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MANAGERIAL DECISION MAKING

J. Bridge and J. C. Dodds

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CONTENTS

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Table 1.1 from *Corporate Strategy* by H. I. Ansoff (Editor), 1965, McGraw Hill, is used with the permission of the McGraw-Hill Book Company and Table 2.1 from *Insurance Company Investment, Principles and Policy* by G. Clayton and W. T. Osborn, 1965, Allen and Unwin, is used with permission of George Allen and Unwin Ltd.

PREFACE

To write another book in the general subject area of managerial economics requires some justification and we have been conscious of two objectives which we hope this book will fulfil. In the first place we have attempted to bridge the gap between economic theory and decision making in business, mindful of J. W. McGuire's* quip that 'Business is a practice in search of a theory' and secondly to provide a text which can be used for courses in Business Studies at Postgraduate Diploma level and for management oriented undergraduate courses at both Universities and Polytechnics.

'Managerial economics' means so many things to so many people that in the choice of our material we could, like others, be criticised for our selection but throughout this book we have adopted a unifying theme of 'decision making' with an emphasis on the normative approach – i.e. how managers can improve their decisions. In places we have felt it necessary to cover some of the theoretical underpinnings which the traditional/neo-classical theory of the firm can offer and while such references to positive economies might be questioned in a book of this nature, we feel that we have gone some way towards providing a 'blend' which we feel from our own teaching experience is necessary in business studies courses which include economics. Inevitably in a book of this length a lot of material has been omitted and some other issues have, or may appear to have been glossed over but we have, where we felt appropriate, provided references which the reader can consult in order to develop a deeper understanding of the subject matter. A complete list of these can be found at the end of the book, including the collections of readings by G. C. Archibald [7], B. V. Carsberg and H. C. Edey [23], L. Wagner and H. Baltazzis [151] and D. S. Watson [152] in which many of the articles can be found.

A first year undergraduate course in economics is desirable but not essential before reading this book and although macroeconomics is not treated explicitly here, the reader should have an understanding of the fundamentals of this subject. To this end, M. Stewart's book *Keynes and After* [137] is a useful addition to the other books we have recommended. Of all the articles we have referred to, probably the most useful as preliminary reading, is that by D. C. Hague [48], "The Economist in a Business School'. Taken together with Chapter 1 of our book this provides a firm foundation for what follows.

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* J. W. McGuire, *Theories of Business Behaviour*, Prentice Hall, 1964.

1 THE FIRM AND MANAGERIAL DECISIONS

1-1 The Business Enterprise and the Nature of Management

When one reads of the business enterprise one normally thinks of a large company in which decisions are made by managers. The type of business unit usually discussed in management textbooks is the Joint Stock Company, possessing limited liability and financed by shareholders.

Large scale production has accompanied technological change and the raising of the necessary capital has been facilitated by the issuing of shares to the public at large. Sole traders, partnerships and family concerns are increasingly rare in the world of big business. The increasing presence of large companies during this century has probably contributed to the improvement in our living standards with the frequent innovations that are characteristic of our industrial system. J. K. Galbraith [43], however, while accepting the ability of the industrial system to create a large volume of output, feels that many of the so-called innovations are wasteful product modifications designed to boost sales and that the increased demand is *created* through advertising. Industrial growth may also be accompanied by pollution and the depletion of resources, but government economic policy is still in part directed towards growth in output as a means of increasing the welfare of the nation.

Whatever one's views may be about the merits or drawbacks of business enterprise as we know it, it is apparent that the management of large firms is a complex matter. In recent years the talents of economists, accountants, psychologists, sociologists, mathematicians and statisticians have been brought together in such areas as operational research, organisation theory, managerial economics, management science, management accounting and so on, with 'General Systems Theory'as the ultimate in terms of the multidisciplinary approach. These subjects serve two aims: to improve our understanding of management and to teach managers methods of analysis which will make them more effective in their work.

Before we develop this further we must be more explicit about what a manager's work consists of. J. L. Massie [88] describes the functions of management as: decision making and policy formulation, planning and controlling, organising and staffing, communicating and directing. Decision making is singled out for special attention since it pervades

most managerial activity. Indeed all the other functions that Massie describes involve decision at some stage or another. Decision is the act of consciously choosing from among alternative courses of action and while one must always relate any decision to the action that ensues, conceptually the two can be separated for purposes of analysis. It is our view that any analysis of managerial decision making, in particular the kind of analysis designed to *improve* decisions, can benefit enormously from the subject matter of economics. This is the theme which runs through this book.

1-2 General Systems Theory

Our understanding of organisations and their behaviour has been promoted through general systems theory as described by K. E. Boulding [20]. A system is any entity which consists of inter-related, interacting or interdependent parts. In engineering we encounter mechanical systems and in the natural sciences we encounter physical and biological systems. In the social sciences we are concerned with more complex systems like social organisations and national economies in which the relationships between the parts or subsystems are often numerous and difficult to identify.

In a subject like industrial management which is concerned not just with the disciplines of social science but also technical processes, it is important to understand how all the facets of the managerial function inter-relate. We look here briefly at general systems theory because it attempts to blend the ideas of the many disciplines which are relevant in a study of management.

The most important contribution, in our view, that general systems theory has to offer the subject of management is the emphasis on the *total* system. The reason for stressing this is that in a large organisation, managers often become obsessed with the subsystems for which they are responsible. The production manager makes decisions about the manufacturing part of a business's operations, the sales manager is concerned with sales, the personnel manager with acquiring and developing human resources and so on. There is a great danger in this kind of organisation of losing sight of the business as a total entity – how the decisions made in one part of the system interact with those made elsewhere and how these influence the direction in which the whole firm will move. To emphasise the sales function in its own right, for example, may result in a level of advertising expenditure and a price structure incompatible with the profitability of the enterprise.*

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* See for example, W. J. Baumol's [14] Sales Revenue Maximisation Hypothesis, considered further in Chapter 6.

