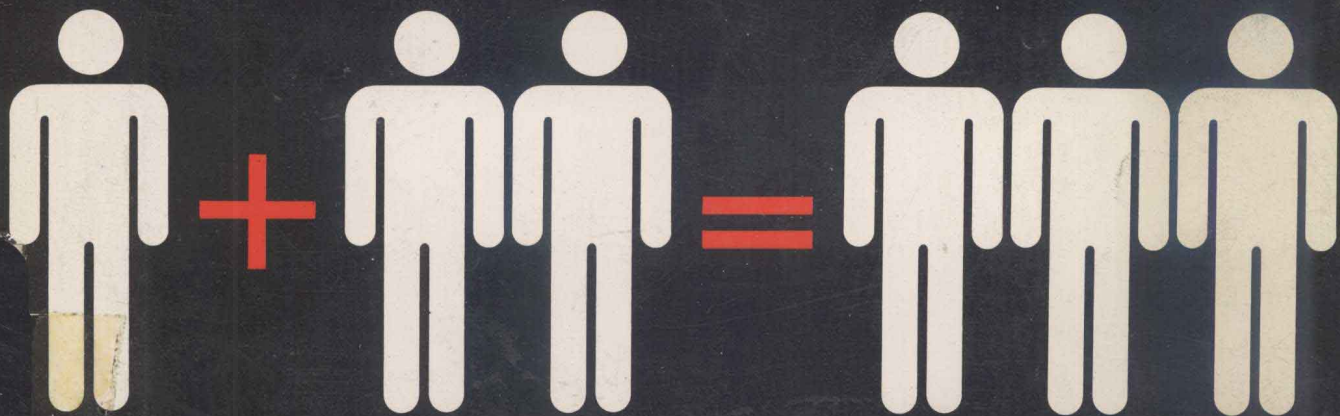


Management Statistics

D.Tasker



Nelson Advanced Business Studies

Management Statistics

D. S. TASKER

NELSON ADVANCED BUSINESS STUDIES

Thomas Nelson and Sons Ltd
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Sunbury-on-Thames Middlesex TW16 7HP
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Figs. 6.3 and 6.10

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What is a business?

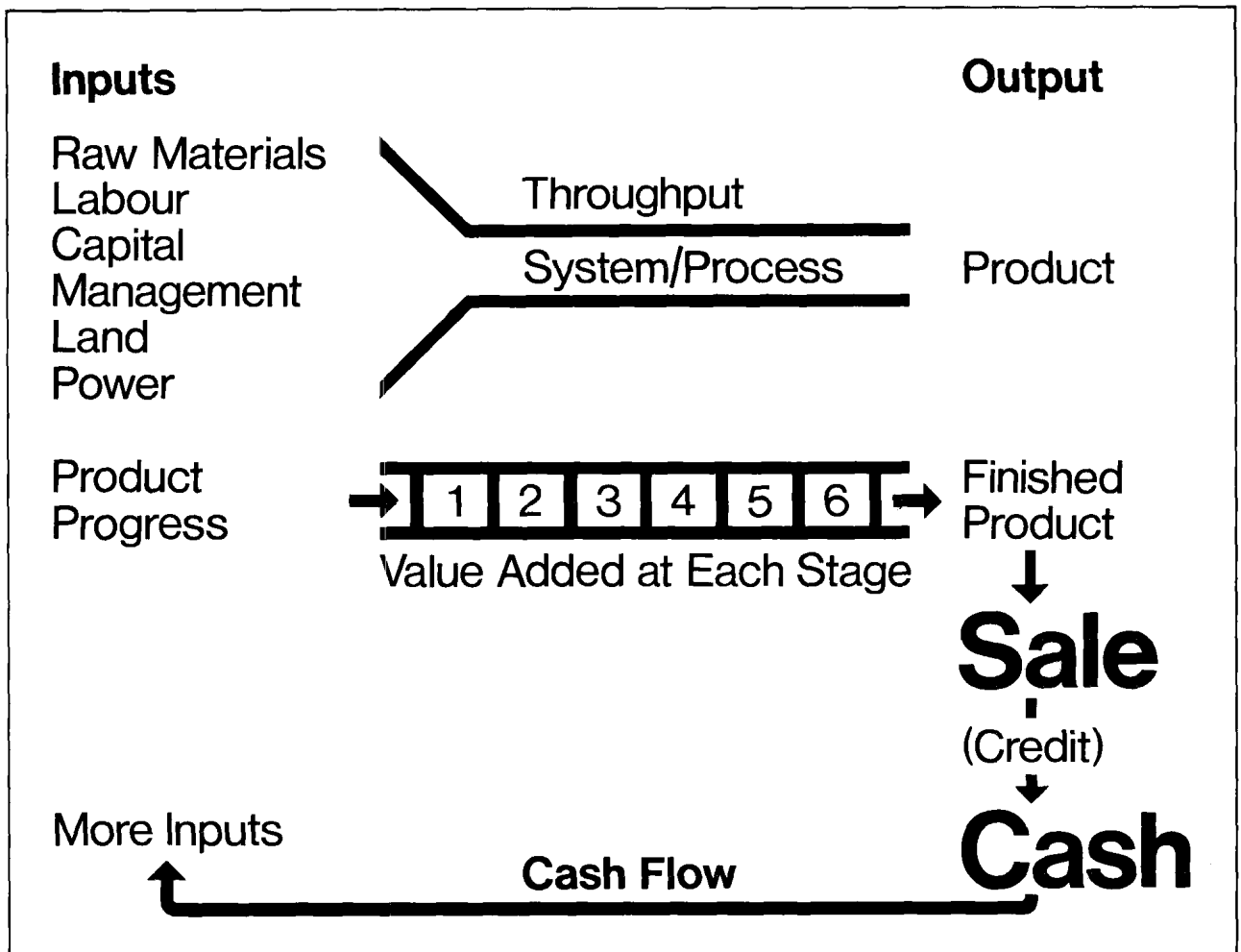
You probably know people or have friends whose parents are in 'business', and you see shops, and are probably familiar with local factories, the local haulage service and so on.

