Chapter 2
The structure of organizations

It is impossible to live in a civilized society without close contact with many large organizations—schools, universities, public utilities, government and local government departments, the Health Service, commercial and industrial companies, and so on. Despite the huge variety of such organizations, there are many ways in which they resemble each other.

In the first two sections of this chapter, we shall describe the legal forms which such organizations may take and then, in the following sections, we shall discuss the way in which such organizations are structured, with particular emphasis on the things that they have in common. We shall concentrate on *trading organizations,* that is organizations which sell products or services for profit but we shall also indicate how non-commercial organizations fit into similar patterns. Finally, we shall discuss some of the issues which arise in managing such organizations.

2.1 Legal forms of organization

Fundamentally, the law recognizes individuals—human beings who can be regarded as responsible for their actions, in other words, all human beings except those excluded by youth or mental incapacity. Individuals can enter into contracts which can be enforced by the courts; individuals can be tried for crimes; individuals can be sued for damages; individuals can give evidence; Acts of Parliament can impose duties on individuals; and so on.

For all but the smallest business organizations, it is desirable that the organization should be given a legal existence, through a process known as *incorporation,* a word which means literally "making into a body," from the Latin *corpus*—hence the English word "corpse". This can be done in a variety of ways. Bodies such as professional institutions or universities are incorporated by Royal Charter. An organization wishing to become incorporated in this way must persuade the Privy Council that its activities are in the public interest and agree a precise statement of their scope and the organization's powers. Public bodies, such as District Health Authorities or County Councils, are statutory bodies, that is, they are established by Act of Parliament.

Trading organizations are usually incorporated as *limited companies* but there are two forms of unincorporated trading organization which we should describe briefly. A *sole trader* is an individual who is operating his or her own business. There are no legal formalities attached to becoming a sole trader; one becomes a sole trader simply by starting to operate a business. It may then be necessary to register with Customs and Excise for VAT purposes and to negotiate with the Inland Revenue regarding one's classification for income tax purposes but neither of these is necessary simply in order to become a sole trader. It is possible, and usually wise, for a sole trader to carry on business as a limited company. If this is not done, the trader is personally liable for all the debts of the business so that all the trader's assets, including the family home, are at risk if the business fails. Nevertheless, there is no obligation for the trader to do this.

The Partnership Act 1890 defines a *partnership* as "the relationship which subsists between persons carrying on a business in common with a view to profit". When two or more people are carrying on business together, the law will treat them as a partnership, whether or not they have concluded a formal partnership agreement. The tradition of partnerships has served the public well and they are still the normal vehicle through which, for example, solicitors and general practitioners operate. The framework within which partnerships operate is still basically that established by the 1890 Act, albeit modified in certain respects by subsequent legislation, notably the Insolvency Act 1986. However, for most business purposes, partnership has fallen out of favour. It is risky for the individuals involved because they can be held personally liable for the partnership's debts, including any which may result from one of the partner's exceeding his or her agreed authority in respect of the partnership's business; as with a sole trader, this liability extends to the whole of their personal property, not just their investment in the business. Professional partnerships are usually fairly stable; the arrival of a new partner or the departure of an existing partner are comparatively rare events. In the business world, senior staff come and go much more frequently and, in these circumstances, the partnership mechanisms become clumsy.

Partnerships continue to be important because certain professional bodies require that groups of members wishing to offer their professional services to the public should be organized in this way. The unlimited liability is seen as an advantage in guaranteeing the professional probity of the partners. Within the engineering profession, partnerships were once common among consulting engineers but, since there is no professional or statutory requirement for this form of organization, it survives only in the case of very small partnerships.

2.2 Companies

As we have said, for most business purposes, it is desirable to have an organization which has its own legal existence separate from that of its proprietors. The law governing this is contained in the Companies Acts 1985 [1] and 1989.

Companies may be either *public* or *private*. Public companies are companies which are allowed to offer their shares to the public (but need not necessarily do so); their names must end with the words "Public Limited Company" or the abbreviation "PLC" [2] A private company cannot offer its shares to the public; its name must end with the word "Limited" or the abbreviation "Ltd". [3] Public companies must be registered as such; they must have an issued share capital (see below) of nominal value greater than £50,000 and they are subject to greater regulation than private companies.