The growing complexity of military and space missile systems has been very significant for the study of all types of system. In military and space programmes it is vital to ensure that individual components or subsystems within a missile are reliable, particularly in their relationships with other components. All elements must function as an operating, integrated whole. Systems analysis* in its strict sense involves breaking the system with which one is concerned down into increasingly smaller subsystems until one arrives at the basic components.

Figure 1.1 The basic parts of a system

Systems are usually represented by flow charts in which the input, the process and the output are represented (Figure 1.1). For example, a firm can be described as a system in which inputs of financial, human and physical resources are converted via a process (in fact a complex of managerial and technical processes) into outputs of goods and services, in order to achieve various objectives, e.g. profit.

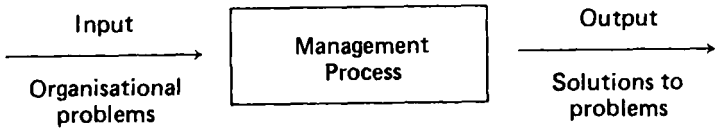
In order to understand just how a firm achieves this conversion, systems analysis is necessary in which the components of the firm and their relationships are identified. However, quite a lot can be learned about a system by treating it as a 'black box', i.e. without probing into the process, or attempting to break the system down into its components. Instead of trying to discover how it works we can simply attempt to relate the input entering the black box to the output which leaves it. This type of approach, which relies on observation over time, helps one to make predictions about the probable behaviour of the system, even if we remain unsure of how it works.

Suppose for instance, we were to study the operation of a particular factory. Over time, the inputs of materials, labour and other resources would vary and the outputs of goods produced in that factory would respond to these variations. Although it would be impossible to deduce a precise relationship from these observations, it should at least be

* The term 'systems analysis' is nowadays used in a rather wider sense, so as to include the measurement of effectiveness of alternative systems or subsystems, *vis-à-vis* their cost, so as to identify the preferred alternatives.

possible to predict in probabilistic terms, the output that would result from a given input.* The production manager can up to a point regulate output by controlling input. It may therefore be that good management is not so much a question of understanding every little intracacy inside the 'black box', but good judgement of the timing and degree of corrective action. We shall return to the question of judgement later in the present chapter.

Figure 1.2 Input, output and management process



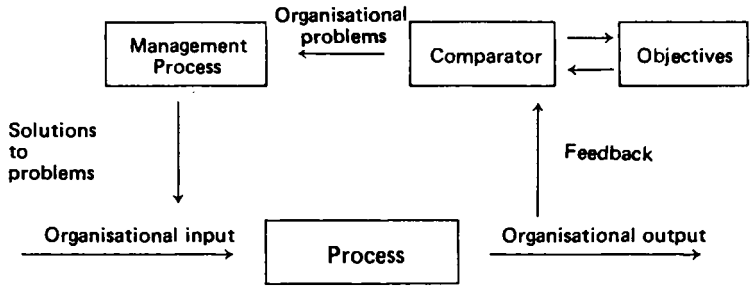
It is now time to look at the nature of management in systems terms. Decision making pervades all functions of management. Taking this a step further, it is reasonable to regard the management of an organisation as a problem solving apparatus, which produces decisions and subsequent action in response to the organisation's needs as represented in Figure 1.2. Systems analysis would reveal the management subsystems within the complex, such as sales management, production management and financial management, etc. Each of the latter being concerned with the solution of sales problems, production problems or financial problems by making appropriate decisions. How are organisational problems recognised? The prime source of information for management in recognising problems is feedback data. These are the data which arise from the measurement of the organisation's output in terms of profit, sales and other appropriate characteristics. Accounting statements, sales records and other documents are ways of communicating feedback data. The firm has a multitude of objectives expressed in terms of profit, sales, production, etc. (see Section 1-5) and comparison of actual performance as measured against the objectives or desired performance reveals organisational problems. For example, a sales revenue target of £50,000 for the year 197X might be set at the beginning of the year. At the end of nine months perhaps only £20,000 sales would have been realised with a forecast of a further £10,000 for the remaining three months. This gap between desired and actual (plus

* This is related to the concept of a production function. See Chapter 3.

forecast) reveals a problem for management to tackle. Systems analysis might reveal that the sales manager is typically called upon to provide solutions to sales problems by making appropriate decisions. A systems analyst however would always look at the sales part of the organisation in relation to the firm as a whole and recognise that solutions might be found in some related subsystem within the organisation. Perhaps the shortfall in sales in this example was caused by poor quality control in production, rather than any deficiency in the pricing and advertising activities of the sales department.

When solutions to a problem have been found they are implemented by acting on the input of the firm, and here it must be borne in mind that management can only partially control the firm's output, not only because of the complexity of inter-relationships within the system, but also on account of the multitude of external or environmental factors which influence the results that a firm produces. This means that when decisions are made, their outcomes are not known precisely (see Chapter 2).

Figure 1.3 Control loop



We can show the sequence of organisational output, feedback, comparison, problem recognition, problem solving and acting on organisational input in a flow diagram drawn as a control loop (Figure 1.3). We use the expression 'control loop' because the control or regulation of the organisation within desired limits is achieved by the sequence of activities which form this loop. Readers acquainted with simple mechanical systems such as the thermostat will find Figure 1.3 very familiar. The principle difference is that simple mechanical systems have a closed control loop with no management process necessary for regulation. In the case of the thermostat, measurement of the actual temperature and comparison with the desired, if different, automatically adjusts input (the fuel supply) to control output (temperature).

Before probing into the black boxes of the firm and its management

so as to appreciate the nature and structure of decision making, it is time to return to the claim we made at the end of the first section, namely that economics has a substantial contribution to make in the context of managerial decision making. This may not be readily apparent, for as we are about to explain, economics has traditionally failed to treat the firm other than as a black box.