All these are businesses—what would you say they have in common? Probably the following:

- a** they are organised by people;
- b** to make something, to buy or sell, or to provide some form of service that other people want;
- c** to do this profitably.

Figure 1.1 shows that a business is a framework: it exists as an organisation which, essentially, *controls* the flow, through time, of the raw materials which become its product..

1.1 A Business



Input

There are four basic inputs—the economists' 'Factors of Production'. These are, traditionally, *land, labour, capital* and the skill of the *entrepreneur*.

Again, in classical economic terms, these four reap their due rewards:

LAND	LABOUR	CAPITAL	ENTREPRENEUR
↓	↓	↓	↓
RENT	WAGES	INTEREST	PROFIT

These are the money rewards of the Factors of Production. Owners of land may rent (or lease) it out for money. People who work receive wages and salaries. Those who lend money expect, eventually, to receive it back with the interest for its use, while those who take risks—people who buy shares in a company, or risk their own money in a personal business venture—expect to gain the profits, after the other three factors have been paid. They must in any case bear the losses.

Two further points may be noted: *government*—which provides the legal and political context in which business operates; and *taxes*—the way in which government takes a share in business. (The classical economists felt that government was a necessary evil, and forbore to mention it.)

All the factors are necessary: they are inter-dependent, although sometimes one person may provide more than one of the factors. For example, a working director in a small firm who (theoretically) labours for a wage, gets interest on his loan capital, and takes profit on his risk capital.

Given this form of co-operation (and business is essentially a co-operative effort, hence the difficulties which arise if one factor withdraws, for example a strike by labour): wealth can be created. This fruitful result of business is of benefit to the whole community, as well as to the factors of production involved.

However, in more practical terms, input can be seen as *raw materials* (bought with capital, or extracted from land) such as the wood necessary for a furniture factory; *labour*—the various skills used in processing the wood, etc.; *energy* (power) to drive the machines and so on.

Throughput

An American term to describe the processes to which the raw materials are submitted to change them into finished goods. These processes may, for example, include machining, chemical processes, packing to size, etc. 'Throughput' is often used quantitatively, for example throughput of so many items per day.

The nature of the processes used will, to a large extent, determine the physical shape, and often the physical size of a business. Clearly the different processes in a chemical factory distinguish it from a supermarket, where the 'process' is simple: stacking shelves so that customers may pick up goods, and providing a checkout where they can pay for them.

Management will seek efficiency in the processing of raw materials, so that wastage, breakages, etc. are kept to a minimum.