Companies can be *limited* or *unlimited*. In an unlimited company the shareholders are personally liable for all the company's debts; not surprisingly, this type of company is very rare. A limited company may be limited *by shares* or *by guarantee*. If a company is limited by guarantee, each member, instead of subscribing for shares, undertakes to pay a fixed, usually small, sum towards the company's debts in the event of the company being wound up. This form of organization is commonly used by professional bodies and charities; it is not used by normal commercial organizations.

The essence of a company is that it enjoys an independent existence as a legal person. Ownership of the company is divided into a number of *shares;* an individual or another company may own one or more shares. Individuals who own shares in a company are known as the shareholders or members of the company. Until recently, a company was required to have at least two members. However, the Companies (Single Member Private Limited Companies) Regulations 1992 permit a private limited company to be formed by one person and to have only one member. The Regulations make certain special provisions to enable a separation to be maintained between the member as himself and the company.

Shares can be bought and sold, although, particularly in small companies, there may be restrictions (see below) on who the shares can be sold to; this provides a way of handling changes in membership which is less cumbersome than the mechanisms necessary in partnerships, although the formalities may still be complicated.

1. The Companies Act (1985) was a consolidating act, that is an act that, as well as introducing some new provisions, brought together, and therefore superseded, previous legislation in the area.
2. Or, for a Welsh company, their Welsh equivalents, "Cwmni Cyfyngedig Cyhoeddus" or "CCC".
3. Welsh equivalents "Cyfyngedig" or "Cyf".

When a company is set up, its memorandum of association (see below) states what the company's *authorized share capital* is to be and the number and nominal value of its shares; it also states who the initial shareholders (the *subscribers*) are and how many shares each will own. The authorized share capital is the maximum amount up to which the company can issue shares. The company need not, and usually will not, issue all its shares. New companies are often started with an authorized share capital of £100 divided into 100 shares with a nominal value (or *par*) value of £1 each. The nominal value is the value written on the share, which is normally the money paid to the company when the share is first purchased; it bears no necessary relation to any subsequent market value of the share. Companies may issue shares initially at a price lower than the nominal value; such shares are said to be *partly paid* and the owner of such a share must be prepared to pay the balance up to the nominal value to the company when called upon to do so. A company may also issue shares at a *premium,* that is, at a price higher than the nominal value of the shares.

A company is not, in general, permitted to provide any sort of financial assistance to help individuals or other companies to acquire its shares. Indeed, the alleged provision of such assistance is at the heart of accusations of unfair practice in some takeover battles in the late 1980s and early 1990s. There is, however, one important exception to this. A company is allowed to provide financial assistance as part of an employee share ownership plan (ESOP). Such plans are becoming increasingly important as part of the movement to give employees a stake in the companies for which they work. Many small "high-tech" companies operate on the basis that all, or at least a substantial proportion of their shares are to be held by their employees. The shares allotted to employees under such a scheme are normally created by issuing part of the company's hitherto unissued share capital.

Our main concern is with companies limited by shares; this is the normal form for a trading organization. In such companies the liability of each member is limited to the shares he or she owns; in other words the shares may become worthless but the shareholder stands to lose nothing more. The way this works is that, if the company is wound up, all legal claims against the company must be met, so far as is possible given the assets of the company. If all such claims are met in full and there is money left, this is distributed to the shareholders. The shareholders thus stand to lose the money they invested in the company, but there is no claim against any other property they may own [4]. Similarly, the company can only distribute profits to the shareholders

4. There are two main exceptions to this. If the shares are only partly paid, the shareholder will be required to pay the unpaid amount. Second, the member may have contracted liabilities in other ways, such as by giving an explicit personal guarantee to secure loans made to the company by third parties.

in the form of a dividend if there are profits to be distributed; furthermore, if the company has made losses in the past, all these losses must be covered by subsequent profits before any distribution is made to shareholders. The shareholders are said to have a *residuary interest* in the company.

In an attempt to reduce the bureaucratic burden on smaller companies, the Companies Act 1989 exempts certain classes of company from certain obligations. To this end, it defines the terms *small* and *medium-sized* companies as ones which satisfy at least two of the three criteria shown in Table 2.1. The terms used in this definition are carefully specified in the Act, as are the provisions for companies moving in and out of these categories from year to year.