1-3 The Theory of the Firm

Economics is customarily divided into macroeconomics and microeconomics and the 'firm' is decisively involved in both aspects. Macroeconomics is concerned with the functioning of the economy in broad aggregate levels, with the factors that determine the level of national income, inflation, employment, economic growth, foreign trade balance and so on, and in doing so recognises that the 'firm' plays an important part in determining these key variables. In economics the firm is seen as a unit which employs productive resources and transforms these into goods and services. An appreciation of macroeconomics is important to the business student not only because it allows him to see the part the firm plays in the economy but because it shows him the environment within which decision making takes place. It is beyond the scope of this book to cover macroeconomics in any detail and we shall take as our starting point microeconomics which has as its focal concern the working of the market system. Attention is concentrated on the two principal economic institutions; firms and households (consumers). But it is important to note that the economist regards these institutions only as essential actors or elements as part of a larger system. The basic functions performed by them may be carried out under a variety of economic systems. At one end of the continuum lies the pure market system where the functioning of the price mechanism shapes the pattern of resource allocation, and at the other the pure command economy where decisions on resource allocation and the prices of goods and services produced in the economy are centralised under a planning authority. Between these two extremes are mixed economies which incorporate features of both, as in the advanced economies of the western world.

Microeconomics starts with an examination of resource allocation within a market or price system where a multitude of individual decisions shape the ultimate pattern. Both groups of institutions are presumed to behave in a purposeful fashion which is motivated by self-interest. For instance profit maximisation is alleged to be the entrepreneur's motivating force as he transforms the productive resources (given a technologically determined production function*) into goods

* The exact technical transformation of inputs into outputs is usually expressed in equation form known as a *production function*. See Chapter 3.

and services. The consumer is assumed to be rational and pursues an objective of utility maximisation where utility in this sense refers to the total benefit, satisfaction and pleasure that a consumer enjoys from his purchases. It is the price system which harmonises and coordinates these separate decisions.

The economist's theory of the firm is in fact a collection of theories examining the behaviour of firms in the context of the market economy. It is not about *a* particular firm, say ICI or Unilever, but the concept employed may help us to draw conclusions about the chemical industry, for example, within the total market system. However, the theory of the firm sheds little light on decision making within the firm *per se*. In other words whilst the firm is recognised as an institution which influences resource allocation, it is more of a black box in economic theory with little attempt to study its internal structure, thus restricting the subject matter of economics. This firm has no balance sheet and no organisational structure and therefore is not to be confused with the firm in practice. The economist's firm is concerned with price and output decisions which determine resource allocation in the economy. It is this confusion over the purpose of the theory of the firm which led F. Machlup to state that:

> '. . . The model of the firm in that theory is not, as so many writers believe, designed to serve to explain and predict the behaviour of real firms; instead, it is designed to explain and predict changes in observed prices . . . as effects of particular changes in conditions (wage rates, interest rates, import duties, excise taxes, technology, etc.). In this causal connection the firm is only a theoretical link, a mental construct helping to explain how one gets from the cause to the effect.' ([83] p. 9)

Economic forces cannot be described, explained and/or predicted by mere observation and the number of variables which can influence a particular event is large so that without the possibility of controlled experiments* economists construct theoretical models, where we are defining a model in this context to be '. . . a set of assumptions from which a conclusion or a set of conclusions is logically deduced'. (K. J. Cohen and R. M. Cyert, [28] p. 18.) One of the critical methodological problems is the reality of the assumptions. We are not in a position here to discuss this at length but suffice it to say that these need not be exact representations but rather abstractions from reality. The economist will select those crucial variables which in his judgement will enable him to achieve predictions through deductive logic. These predictions can then be tested against the available evidence and accepted or refuted. In other words, 'Economists believe that they can success-

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* There have been attempts at controlled experiments to test the relationship between price and consumer demand. See Chapter 5.

fully predict market actions of firms without knowing how the firm makes decisions'. (D. Bodenhorn, [19] p. 168.) Models of this type are general, applying to all firms in the economy but whilst they lead to prediction they may do so without any explanatory power (see R. M. Cyert and E. Grunberg [31]). Moreover they are not designed to be able to answer the different set of questions which may be posed about resource allocation *within* the firm.

There are four elements or parts to the economist's theory of the firm. We described firms and households earlier as being purposive institutions and we ascribed profit maximisation to be the motivating force behind the firm. The objective of the firm is the first of these four elements. The second element concerns the production transformation process; transformation because inputs are changed into outputs. But this process can only take place with given information flows (third element) not only on the technology of production but on the availability of factors of production and the market demand curve for the product(s) produced by the firm. It is assumed that perfect knowledge is possessed by management. The fourth element transcends the first three parts since it is concerned with the decision making process within the firm. We have stressed that decision making is the most important function of management and if there is one single feature that can distinguish managers within a hierarchy it would be the degree of autonomy they possess in their decision making and also the type of decisions they take; whether for instance they are taking decisions which can mould the future of the firm or day to day operating decisions. It must of course be re-stated that because the focus of interest of the traditional theory is outward looking the decision making element is simplified almost to an automatic stimulus – response. Because of the assumptions made of rationality and perfect foresight the entrepreneur has a clear cut course of action and will behave in a predictable fashion.