Output

This is the name given to the finished goods in their pristine state, ready for sale. Output may also be of services; the 'output' of a haulage firm, for example, is of this nature. The size of the output (in relation to other firms in the same line of business) is the scale at which the firm operates: its value in money terms is one way of determining the importance of a firm in an absolute sense, compared with businesses throughout the country.

But, most important of all, the size of the output in relation to the input is a measure of the efficiency with which the firm carries out its processes. Firms constantly strive towards greater productive efficiency—*productivity*.

Marketing

Output is not the end of the business, however. *The output must be sold*. Giant car firms are very efficient, and have a large productive capacity, but in recession, when fewer people are buying cars, they run into financial difficulties, and may face bankruptcy.

So, alongside the **Production Manager**, the **Sales Manager** has an equally important place.

Selling is exchanging the product (finished goods) for money and it is obvious that sales must be

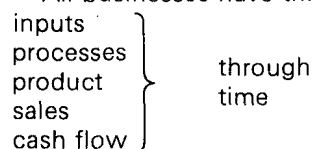
at a price which will at least pay the full cost of the inputs and processing. Marketing covers more than simply selling. It suggests, in addition to the other jobs of a Sales Department, promoting (advertising, etc.) the product; persuading people to buy; deciding a price, etc.

Cash Flow

From sales stems the cash flow, as people receive their goods (the product) and pay for them. A healthy cash flow is vital to the firm. The money is used to buy more inputs of raw materials; to pay wages of labour; to meet all the expenses of running the business. So the pattern carries on: the new inputs are processed, sold and provide money to continue the cash flow into more raw materials, etc.

Over a period of time, hopefully, a surplus of cash arises, above that needed to replace raw materials. This **profit** can be given to the entrepreneurs, the owners of the 'equity' capital, or it can be retained within the business to allow expansion and growth.

All businesses have this basic pattern:



Working and Fixed Capital

The amount needed for the inputs and processes up to the point of sale, is often referred to as the 'working capital'. In many businesses this working capital is borrowed from the bank, and is distinguished from the 'fixed capital', which is the shareholders' money tied up in the land, buildings, machines, etc., used by the business.

The time element is important: with working capital, the money is committed from the start. The fixed capital buys the assets which are used specifically for this business and the working capital buys the raw materials—which are themselves capable of many alternative uses—and commits them to a process.

Thus the money is 'tied up' in the business, as inputs are transformed from the general (for example,

wood) to the specific (for example, a coffee table). The value of the inputs will be greater, in many cases, than any of the halfway stages (for example, a half-finished coffee table leg), but the final product, having had skill (work) performed to produce it, should be more valuable than the inputs—wealth has been created.

The creation of wealth has taken time, as well as effort (of work) and money.

What does a business do?

It creates wealth.

It tries to satisfy consumers' wants. (A sale is the creation of a customer!)

It is thus involved in many activities: assessing and creating consumer markets; marshalling inputs; carrying on the processes of production; having its products available for sale; and *selling*.

Within this, the functions of *management* are as follows:

- a** Control of the whole organisation, including the main areas of production and marketing.
- b** Innovation, to develop and update the business.
- c** Utilisation of resources productively.

And where does the profit motive, so important to business, fit in?

Profit is the financial result of business: it arises from the carrying on of the business. Whatever the owners of a business may feel about it, profit is a result of successful business, not its main motivation; though without profit it is hard for a business to continue to exist.

Profit provides funds for expansion, and also gives security to the enterprise, so that it can weather the ups and downs of the economic climate. Finally, profit is what the shareholders get part of, as dividends.

What are the different forms of business?

We may classify business in three ways, according to:

- 1** Legal definition—its structure and ownership.

- 2 Function in the economy.
- 3 Size, as employer of labour and of capital.

Any single business may be described in these three ways, and in addition, if its geographical location is given, we have a fairly accurate picture of what the business is.

Legal Structure and Ownership

In the first place, business organisations are either owned privately, or belong to the country at large. The latter, the *public sector*, has grown greatly since the Second World War, and includes the nationalised industries, and corporations such as the National Coal Board and the Central Electricity Generating Board. These corporations trade with other firms and with the public, just as do firms in the private sector. However, they are owned by the country, their capital structure and control being vested in boards of management set up by government through special Acts of Parliament. This being the case, they are sometimes required, for political or overall economic and social reasons, to behave in other than a direct commercial manner: profitability is not necessarily an objective of a public corporation, and losses may be covered by government subsidies. Thus transport has been provided by British Rail at less than cost: this has social and economic advantages, but the corporation runs a massive deficit, which must eventually be covered by subsidy or fare and tariff increases.