Table 2.1 Eligibility criteria for small- and medium-sized company status.

	Small company	*Medium-sized company*
Turnover	⩽£2,000,000	⩽£8,000,000
Balance sheet total	⩽£975,000	⩽£3,900,000
Average number of employees	⩽50	⩽250

2.2.1 The constitution of a company

All companies must have a written constitution, which consists of two documents: the memorandum of association, which controls its external relations, and the articles of association, which state how its internal affairs are to be run. Separate from these documents and not formally part of the company's constitution, there may also be a shareholders' agreement. We shall look at each of these documents in turn.

Professional advice should always be taken when forming a company; the material that follows is intended only to explain the purposes of these documents and some of the important issues which they raise.

The memorandum of association

This document covers the following matters:

- the name of the company. There are several restrictions on the choice of name for a company. The most obvious one is that the name must not already be in use by another company. There is also a long list of words for whose inclusion in a company name prior permission must be sought. This list includes words such as "Parliament" or "Wales", which may give the impression of some official status; words implying a representa-tive role, such as "Association"; and words implying that certain types of service are offered by the company;
- the country in which its registered office will be located—England and Wales, Wales (to the exclusion of England) or Scotland;
- the objects of the company. This is a statement of the type of business in which the company will engage. Up until the Companies Act 1989, it was essential that the objects of the company were stated in terms sufficiently broad to encompass every type of activity in which the company might engage. If the company engaged in business which was not covered by this statement, the activity would have been *ultra vires,* that is, beyond the powers of the company. If the company suffered a loss as a result of such activity, the directors could be required to compensate the company. The Companies Act 1989 effectively abolishes the doctrine of *ultra vires* (although there are some provisions to protect a company from the actions of unscrupulous directors). In particular, the Act allows a company's memorandum of association to state simply that its object is to carry on business as a general commercial company, without being any more specific;
- a liability clause. In the case of a company limited by shares, this clause merely states that the liability of the members is limited;
- the company's authorized share capital and the number and nominal value of its shares.

In addition, the memorandum will conclude with a *declaration of association* along the following lines:

> We, the several persons whose names, addresses and descriptions are written below, are desirous of being formed into a company in pursuance of this Memorandum of Association, and we respectively agree to take the number of shares in the capital of the company set out opposite our respective names.

The articles of association

Many of the issues which must be addressed in the articles of association are very technical. In order to avoid the expense of having to produce a complete set of articles for each company and the consequent risk of errors, a model set of articles is published, known as Table A. Table A was originally a table set out at the end of the Companies Act 1948; it has been amended by subsequent Acts and regulations. If a company does not have its own set of articles, the provisions of Table A apply automatically. In practice, newly formed companies usually adopt the Table A provisions, with modifications to suit their circumstances. The company's articles can be in "long form", in which case all the provisions are written out in full, whether or not they are the same as Table A, or they can be in "short form", in which case only amendments to, and excisions from, Table A are shown. The articles of association of a company usually need to address at least the following topics:

- the rules to be applied in allotting new shares up to the amount of the authorized but unissued share capital of the company;
- the rules governing the transfer of shares. In a small private company it is usually undesirable that members should be allowed to transfer their shareholdings to whomsoever they might wish. One way of avoiding this is to include in the articles of association a provision that a member wishing to dispose of his shareholding must first of all offer it to the existing members; along with this must go some provision for establishing a fair price for the shares if this cannot be done by agreement;
- meetings of members. Meetings of shareholders are called general meetings. Every company is required to hold an annual general meeting (AGM); other meetings are called extraordinary general meetings. The articles must specify how such meetings are to be called, how business at the meetings is to be handled (e.g. how resolutions are to be proposed), arrangements for proxies, how many members constitute a quorum, etc. There is one exception to this requirement to hold AGMs. The Companies Act 1989 allows a private company to pass an elective resolution to dispense with the obligation to hold AGMs;
- appointment and removal of directors. Directors are elected by the shareholders to run the company and they can be removed by a resolution passed at a general meeting. In addition, Table A provides that all directors retire at the first AGM and that one third of the directors retire, in rotation, at successive AGMs; retiring directors are usually eligible for re-election;
- powers of directors. General meetings are too cumbersome to be used for the day to day management of the business; this is the reason for appointing directors. Table A allows the directors to exercise all the powers of the company but in some circumstances it may be desirable to reserve certain powers to the general meeting, for instance the power to borrow beyond certain limits;
- dividends and reserves.