Traditional theory, however, consists of not just one model but a collection of models where the main distinguishing feature between each of these is the structure of the market within which the firm operates. Indeed if one views the theory in terms of a continuum there are competitive markets at one end and monopoly at the other (see Chapter 6, Section 6-3). The competitive market model is normally referred to in the textbooks as perfect competition. This is a situation where there are large numbers of firms selling homogenous products to large numbers of buyers with perfect information on prices of finished goods and factors of production prices as well as perfect foresight as to the courses open to the firm. Monopoly is the other extreme where the firm controls the supply of the product (and its substitutes). The 1930s was a period of advance in the theory of the firm when a number of

attempts were made to chart the area between these two extremes* – an area often referred to as imperfect competition. These models which dealt, for instance, with fewness of sellers or the differentiation of products, were still cast in the traditional framework with profit maximisation being retained as the motivational force. But the 1930s also witnessed parallel developments which have led to the redefinition of the four elements of the traditional theory. The starting point can be said to have occurred with the attempt by economists to place their theories under empirical scrutiny with a view to examining how decisions were taken – particularly on price – compared with how economists hypothesised they were taken. This is best illustrated by the famous Oxford Study in 1939** which revealed that in practice the pricing decision was not based on the analysis found in textbooks covering the theory of the firm. This seeking of empirical validity amounts to a departure from the black box approach, and coupled with the widening of the traditional theory of the firm to include imperfections in the markets for goods and factors led economists to a redefinition of their concept of the firm. The small firm *without* influence in the market was replaced by the large Joint Stock Company or Corporation. These large companies were also shown to have market power. Admittedly not the power of the absolute monopolist but power that could be wielded to influence not only the pattern of resource allocation but that of the distribution of income in the community. In addition, the separation of ownership and management in these companies was recognised, and the possible conflict in objectives that might result from this (see especially A. A. Berle and G. C. Means pioneering work [16]).

The changing emphasis in economic theory, in particular the concern with its empirical foundations brought the following comment from Professor E. A. G. Robinson writing in 1950:

> 'But we shall not, I believe, make useful progress by writing down a series of alternative generalizations. What we need most is comparative detailed study of the processes in particular industries with particular frameworks of cost and demand.' ([118] p. 780)

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* Monopoly in traditional theory was normally reserved for certain special situations but the pioneering work of E. Chamberlin [25] and J. Robinson [119] recognised that imperfections and monopolistic elements were commonplace in markets not only for goods and services but also for factors of production, e.g. labour.

** In this study by R. L. Hall and C. J. Hitch [52], evidence from thirty-eight entrepreneurs' interviewed on their price/output decisions appeared to show that most did not aim at the maximisation of profit, but followed business conventions or rules of thumb, developed by firms compelled to make decisions in the absence of complete information. The most commonly observed pricing rule was 'full cost' plus a percentage markup to allow for profit. See Chapter 7.

In addition to discovering how decisions are actually made for positive purposes, the business economist is very much concerned with how they might be improved. In fact the emphasis of the business economist is normative in that he attempts to analyze how a system ought to behave and present the conditions necessary to bring this about. This is his part in business education* but he must temper his advice with the recognition that the firm is a complex organisation without possession of full information. The models that he constructs will often be inductive, starting with observed phenomena and then devising a model to explain them. Studies of the firm, whether normative or positive, necessarily involve an interdisciplinary approach, but before we can fully appreciate the economist's contribution, it is necessary to look rather more closely at the nature of decision making.

1-4 Three Types of Decision

A useful starting point we can employ in the classification of business decisions is the tripartite one suggested by H. I. Ansoff [6]. He argues that firms, when they are involved in the transformation of productive resources into the output of goods and services, feature strategic, administrative and operating decisions. These he sees as both interdependent and complementary. To illustrate the nature of decisions within those broad classes we have reproduced his chart as Table 1.1.

Strategic decisions, as the name suggests, are concerned with the overall place of the firm within its environment – in other words the product it makes, the markets it operates in and its ability to meet future changes. Decisions about product mix and marketing dictate the firm's long run possibilities and hence the type of decisions it can make in the future. Consequently the firm must have an adequate flow of information to permit strategic decisions to be made. But the strategic decisions which are taken depend upon the objectives of the firm and the large firm may have discretion in the objective(s) it wishes to pursue. Unlike the unequivocal assumption of profit maximisation allegedly pursued by the firm in traditional theory a real firm will not be in a position to adopt such a simple objective. This is because management does not have perfect information and cannot therefore be sure which course of action will yield the maximum. Even if it did have this perfect knowledge, profit might only enter as a constraint on the pursuit of other objectives, in order to ensure long run survival. Furthermore, strategic decisions cannot be taken in isolation from what other firms in the industry might do in response to a major change in strategy. In the cases of perfect competition and monopoly referred to earlier, the

* For a further discussion of the normative nature of business economics see D. C. Hague [48].

Table 1.1 Principal decision classes in the firm

	Strategic	Administrative	Operating
Problem	To select product-market mix which optimises firm's ROI* potential	To structure firm's resources for optimum performance	To optimise realisation of ROI potential
Nature of problem	Allocation of total resources among product-market opportunities	Organisation, acquisition and development of resources	Budgeting of resources among principal functional areas Scheduling resource application and conversion. Supervision and contact
Key decisions	Objectives and goals Diversification strategy Expansion strategy Administrative strategy Finance strategy Growth method Timing of growth	Organisation: structure of information, authority, and responsibility flows Structure of resource-conversion: work flows, distribution system, facilities location Resource acquisition and development: financing, facilities and equipment, personnel, raw materials	Operating objectives and goals Pricing and output levels Operating levels: production schedules, inventory levels, warehousing, etc. Marketing policies and strategy R & D policies and strategy Control
Key charactersitics	Decisions centralised Partial ignorance Decisions non-repetitive Decisions not self-regenerative	Conflict between strategy and operations Conflict between individual and institutional objectives Strong coupling between economic and social variables Decisions triggered by strategic and/or operating problems	Decentralised decisions Risk and uncertainty Repetitive decisions Large volume of decisions Suboptimisation forced by complexity Decisions self-regenerative

* ROI stands for 'return on investment'.