Most of the basic industries, and especially those subject to heavy capital investment and fluctuating markets are now in the public sector. Power—coal, gas, electricity, atomic power; air transport, ship-building, telecommunications, etc., are all nationally owned.

Not usually considered as part of the business world are those services which also are publicly owned; health, education etc. In many ways though, other than the basic profit motive, these must also be considered as business organisations: they have massive monetary demands, and should be run as efficiently as any commercial business.

The above public sector examples are, of course, solely British. The economies of other countries

have different balances between their public and private sectors, ranging from substantially private enterprise economies to the almost completely public economies of some socialist states. Although, from the economic point of view, the balance of private/public sectors does not necessarily imply any particular form of government, countries with dominant public sectors tend to have socialist or other 'left wing' forms of government.

The *private sector* contains businesses belonging to private persons, as shareholders and individuals. The legal structure is controlled by government, by Acts of Parliament such as the various Companies Acts, but, so long as they behave legally, 'private enterprise' businesses are free to do as they wish, in pursuit of their own aims (rather than overall economic aims)—usually profitability.

Larger firms are usually *Limited Liability Companies*. Their need to attract capital from a great number of shareholders led to the legal protection of limited liability. This means that no shareholder is liable for the debts of the business except to the extent of his investment—he may lose all he has put in (or promised to put in), but no more.

Public limited companies raise capital from the general public, and their shares are quoted and dealt in on the Stock Exchange. Some companies are so large that the actual ownership (i.e. the possession of shares) and control (i.e. the running of the company by a Board of Directors) are largely divorced.

Private limited companies do not raise capital from the general public. They are limited to fifty shareholders, apart from employees or ex-employees. In general they are much smaller enterprises.

Partnerships are small-scale businesses, legally governed by the Partnership Acts, where a small number of people group together to carry on business. They are popular in many 'service' areas, for example, solicitors, estate agents, etc.

The Sole Trader—very often found in small-scale retailing and such things as servicing of domestic electric equipment—is the independent businessman, working on his own account, owning and controlling the entire business, taking all the profits, but liable for all the losses, should his business fail.

Function

The second way that firms may be classified is by their function in the economy: *primary*; *secondary*; *tertiary*. Primary industry is concerned with the basic requirements of raw materials. These are the *extractive* industries of mining, quarrying, oil extraction, agriculture, forestry and fishing.

The secondary stage covers the *manufacturing* industries, which process raw materials to make all the different goods that are available in the economy. These industries are usually sub-divided by the categories of goods they produce: *capital goods*; *consumer durables*; *consumer goods*.

Capital goods are those which are necessary for the actual productive process, for example machine tools—lathes, milling machines, etc.; plant—cranes, oil rigs, etc.; and other equipment. Capital goods are not wanted for themselves, but because they help in the production of consumer goods.

'The final end of production is consumption.' Goods for consumption by the public are divided into durables and immediate consumption goods. The consumer durables are those goods which are bought to provide a series of services over a working life (a period of time).

Examples of consumer durables are:

a car: which provides a private transport service for many miles over several years.

an electric cooker: which provides facility for making hot meals for many years.

a television set: which provides entertainment, education, a news service, etc.

It is the services they provide, rather than the goods themselves which are important. (Of course, there is also a 'status factor' in having an expensive make of car or dishwasher.)

Other consumer goods are those which we buy for immediate consumption, for example food. The tertiary stage is concerned with services required by the community and which are performed directly to the persons wanting them. Education, health, banking and insurance are examples.

Size

Size can be considered in several ways, depending

on the nature of the business. For example, an agricultural enterprise, a farm, may have a large geographical size, while a factory may occupy a relatively small area, but there may be considerably more capital invested in the latter.

However, in relation to size, the two important yardsticks are *labour* and *capital*.

Firms as employers of labour

The importance of a firm in the economic sense is not related directly to the number of workers it employs. Electricity generation (C.E.G.B.) employs a comparatively small number of personnel compared with the number of miners employed by the N.C.B., but both are essential to the energy industry. Traditionally, labour has been regarded as a resource that could be bought by employers, when required, almost in the same way as raw materials. Therefore workmen, until recently, were discarded into unemployment when business was slack.