Shareholders' agreements

The articles of association can be changed by resolution at a general meeting by a 75 per cent majority. This may make it difficult to protect the interests of minority shareholders. In order to alleviate possible problems, it is open to the shareholders (or some subset of them) to conclude an agreement amongst themselves governing the way that the company is run and agreeing to use their voting rights to enforce this. Such an agreement can only be varied with the consent of all the signatories.

2.2.2 Directors and the Company Secretary

As we have seen, the directors are elected by the shareholders to run the company on their behalf. They have considerable powers and, in a large company with many shareholders, the effective "democratic control" is very weak. However, this is balanced by a series of obligations.

Directors must act in good faith and for the benefit of the company. Suppose, for example, that a consultancy company is approached to undertake a short assignment. A director who became aware of this and undertook the assignment in a personal capacity, would be breaching this duty. He or she could be required to pay the company compensation for the loss of the contract and might not be allowed to carry it out in a personal capacity.

Directors must exercise the skill and care in carrying out their duties that might be expected from someone of their qualifications and experience. Thus, a director with long experience of managing fixed price, real time projects who signed a contract for such a project without checking, for example, that appropriate design calculations had been carried out, might be held liable for any loss the company sustained as a result of this negligence.

A director who has an interest in a contract made with the company (e.g. owning rights in a piece of software the company is thinking of acquiring) must disclose this interest to the board of directors. Table A further stipulates that the director must not be allowed to vote or be counted in the quorum when the matter is discussed but, in the case of a small company, this may well be varied by the articles.

A company is required to have a company secretary whose statutory duties include the keeping of the various records that the company is obliged to maintain and submitting various statutory returns to Companies House in Cardiff. The company secretary will normally also take responsibility for a variety of related matters. Provided the company has more than one director, the secretary may be, and often is, a director. Because of the technical expertise required, small companies often appoint an outside professional advisor as a company secretary.

If directors allow a company to continue to incur debts when they know or should have known that the company will be unable to repay them, a court can make them personally liable for the company's debts. This means that company directors should keep themselves aware of the company's financial position. There are also certain other, less likely circumstances in which directors can be made responsible for a company's debts, for which more specialist works should be consulted.

Many companies have both *executive* directors and *non-executive* directors. Executive directors are normally also employees of the company, with specific responsibility for certain areas of its activities. Non-executive directors are directors who act in advisory capacity only. Typically, they attend monthly board meetings to offer the benefit of their advice and are paid a fee for their services. It is important to realize that, legally, the duties and responsibilities of non-executive directors are precisely the same as those of the executive directors.

2.2.3 Disclosure requirements

In compensation for the benefits of limited liability, the law imposes on limited companies a requirement to disclose information about their operations. All limited companies must submit an annual return and copies of their accounts to the Registrar of Companies. Over and above this requirement, public companies that wish to have their shares listed on a stock exchange must satisfy the disclosure requirements of that exchange. For the London Stock Exchange, these requirements are listed in a document known as the “Yellow Book”.

2.2.4 Corporate governance

In theory, a limited liability company is governed in a simple and democratic way: the shareholders meet annually to receive a report from the directors about the state of the company. If they are unhappy with the way in which things are going, they can elect different directors. Clearly, the job of the directors is to run the company in the best interests of the shareholders and it is the possibility of not being re-elected that encourages the directors to carry out their duties diligently and honestly.

Unfortunately, this simple picture is realistic only for companies with a small number of shareholders. We have already mentioned that, in a large company with many shareholders, the democratic control is very weak. The result is that the directors, together possibly with the senior management, become a self-perpetuating oligarchy. They fix their own remuneration, which in some cases may be felt to be excessive, and they run the company in their own interests rather than that of the shareholders.