Source: H. I. Ansoff [6].

individual firm need not take account of its competitors' reactions because in the case of perfect competition each firm is deemed to be such a small part of the market its individual actions can have no effect on market price and in the case of monopoly there are no competitors. As soon as we depart from these two extremes and consider the kind of enterprise which has market power and also a few rivals (what economists refer to as oligopoly) then the interdependence of decisions – particularly strategic decisions – becomes important. Information is therefore required on the anticipated behaviour of rivals to a given policy change and some conjecture may have to be made as to how they will behave in the face of such a change. We shall discuss this feature of decision making in Chapter 6 where we explicitly deal with the behaviour of firms under oligopoly and examine some of the approaches open to decision makers.

In the absence of a single objective for the firm various alternatives have been suggested and we shall cover these in more detail later in this chapter. For our present purposes we can jump ahead of our story a little and argue that a firm may for instance have a target rate of return on its capital investment and this target becomes an objective of the firm or at the very least, a constraint. Decisions can then be made on the product mix, for instance, in line with this objective. Alternatively, it may have an objective of increasing or maintaining its market share but at the same time making positive profits.

Strategic decisions then are very much bound up with both time and knowledge. So far as the consideration of time is concerned we must stress that the firm's objective in pursuing profits is subservient to the ultimate goal of survival as a long run entity. Knowledge leads us to the question of information flow and the uncertain world outside the firm and to the fact that the firm is making crucial and often non-repetitive decisions on which little information is available. These decisions which can have a profound effect on the firm's future position and in the management structure, are the concern of top management.

Operating decisions are concerned with internal resource allocation and they translate the overall objectives into effective action. They tend to be short run decisions, concerned essentially with day to day or current operations. As Ansoff argues, 'operating decisions usually absorb the bulk of the firm's energy and attention',* and of course operating decisions of one sort or another will be spread downwards in the managerial structure. Some of these decisions may be routine, in which case it is possible to have standardised procedures. Others will be unique and require judgement in particular with reference to the firm's environment. We illustrate in Chapter 7 that pricing decisions feature

* *op. cit.*, p. 18.

a combination of internal and external factors in that it is inadequate simply to relate price to the firm's costs. Pricing must also take account of the market structure of which the firm is a part and the nature of demand. Operating decisions in their entirety can be termed the bread and butter of management.

The third class of decisions, administrative, are principally organisational. They are concerned with the structuring of the organisation so as to maximise the performance of the firm. Ansoff recognises two types of administrative decisions. On the one hand are those that are concerned with the organisational structure *per se*, the authority and responsibility patterns through which the information flows and work loads are determined. On the other are those that are vital to both operating and strategic decisions. The organisation has to ensure the supply of resources (raw materials, manpower, finance and information) both for the present and future operations of the firm.

The business economist *cannot* be expected to make an equal contribution to all three types of decision. If we break down the decisions process into separate elements we can distinguish where the economist has a part to play.

1-5 The Decision Making Process

As we indicated in Section 1-1, to emphasise decision making as a function of management is not to deny the importance of the action that decisions give rise to, it merely acknowledges that conceptually decision and action can be separated. Organisations must be designed to ensure effective action as well as decision making but the economist's contribution is restricted to the latter.

Four main stages in the decision making process can be identified:

(1) Recognising and Defining the Need

Decisions are only necessary if there is a gap between what is desired or required, and what is actually going to be achieved. Reverting to Figure 1.3 we observe that comparison between objectives and performance as revealed by feedback, indicates where organisational problems exist and the need for decision. Feedback is not the only source of data for the decision process but perhaps the most important one. Desired performance may be expressed as a target rate of return on capital employed, although this is only one possible organisational objective, as we shall see shortly. The need for a decision would be expressed in terms of the short-fall in performance. There may be some kind of trigger mechanism which warns management that the reality is different from the desired state of affairs, or managerial judgement may be involved. Sir G. Vickers [149] calls the latter 'reality judgement'.

Inventory control involves the setting of minimum stock levels which act as an automatic warning device for inventory management. Re-ordering is more or less an automatic process, akin to regulation in a thermostat. Managerial judgement is not necessary. Automatic devices like this form closed loops so that comparing actual with desired, if different, generates an 'error signal' which triggers off decision and action. The organisation is often able to respond appropriately by using standard procedures for routine decisions, in response to the feedback or signal. Higher level, or strategic decisions, however, involve forecasting and managerial judgement before the need for decision is recognised. Having recognised this need, search is then instigated.

(2) The Search for Alternative Solutions

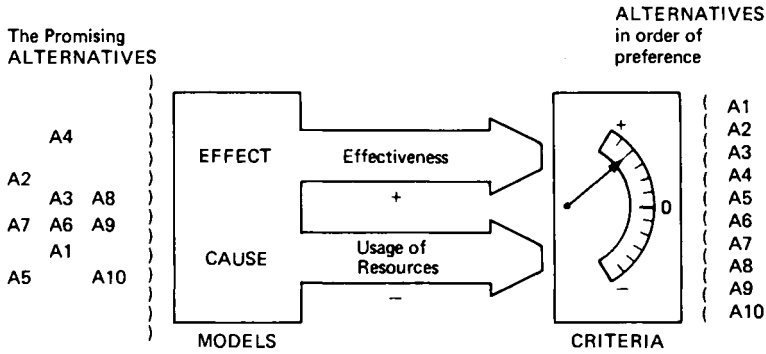
The complexity of search therefore depends upon the class of problem. For operating decisions like stock control search is only initiated if standard procedure fails whereas strategic decisions can rarely be reduced to set methods of solution. Generating the alternatives may require research, fact finding or discussion. In strategic decisions it may be necessary to consider alternatives outside the confines of the firm's existing activities. Finding courses of action which are feasible and likely to be successful may involve managerial judgement (Vickers talks about 'action judgement' in this context). Ideally the firm should consider all solutions, but in practice it will normally base its decisions on relatively few alternatives for which it is possible to ascribe 'pay-offs'. It will not in practice seek complete or perfect information, but consider alternatives which are feasible in that they can be subsequently implemented. These alternatives will consist of manipulations of factors which are within the control of management. In decision theory (Chapter 2) they are called 'strategies'. R. M. Cyert and J. G. March [32] point out that search tends to be localised initially, managers perceiving conspicuous alternatives, and that activity only becomes more widespread if a feasible alternative does not emerge in the early stages. Certainly the idea of search behaviour taking place as a consequence of a need or problem arising is very much a part of Cyert and March's 'Behavioural Theory' and something not immediately apparent to the economist whose study of the firm has revolved around a 'mental construct' or black box with an unknown internal structure.