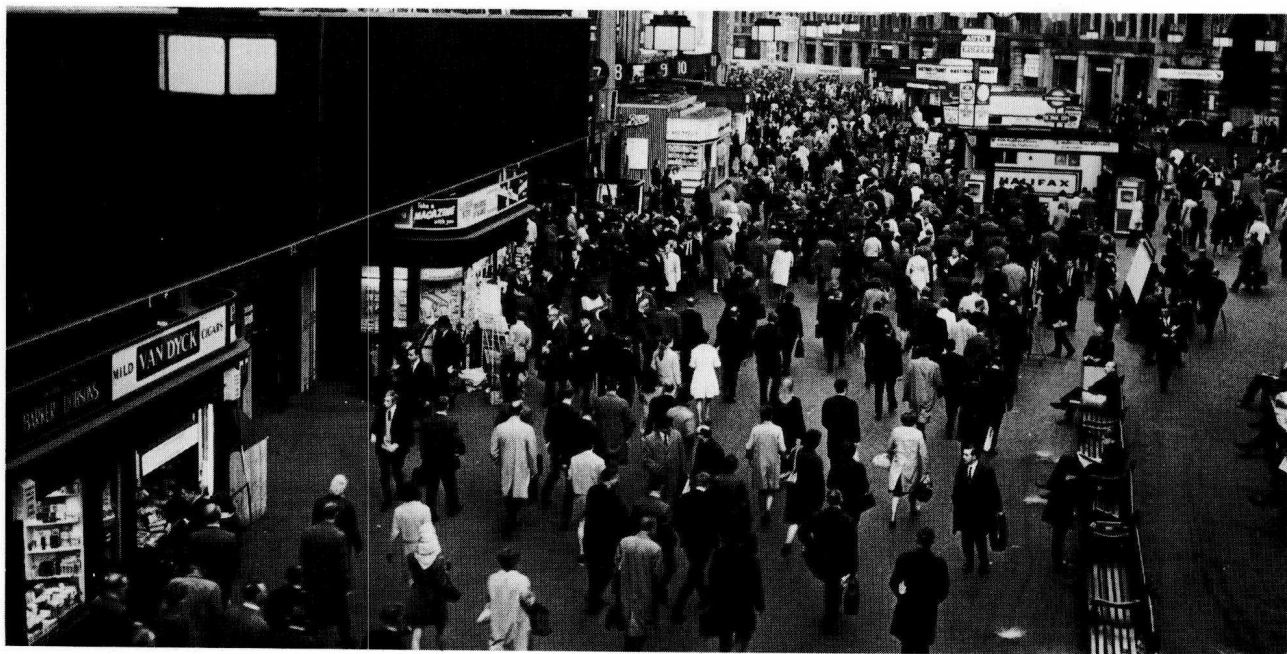
However, the social wellbeing of a country depends on a high level of employment, and therefore those industries which employ large numbers of people, or which dominate employment opportunities in a particular locality, are very important to the economy. Thus employment and wages (the price paid for it) become matters of national importance.

It may also be said that in whatever size firm a person is employed, the continuance of that employment is vitally important to him.