It should be emphasized that the type of corporate governance that we have described is largely peculiar to the Anglo-Saxon world—the UK, North America, Canada and New Zealand. Although the concept of a limited liability company is nearly universal, the relationship between ownership, control and management is very different elsewhere in Europe.

Even when the simple picture is realistic, it contains unsatisfactory elements. We have said that the directors run the company in the interests of the shareholders. But there are other people who have a stake in the company, notably its employees, but also those to whom it owes money and, perhaps, the public at large. Who, precisely, should be regarded as the *sta- keholders* in a company is a question on the answer to which there is little agreement. On the one hand, some writers vigorously maintain that shareholders, as the owners of the company, are free to exercise their rights so as to maximize their income or profits, and that the duty of the directors is to pursue this aim to the best of their ability. Indeed, until the Companies Act 1985, there was no requirement for directors to consider the interests of the employees of the company (and they might have been considered to have acted wrongly had they done so). At the other extreme, it is argued that the activities of many companies, particularly large ones, can affect the public interest and that their direction should be required to take this into account. These issues are not simply a matter for academic debate. There are many circumstances in which the economic interests of the shareholders conflict with the interests of the employees—this is most obviously the case when a takeover bid is made, which may provide shareholders with a handsome profit but will mean many employees losing their jobs.

The relationship between the stakeholders in companies and its most senior management is known as *corporate governance*. The issues are not new; the founder of modern economics, Adam Smith, had some trenchant things to say on the topic in the late eighteenth century and debate has continued intermittently over the two centuries that have elapsed since then. However, a number of *causes célèbres* during the 1980s, together with the debate about harmonization of company law throughout the European Community, have led to extensive discussion in recent years. In 1991, the London Stock Exchange, the Financial Reporting Council and the accountancy profession set up the Committee on the Financial Aspects of Corporate Governance, under the chairmanship of Sir Adrian Cadbury. The report of this committee (known as the Cadbury Report) was published in December 1992. Since the terms of reference of this committee were restricted to the financial aspects of corporate governance, we shall discuss their recommendations further in Chapter 3 (Section 3.9).

2.3 Organizing an organization

However democratic its principles, an organization can only function effectively if it has some kind of structure. The tasks that have to be carried out must be identified and agreement must be reached as to who will do what. It is usual to group the tasks together and to assign responsibility for each group of tasks to a specific executive director.

2.3.1 Functional units of an organization

It is common to group the tasks that have to be carried out in an organization into five major functions:

1. production—the activities that directly contribute to creating the products or services that the company sells;
2. quality management—the quality activities necessary to ensure that quality of the products and services produced is maintained at the agreed level;
3. sales and marketing—sales is concerned directly with selling the product, while marketing is concerned with establishing the environment in which the product is sold (e.g. through advertising) and with deciding how the range of products sold by the company should develop;
4. finance and administration—every company needs to pay its bills, to look after its funds, to pay its employees and so on and it is usual to include within this function central services such as data processing and the legal department;
5. research and development—how can the company do better the things that it already does and what other things might it profitably be doing?

It is important to realize that these five groups of functions exist in almost any organization, whether or not the structure of the organization reflects this.

The relevance of this view of an organization is fairly clear when we are considering, say, a car manufacturer. It is much less obvious if we are looking at an institution providing higher education or the Department of Social Security. Nevertheless, it is still a valid and useful classification of the tasks that have to be carried out. As an example of how this structural model applies to a non-commercial organization, we consider the case of a university.

"Production" in the context of a university has two main aspects:

- provision of education in the form of undergraduate and postgraduate courses, research training, short courses provided for industry, etc;
- research, whether carried out for purely scholarly purposes or under contract to government or private industry.

On the educational side internal quality control takes place on at least two levels. The system of using external examiners imposes a control on the quality of the final product, that is, the degree which is awarded. The internal validation process, which is carried out when a degree scheme is first proposed and at regular intervals thereafter, provides a measure of control over the educational process used to produce the final product. Quality control of this sort was well developed in the former polytechnics because their degrees were under the control of the Council for National Academic Awards. It was not until after the former polytechnics became universities, in 1992, that such procedures were imposed on the whole of higher education. This was done by imposing external quality control through the Quality Assurance Agency. This body conducts institutional reviews intended to ensure that each institu-tion of higher education operates appropriate internal quality management procedures across the institution as a whole. It also carries out inspections (teaching quality assessments) of the teaching of individual subjects.