(3) Evaluation of Alternatives

The decision maker must then identify and where possible quantify the consequences of the alternatives. Somehow alternatives which are to be preferred must be isolated from the rest. Ideally, a strict ranking should be obtained before the decision is made. The term 'systems analysis' encompasses formal analytical studies designed to help a

decision maker identify preferred courses of action, especially in military decisions. Unfortunately it is one of those terms which means all things to all men (see Section 1-2 above). Whatever the nature of the systems, subsystems, or alternative courses of action put forward, analysis is necessary both in terms of the resources used and the effectiveness of each alternative in attaining a specified objective. For this purpose models are required, showing for each alternative what resources will be used and the extent to which objectives can be attained, the latter involving a 'pay-off' measure. Such models may be abstractions of the real world with or without empirical validity or mathematical equations, the important feature being their ab'lity to relate cause and effect, input to output, usage and cost to effectiveness (see Figure 1.4).

Figure 1.4 The structure of analysis



Criteria are then applied in order to rank the alternatives. Some measure of profitability will obviously be involved as it is a means of comparing outgoings of the enterprise with incoming revenues. Return on investment is the principal measure of cost-effectiveness* of the

* Cost-effectiveness is the term used by systems analysts in their assessment of efficiency. The latter must take account of the input cost as well as the magnitude of output in a world where resources are scarce and costly.

business organisation. Unequivocal criteria, however, are hard to come by and rankings are moreover confounded by risk and uncertainty which preclude any unique figure being placed on an outcome. Vickers again points to the role of judgement, in this instance 'value judgement' which may be exercised by the decision maker in evaluating alternatives. There may be conflict situations with the biases and the aspirations of the various subunits of the organisation precluding an unequivocal choice. It is thus vital that criteria should be established wherever possible if the evaluation procedure is to be straightforward.

(4) Decision – The Act of Choosing

A decision is a conscious choice from among alternatives. What has been emphasised so far is that decision making is directed towards definite objectives, that several alternatives may be possible, and that each of these may consume different amounts of resources and result in varying degrees of effectiveness in meeting the objectives. If the criterion (or criteria) adopted gives a definite ranking, then the best alternative should be chosen by the decision maker. In this book we shall be discussing a number of optimisation techniques: for example in Chapter 3, linear programming will be advocated as a powerful technique for optimal decision making in such diverse areas as planning the product mix, blending and transportation, and in Chapter 8 we shall show how preferred investments can be identified using discounted cash flow techniques.

When uncertainty, the lack of a suitable criterion or managerial inability to judge precludes an optimal choice, choosing an alternative which is satisfactory may prove a less demanding task. Indeed it is argued by H. A. Simon [132] that 'satisficing' behaviour is all we can strive for in organisations and it is for this reason that the profit goal is most likely to be expressed as a *target* rate of return rather than the maximum possible.

Furthermore, once a satisfactory alternative has been discovered, Cyert and March have shown that decision often follows immediately; so that the first satisfactory alternative is chosen and implemented. This implies that search and evaluation and even choice may take place more or less simultaneously. This is particularly true of repetitive operating decisions which often involve standard procedures. Such decisions may become programmed, i.e. a set response follows the recognition of a specific problem. So although decisions can be regarded as involving these four steps, in practice a simplified procedure may be possible.

Having decided on the course of action, managers must ensure that the decision is implemented. As stated earlier, this in itself is an important function of management but the book's main emphasis is on the decision rather than the action which follows. After implementation

comes measurement – the control function of management. The control mechanism provides a means of perceiving the need for decision, in comparing actual with anticipated. A continuous cycle of decision-action-control-decision-action-control then results.

1-6 The Role of the Economist

The economist will find that his understanding of the business environment enables him to play a vital part in anticipating the firm's short and long term needs. Moreover he may have an important part to play in the discovery of feasible courses of action.

However, managerial economics is primarily concerned with the evaluation of alternatives. The reason that economic analysis is suitable for this purpose is that whatever its shortcomings may be in describing and explaining the behaviour of real firms, the principles that are employed are logically consistent. In evaluation, each alternative must be appraised in terms of cost and returns if resources are to be allocated efficiently. Economics shows how costs should be measured in terms of displaced opportunities and emphasises the distinction between fixed and variable costs (see Chapter 4). It provides a framework for demand analysis within which sales revenue can be estimated (see Chapter 5). Probably the two most valuable concepts used in evaluation are those of marginal analysis and opportunity cost. The logic behind marginal or incremental analysis is beyond dispute. Quite simply if a manager wishes to commit resources to a particular course of action he should first estimate the additional costs the firm will incur and the additional revenue it will receive.* The difference between these two is called the 'contribution'. However, an alternative showing a positive contribution (incremental revenue exceeds incremental cost) offers no guarantee that the firm's financial position will be improved on its adoption. The reasons for this is that the course of action may require productive facilities that the firm already owns. The cost of using these facilities would not be included under incremental cost since the latter only includes *additional* outlays. The economist argues that the use of any resource can only be justified if it brings a return at least as great as the best alternative use for that resource. Opportunity cost measures the return foregone by rejecting the best alternative use.