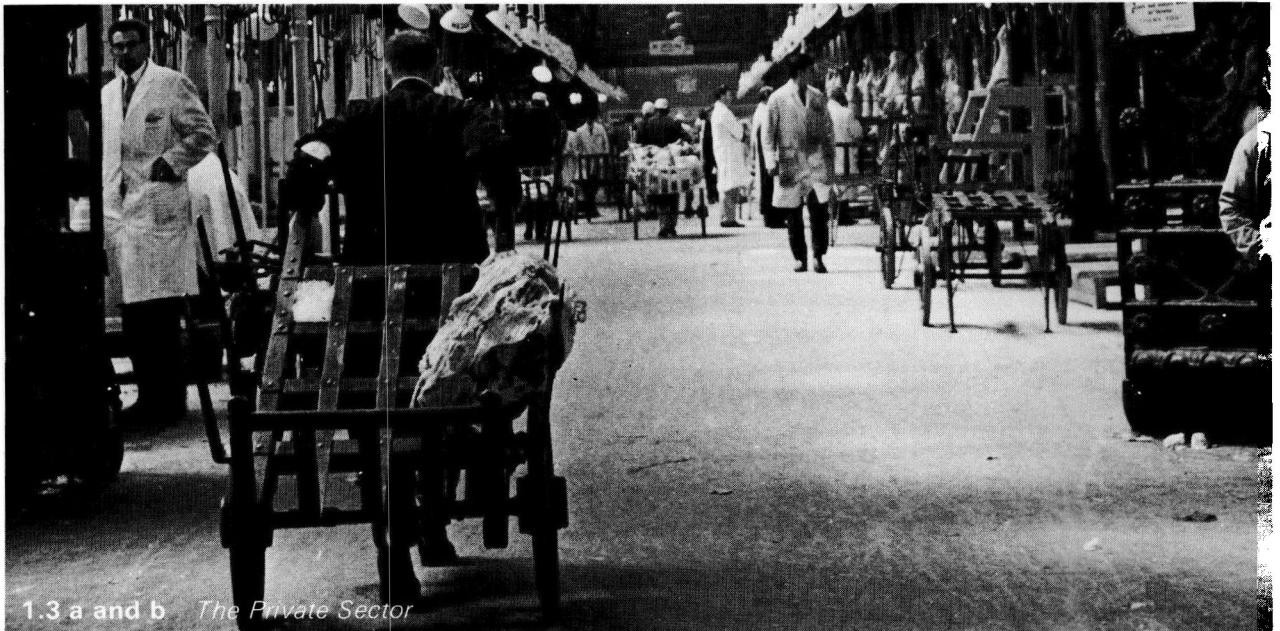
Size is also important from the organisation point of view. In a small firm the employees know the 'boss' personally, and communication is direct and informal. In the large firm, however, there are tiers of authority, and communication becomes a matter of organisational channels, memoranda, instructions, rules, notices. This tends to de-personalise work and may have an adverse effect on morale and loyalty.

Firms as employers of capital

The amount of money resources needed to run a business varies tremendously from the multi-million pound international giants (for example Shell, I.C.I.) to the corner shop getting by on a few thousand pounds. This leads to differences in the



1.2 The Public Sector



1.3 a and b *The Private Sector*

way capital is acquired. Large firms have many thousands of shareholders, and may also include government investment. There is a whole market (the Stock Exchange and banking institutions) geared to the channelling of capital into business. A small firm, on the other hand, may obtain the capital it needs through friends of the owners, solicitors, etc.

The degree of sophistication of the industrial processes used also affects the amount of capital needed. A complicated machine process, electronically controlled, obviously needs considerably more capital than a manual process, and therefore many firms in advanced technology are large users of capital.

In addition, many modern processes which produce the same, or improved versions of, goods, employ more mechanical or electronic devices, and fewer men. Thus, there is sometimes an inverse ratio between capital and labour: the more modern and more sophisticated the process, the fewer the employees. Though their pay may be higher than those of the equivalent manual workers, the skills required may be quite different.

As an example, modern electronic typesetting and printing methods have reduced the need for labour in the newspaper industry and, despite strong trade unions, employment is falling and there are forced redundancies.

The classifications above, though useful, are

arbitrary and there is overlap. A few firms—like Rolls Royce—are part public and part privately owned and controlled. Some firms *integrate* processes combining primary and secondary functions. Food firms like the chocolate companies (for example Cadbury-Schweppes) have their own chocolate-growing plantations abroad, besides manufacturing and marketing their own products, and are thus engaged in both functions.

Finally, it may be stressed that all firms, big or small, primary or tertiary, public or private, add to the general wealth and standard of living of the country, and their interdependence is such that success in one is good for all—and adverse factors are bad for all.

'What is good for General Motors is good for the country.'

Follow-up

- 1 Describe a business known to you in terms of a) its organisation and b) its product or services.
 - 2 'There is now no "private" sector, if that means a part of the economy outside the ranges of public scrutiny and legislative control'. (D. F. Lomax, 1976) Explain what is meant by 'private sector' and 'public sector'. Is the statement strictly true?
 - 3 How important are the wishes of shareholders in the running of a company?
-

Choice

What are you wearing today? At some point—probably half awake and bleary-eyed—you made a number of decisions: the socks, pullover/blouse, skirt/trousers/jeans. The clothes you are not wearing are still in the wardrobe. It is not important, but you choose one tie—and reject the others.

Choice implies rejection.

