nature of Control**

The control of an organization as a whole may, at present, be seen operating at three levels of sophistication.