This is perhaps best seen in a numerical example. Suppose a manufacturing concern is producing 5,000 units of product X per month

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* Marginal analysis is often used in a more restricted sense. Marginal cost to an economist is the change in cost brought about by a *unit* change in output. Similarly for marginal revenue. When dealing with proposals which refer to other than unit changes in output, the term 'incremental' is normally preferred to 'marginal'.

which sell at £3 per unit and add £2 per unit to the firm's production costs for the labour and raw material resources used. A proposal for product Y is then considered. Each unit of the latter would sell for £4 and add £2.50 to production costs, again for labour and material inputs. Three thousand units of Y could be sold each month but the output of X would have to be halved to a monthly figure of 2,500 units in order to release the necessary machine time for Y's production.

In order to analyse this proposal, it is first necessary to apply marginal or incremental analysis. Marginal cost of Y is £2.50 and marginal revenue is £4.00. We are assuming these figures remain constant for all output levels in this example, so that for 3,000 units of Y,

incremental revenue	=	£12,000
incremental cost	=	£7,500
contribution	=	£4,500

The second step is to measure the cost of using the firm's productive capacity in terms of displaced opportunities. If product X is the only competitor for machine time, we can measure the opportunity cost of that resource as the contribution foregone by displacing 2,500 units of X. This amounts to 2,500(£3 – £2) = £2,500.

The firm would therefore benefit from the production of Y but not by the £4,500 per month revealed by the first step in the analysis. After allowing for the opportunity cost of machine time (step 2) the true profit obtainable from the manufacture of Y would be £4,500 – £2,500 = £2,000 per month. Taking this further, it can be seen that if Y could only be sold for £3 per unit, the total contribution from 3,000 units would only be (£9,000 – £7,500) = £1,500. This would be insufficient to compensate for the return foregone of £2,500 per month.

An interesting case is the one where existing productive capacity is standing idle. The opportunity cost of using it is zero, since no alternatives are being displaced. The decision to use this capacity then rests solely on the first step, i.e. marginal or incremental analysis. These two stages (marginal analysis and opportunity costing) in evaluation will be referred to repeatedly in the chapters which follow. Together they amount to the 'golden rule' of economic appraisal. The criteria used in assessing the alternatives are consistent with this kind of analysis. This is true of all levels of decision, including investment which is a higher level decision. In investment appraisal, the criteria of net present value and internal rate of return provide the basis of testing for acceptability and for ranking projects (see Chapter 8).

One of the major issues in the decision process is allowing for risk and uncertainty. Unfortunately economic analysis has no ready solution to this. Consequently a text such as this has to consider the

contributions of decision theory and game theory in handling imperfections of knowledge. Decision theory is dealt with in Chapter 2 and game theory follows later in Chapter 6.

1-7 Objectives

Before any analysis can be developed to help managers improve their decisions, the objectives of the firm must be stated. Obviously different advice would be appropriate for a firm which sought the achievement of short-run profit maximisation from that given for an objective of market share maximisation. The latter might involve lower prices and higher advertising expenditure than is compatible with profit maximisation.

Economic theory has normally assumed profit maximisation with some justification because a private firm has to make some profit in order ro survive. In looking for an objective which is characteristic of all firms, profit is undoubtedly of widest applicability. The idea of maximisation should not be taken too literally. It is easy to see that if knowledge is less than perfect the alternative which is capable of yielding the maximum profit possible may not be known. And even if all alternatives were available for evaluation it is generally impossible to estimate precisely what outcome or pay-offs will result (see Chapter 2). The reason why maximisation is retained in economic theory is that definite predictions are more readily available with it than without it. Moreover it is surely a reasonable belief that the interests of firms will be better served by a bigger profit than a smaller profit so that maximisation is at least a useful approximation.

Of course, when the theory of the firm is only a means to an end as has been suggested and not a study of the firm *per se*, the use of such approximations is defensible. Profit maximisation comes under attack in the analysis of large firms with substantial discretion in decision making and which are significant entities in their own right to warrant special study. W. J. Baumol [14] argues that large firms operating in markets where the forces of competition are weak don't have to maximise profits in order to survive. So long as sufficient profit is being made to keep shareholders happy and to provide adequate internal finance, managers can pursue other objectives which reflect their own interests. Unless management has substantial holdings of shares, Baumol argues that sales revenue is likely to be a key managerial goal in the short run, and growth of sales in the long run. These views are also held by J. K. Galbraith [43] and R. Marris [87] though their emphasis is mainly on long term growth rather than the short run. Williamson [157, 158] believes that managerial utility depends partially upon profit but he also includes expenditure on managerial perquisites and

staffing in his objective function.

At this juncture it is appropriate to say a few words about managerial utility. Williamson uses the concept of utility in much the same sense that it is used when referring to a consumer's utility from his purchases. In the same way that certain patterns of consumption will offer a higher level of satisfaction to the consumer than others, certain combinations of profit, managerial 'perks' and staffing expenditures will be preferred by management to other allocations of resources.

A further use of the word utility is encountered in the next chapter (Section 2-8). This is the usage of J. Von Neumann and O. Morgenstern [105] and it refers to an individual's preferences when confronted with risky choices. The latter have a psychological impact on the individual and this varies with the probability of gain viewed against the probability of loss. Certain options will offer a higher sense of well-being to an individual than others and the degree of such preferences is also referred to as utility.