Universities do little direct selling—although a lecturer interviewing an applicant may well be trying "sell" the institution—but marketing, in the form of producing attractive brochures and prospectuses or even direct advertising abroad, is an activity which is now taken very seriously.

The administrative load in a university is surprisingly large. Staff have to be paid and bills have to be paid; student fees have to be collected. The maintenance of student records is an important and substantial task. The preparation of statistics for funding bodies occupies an increasing amount of time.

Research and development which an institution carries out into its own activities (as opposed to research and development carried out, either for specific external clients or for the general public good, as part of the production function) may include the development of new courses and course materials, research into new methods of teaching, new types of courses or the needs of specific classes of students.

The functional units which we have described are frequently used as a basis for the structure of small and medium-sized organizations. This means that a director or senior manager will be responsible for each major group of functions; below them, the major groups of functions will be divided into smaller groups, each under its own manager, and so on. This type of structure is sometimes found in larger organizations but, more typically, at the top level they are structured geographically or on a product line basis, although a functional structure will still be used at the lower levels. It is also usual to handle specialized functions such as legal services centrally even if the rest of the company is structured on a non-functional basis.

2.3.2 Geographical organization

In an organization which operates over a large geographical area, there are inevitably some tasks which are best organized on a geographical basis. If an organization operates in more than one country, for example, it is usually desirable to handle sales and marketing on a country by country basis. Because of cultural differences, an approach to selling a product which may prove very effective in one country can fail completely in another. Indeed, cultural differences may mean that a product which sells well in one country may be almost unsaleable in another. The most obvious examples are in the field of food and drink but there are plenty of examples in the field of professional services.

Even within a single country, the facts of geography may dictate a geographical organization. A large retailing organization will have many branches spread across the country. Geography dictates that the distribution of goods and supervision of the branches is organized geographically.

2.3.3 Organization by product

Where an organization produces several different types of product or services, it may be desirable to use a top-level structure based on this division. This is perhaps the commonest form of structure to be found in really large corporations today. Thus a motor vehicle manufacturer may be organized on the basis of divisions handling cars, vans and light goods vehicles, another handling heavy goods vehicles, and so on; on the whole, the company will be dealing with different customers for each of these types of product and there is comparatively little overlap in design and manufacture between the different divisions.

In software companies this type of structure is often found to be desirable in order to separate fee-based services from the development and sale of products. There is an inherent "culture clash" between these activities. If they are not clearly separated, there is a great risk that staff, particularly the most able, will be moved from product development to fee-based work because the latter brings more immediate and more certain revenue. The result is that the longer term rewards that can come from product development are never realized.

With this sort of organization, each division is likely to be headed by a director; within the division, organization may well be by function. An alternative is that each division is itself a separate company, with its own board of directors. Such companies are known as subsidiaries [5] ; they are usually "wholly owned" in the sense that the main company and its nominees own all the shares in the subsidiary. In many cases, the main (or "holding") company does not trade itself; all the trading operations are carried out by the subsidiaries. This form of structure can also be used with a geographical organization, particularly where operations are being carried on in several countries.

2.3.4 Centralization v. *decentralization*

Whatever the basis of the organizational structure, it is possible for the organization to be centralized or decentralized or a mixture of both. In a centralized organization, many of the detailed operational decisions are taken at the centre; so, for example, details of the expense rates that employees can claim for travel involved with their work or standards for programming in COBOL may be settled at the centre of the organization and apply every

5. The definition of subsidiary is much wider than this. The Companies Act 1989 introduced two definitions, one for accounting purposes and one for other Companies Act purposes.

where within it. Alternatively, in a decentralized organization, as many details as possible are settled at local level.