But you are a creature of habit: generally your range of choice is limited to clothes which 'suit' you; just occasionally you have a change.

Business management, looked at in one way, is similar: it is a question of choice: choice between alternatives. And the action of choice is making a decision to do one thing rather than any other alternative thing.

The alternatives in business are not limited, as the choice from a wardrobe is limited. And the decisions businesses make are rather more important than individual decisions about what to wear!

In business, the action of one firm may well have a very definite effect on other firms, especially those in competition with it.

What are the alternatives which face business?

'To be, or not to be?' At its simplest, that is the choice of business. A firm is an entity, in legal terms; it was created within a process laid down by law and its existence may be terminated by law. (When a firm goes bankrupt its affairs are 'wound up', and it ceases to exist.)

So, in effect, a business exists so long as it can show a profit, in money terms; so long as the resources it uses in inputs are more than matched by what it produces in output; so long as it creates wealth.

This is not to say that, in a social sense, a business does not have other functions. For example, a large firm in a small town is very important because of the employment it provides, and its failure would be a catastrophe to the town. This happened with the closing of the shipyard in Jarrow in the 1930's under a government plan to rationalise shipbuilding.

But, from the point of view of the business world in general, the health of any particular firm is measured by *the profitable use it makes of its resources*. And the method by which its profitability is assessed is the accountant's method: profit is the

excess of money after all the costs (in money terms) of the inputs have been paid.

And the profit, naturally, goes to those people—the shareholders—who have risked their money resources in the uncertainties of the business, except that, equally naturally, the state takes a large share of profits in tax, because, after all, it is responsible for the situation in which the business operates.

The other types of resource (other than the money provided by shareholders), such as labour, are paid what they cost, and in this sense labour is treated as a raw material and has nothing to do with profits. (The labour force of a prosperous firm may not be affluent—indeed the firm may be prosperous because it has kept its wages bill low!)

Lending and investing

Very often, the man who wishes to go into business (perhaps he is an inventor who has just hit upon a good idea, and wants to market the gadget he's made), has not the money which is necessary to start a firm. If he has not, he must try to borrow—from his friends, a bank, or the public at large—sufficient *capital* to turn his dream into reality.

On the other side of the fence, there are people with money which they may be prepared to lend or invest in a business.

Two considerations are important to the potential lender or investor:

- 1 Will the lending (or investing) be profitable to the lender (investor), that is, will the lender get more back in the end than he gives now?
- 2 What is the risk that the money will be lost?

Thus, each investment has:

- 1 A profit factor.
- 2 A risk factor.

Here it is appropriate to distinguish between lending, and investing in shares.

The lender gives a sum of money for a certain period of time to the borrower, to be used in the business. The lender will expect to receive his money back at the end of the period, together with interest, at a stated rate per cent per year. The

interest represents a 'reward' to the lender for the fact that he has been deprived of the money during the period of the loan. (If someone is using your bike, you cannot be using it at the same time!)

The investor who buys shares in a company, however, is buying, i.e. he is exchanging money permanently for the shares. In effect, he has bought an entitlement to part of the firm. He *cannot* get his money back from the firm (though he may sell his shares to some other person for money, if he wishes). The shareholders altogether *own* the firm—its complete assets (i.e. everything of value). A shareholder will expect the firm to use the money to make more money. The 'reward' this time, for being permanently deprived of the money is two-fold (but uncertain): a profit on the firm's operations; and an increase in the value of the shares, as the firm successfully accrues wealth.

Levels of decisions

Thus, the context within which business decisions are made is a financial one. (The fact that an employee will 'invest' himself in a firm which will give him a reasonable career is quite irrelevant to this line of thought.)

Therefore, if the context is financial, the decisions which effectively control the progress of the firm are, similarly, financial decisions. The firm may have an excellent product, but unless that product can be produced at a cost which will enable it to be sold on the market to give a fair return on the resources used in its making, it is not a saleable product. (Rolls Royce, the famous quality engineering firm failed, not because its products were poor, but because the standards were so high that there were not sufficient buyers who could afford them.)

Financial management, then, is at the heart of the firm.

Looking to the future

'They're off!' And whatever the racecourse or the field, the punter will be trying his luck in predicting

the future—a short term prediction, soon joyfully fulfilled or gloomily proved false by the result of the race.