R. M. Cyert and J. G. March [32] in their 'Behavioural Theory of the Firm' recognised, like Baumol, that when competitive pressures are weak, the organisation can survive with satisfactory profits which are less than the maximum possible. Thus 'organisational slack' which includes excessive costs or unprofitable sales, can build up, without the company's livelihood being endangered. A similar concept to organisational slack is Leibenstein's [78] 'X-inefficiency'. This refers to inefficiency in internal resource allocation which can reduce the welfare of the community in the same way that allocative inefficiency in product markets is alleged to do. Cyert and March observed that the targets of organisations changed over time as aspirations changed, with success stimulating aspiration and failure inducing search and the dampening of aspiration. Instead of restricting their discussion to *managerial* goals, Cyert and March point out that the firm is normally departmentalised and that each sub-unit will work towards one or more of the following five goals: profit, sales, market share, production and inventory, target levels for each goal being set as a result of a bargaining process. Sales and marketing personnel would normally work towards a sales or market share goal. Employees in production departments would generally strive towards production targets, etc. Even here profit retains some importance as it is the only goal which all parties are involved in regardless of which department they work in or their seniority in the hierarchy.

None of the authors mentioned are arguing that managers should be encouraged to pursue these non-profit maximising objectives, they are trying to improve our understanding of resource allocation in situations where large firms are predominant and where market constraints no longer determine a firm's behaviour. Cyert and March in particular are

concerned with resource allocations within the firm and actual decision processes. They have gone the furthest in making their firm more like a real firm, but at the expense of tractability and the provision of general predictions about prices and outputs in markets. If we were to use the objectives described in these managerial and behavioural theories for normative purposes we could be wrong on two counts. First of all they pertain to business as it currently exists. The purpose of this book is to provide a framework of analysis within which management can improve decision making and we must state what the aims of a business should be rather than what they are in practice. Secondly, there is the danger of using objectives which reflect the needs of departments or sub-systems within the firm or individual interest groups. Our concern is with the enterprise as a whole, a view consistent with systems thinking as depicted by R. A. Johnson, F. E. Kast and J. E. Rosenzweig, who say,

> 'Managers are needed to convert disorganised resources of men, machines, and money into a useful effective enterprise. Essentially, management is the process whereby these unrelated resources are integrated into a total system for objective accomplishment.' ([65] p. 301*)

This however still begs the question of what constitutes 'a useful effective enterprise', and what yardstick measures effectiveness.

Short run profit maximisation, abandoned by managerial and behavioural theorists as inadequate for their positive theories has also been regarded as unsuitable for normative purposes. P. F. Drucker [36] points out that the firm's ultimate long-term aim is survival. Referring to short run profit maximisation, he says: 'To emphasize only profit, for instance, misdirects managers to the point where they may endanger the survival of the business.' (p. 82).

In particular he points to the neglect of research, promotion and postponable investments which can result from this objective. Drucker, however, does include profitability as one of the key objectives a business should aim for. Profitability differs from profit in that it is expressed as a rate of return on capital and is ideally calculated over the total life of an investment,** or at least over a long time period if one is measuring the performance of a whole company rather than a single project. Profitability also satisfies the shareholders' requirements

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* The page number refers to that in B. V. Carsberg and H. C. Edey [23] where the article is reprinted.

** We shall discuss the problems of measuring profit in Chapter 4, when we examine the differences between economic and accounting concepts of cost. See also Chapter 8 where 'internal rate of return' is used as a measure of profitability.

because this is the source of their dividends and capital gains. Shareholders after all, are the legal owners of the company and quite obviously managers must at all times look after their interests. At the same time it is generally accepted that the responsibilities of management do not stop at the shareholder. Employees and the public at large must also be considered and this may impose constraints on the quest for profitability. Such considerations mean that high profits do not guarantee an effective enterprise. Though the measures of profitability show whether or not the firm is earning sufficient revenue to cover outgoings and provide a return on capital, they are imperfect measures of efficiency in terms of output to input. Perhaps they are the best guides available, but large surpluses can be enjoyed by companies, not only by satisfying consumer demands and utilising resources efficiently, but by virtue of their market power.

Exploiting market power enables companies to charge higher prices and receive higher profits than if perfect competition were the order of the day.* Galbraith [43] believes that consumer demands can be created by persuasive selling techniques so that producing outputs to satisfy these contrived demands has no virtue, despite the profits that are enjoyed by companies. A further point is that high profitability can be achieved by paying inadequate wages and avoiding costs by neglecting responsibilities to employees generally. However, this latter argument is unlikely to have much relevance where employees are unionised and are able to wield their own market power. Moreover paying higher wages and improving working conditions may increase worker productivity and ultimately profitability.

A rather different drawback to the usual profitability measures is that only private costs and returns are included. Costs which society has to bear, such as pollution of the atmosphere and rivers are not included in a company's calculations. Neither for that matter are any social benefits which the company may provide either directly or indirectly. Social *costs* are the more controversial since they are generally believed to exceed the social benefits. A firm which is profitable in terms of private costs and returns can hardly be regarded as efficient if it is only profitable at a high cost borne by society in the form of environmental damage.

From this brief discussion it is apparent that profitability, while satisfying shareholder needs, is not necessarily consistent with the other responsibilities of management. But despite the reservations we have made, it is unlikely that any other goal is so widely applicable. As far as possible the analysis developed in this book will be sufficiently general so as to facilitate decision making for the achievement of other

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* Although it is often difficult to use 'profit' as an indicator of monopoly. See C. K. Rowley [121].

goals which may arise in practice, but because of the universality of the profit goal this will be the prime one referred to from now on. Basically the emphasis will be on long run profitability, though some of the models will be short run in nature, to show how existing resources might be used more efficiently. Occasional reference will be made to other objectives, for example sales revenue as an aim for marketing, or possibly a short run objective for the whole company (see Baumol, *op. cit.*, [14]), but it is assumed that any such departmental or short run considerations are consistent with the overall long term aims of the enterprise.

Finally, we accept that *maximum* profitability is an ideal which cannot be realised in practice. Nevertheless, we hope that in the following chapters, the reader will learn how to improve profitability, not through neglecting employee and customer interests, but through the efficient use of scarce productive resources.

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