Business management is similarly concerned with the future. Goods are usually produced in anticipation that they will be sold at a profit. The productive process takes time. If one is setting up a new factory, it takes time before production can start. Money resources must be committed a long time before results can be obtained.

But business, though uncertain, is not a gamble, like football pools or horse racing.

Management will plan and control the situation, so that as far as possible the future will work out according to the plan. Allowing that 'tomorrow never comes' a firm will carry on a continuous stream of activities, bringing to fruition in the present those planned in the past, meanwhile starting new projects for the future. As the produced output is sold and cash received, so that cash will be used to purchase new inputs, which will be sold at a future date.

Thus, control of money and time is of the essence of management. In business, 'time is money'.

(One other important control must be mentioned, though it is outside the scope of this book. A firm must 'control' its human labour force, at least to the extent of persuading them to do the required work for payment, but hopefully, motivating its employees to take an interest in the corporate identity of the firm beyond the mere 'wage reward'.)

To control money and time, managers must make decisions.

Some of the decisions are of a routine nature. Similar choices are made frequently, and the operative, or the foreman on the factory floor is skilled to make these choices, and authorised by management to do so.

Other decisions may be of major importance: for example, where to locate a new factory, or when to market an improved product. These decisions will be made by top management.

So, within the hierarchy of the firm, there will be persons authorised to make decisions within limits of time and money.

Summary

Management must control money and time, keeping major decisions to top management and devolving other decisions to appropriate levels in the firm's hierarchy.

The success of this control operation will depend, obviously, on the rightness of the decisions taken, and these will depend again on the awareness of possibilities and alternatives.

Much discussion can take place about possibilities (*have you ever tried to decide what to do in an evening when a dozen or so friends are at a 'loose end'?*). It is, of course, necessary that discussion precedes action, otherwise there can be little idea of the possible consequences.

In any discussion, however, some of the ideas advanced are feasible (i.e. possible to do successfully) while others (even in a business sense) are rhetoric (i.e. 'hot air'). To enable a reasonable assessment to be made, the different alternatives must be compared. This comparison can be made in ordinary language ('I suggest we all go to the cinema' or 'Let's go to the beach by bike').

These comparisons can also be qualified—and perhaps thus made more precise. ('It will cost 70p each for the film' or 'It's 30 kilometres to the beach and back.')

Comparisons of this sort can only sometimes be made more precise because, although facts like cinema prices and mileages are known, some things—such as the future demand for a firm's soap powder 'X'—are uncertain.

Numerate management uses figures where precision is useful in decision making, and some of the techniques of accountancy, statistics, and operational research will be looked at in the following chapters.

Follow-up

- 1 Distinguish between 'lending' and 'investing'.
- 2 Why is the success of a firm measured in money terms (i.e. profitability) rather than in terms of the employment it provides, or the satisfaction its products give to customers?
- 3 'The ability to make a decision and stick to it is the key characteristic of a successful manager.' Discuss this statement.

Model making for decision

Have you ever been faced with a problem which seems, at first sight, unanswerable?

Businesses often face difficult problems and, since the solutions lie in future events, the problems have to be approached by looking for a solution within the limits of present knowledge, i.e. based on the information at present known.

However, there are several approaches to problem solving which are applied to decision making, both in business and in everyday life.

Guesswork: this may or may not lead to correct decisions.

Intuition: a feeling towards a solution, but not based on factual evidence.

Judgment: an assessment of evidence, but an evaluation which is not necessarily based on facts and figures.

Rule of thumb: a 'rough and ready' method based, perhaps, on tradition and experience.

All these methods may have some use, but their limitations are exposed when things go wrong.

However, it is possible to apply scientific ideas to decision making, and one of the key points is the *orderliness* and *method* of scientific thought, which

helps to reduce a confusing mass of information to evidence on which clear decisions can be taken.

Models

One approach to the solving of large scale problems is to build a small model, and see how it behaves under scaled down conditions. Thus models of *Concorde* were tested in wind tunnels, long before the prototype ever took off from Bristol. That is obviously a model. However, many types of 'model' may be used in business, and the types we shall consider may be described as 'frameworks', which help to bring system and order to problem solving and reduce the variables to manageable limits.

These models may, for example, be a series of parameters built into computer programmes, with which actual information can be readily compared.

3.1 A small scale model of Concorde being tested in a wind tunnel experiment

3.2 The real Concorde