There are advantages and disadvantages to both approaches. By devolving decisions to the lowest level at which the knowledge and ability to take them exists, it is likely that better decisions will be taken and the performance of the individual units improved. Furthermore, the motivation of the managers of these units is likely to be improved by giving them greater responsibility for the operation of their own units. On the other hand, this can lead to wasteful duplication—it is unlikely to be sensible for six different subsidiaries each to produce its own set of COBOL programming standards. It can also mean that good practice is slow to spread through the organization. There are many organizations in which one can find one division using good modern software design techniques and programming in ADA while another division is still using FORTRAN and flowcharts.

2.3.5 The position of quality management

However an organization may be structured, it is important that ultimate responsibility for quality is kept at the centre. The day-to-day pressures on production and sales create the temptation to skimp on quality procedures in the interests of raising production levels, increasing sales or reducing costs. This can only be avoided by developing a "quality culture" within the organization, that is by creating an environment in which the idea of skipping quality procedures because of other pressures becomes unthinkable. For this to happen, the importance of quality must be seen to be recognized at the highest levels in the organization. The success of Japanese industry, and in particular its car industry, is due in very large measure to its success in establishing a quality culture.

The role of the central quality management function is to establish a quality plan which describes the quality procedures to be followed throughout the organization and how compliance with the plan will be monitored. There are national and international standards such as British Standard 5750, or its international equivalent ISO 9000, which lay down very broadly the requirements which a quality plan must meet; some major purchasers such as the Ministry of Defence and NATO have their own standards. In addition to establishing and maintaining the quality plan, and monitoring compliance, the central quality management function will also have an educational and proselytizing role in creating the quality culture. The detailed, day-to-day activities required to implement the quality procedures must remain the responsibility of the individual units; the job of the central quality function is to ensure that they meet the overall objectives of the organization's quality plan—and that they are carried out.

2.4 Management

The importance of project management will be familiar to all students of software engineering. Failure to manage projects properly has been the root cause of most of the spectacular failures of computer projects. The goal of project managers is to produce systems which meet the users' needs, on time and within budget. Their main concerns are therefore planning, progress monitoring, acquisition and allocation of resources, and quality control. The tools of their trade are bar charts, activity networks, critical path analysis, and so on. The project manager's horizon is the successful completion of the project.

Project management is usually contrasted with *production management* and *corporate management*. Production management is concerned with the management of activities which continue indefinitely and change comparatively slowly; production managers' horizons are both longer and shorter than project managers'. On the one hand, they are concerned with very short term problems, such as the need to restart production as quickly as possible after a breakdown; on the other hand, they are concerned to maintain the productivity and efficiency of their plants over their whole lifetime, perhaps 20 or 30 years. The typical example is management of a production line but there are many examples from widely different fields—operations management in a large computer installation, for instance. Production management is concerned with productivity, efficiency and maintenance of quality. It is an area in which quantitative models have an important part to play.

As a result of efforts to make the development of software less uncertain and more disciplined, it has become fashionable to use analogies such as the "software factory" and to talk about software development in terms of production management. While this trend is desirable, it is easy to be misled by the analogies. Production management is concerned with the replication of a product; software development is concerned with the development of new products. In particular, the lack of effective and usable "software metrics", despite the considerable research activity in this area, makes it very difficult to use quantitative techniques.

General or corporate management deals with the management of the organization as a whole. On the one hand, corporate managers are responsible for the long-term strategy of the organization; on the other hand it is with them that "the buck stops" and so they must monitor the overall performance of the organization and be prepared to handle serious problems which arise anywhere in the organization.

There are, of course, many other characteristics which can be used to classify different management roles. While each has its own peculiar concerns and its own methods for addressing them, there are certain issues and techniques that are common to almost all management roles.

2.4.1 Motivation

How well individuals carry out their jobs depends on several factors:

1. how well they understand what is required of them;
2. their ability;
3. the quality of the facilities provided for doing the job;
4. their motivation, that is how well they want to do the job;
5. the attitude of their colleagues.

While these factors apply generally, they are particularly important in the software industry—and only too often ignored.

Consider the case of a team of 25 people engaged in coding and testing a large real-time system. It is regrettably not uncommon to find a scenario like this:

- Specifications of individual modules are unclear, ambiguous or incomplete. Anyone who asks for clarification is told “Do the best you can with the spec you’ve got”.
- Because of the habit of measuring effort in man months, there is an assumption that people are all the same. The result is that the programmer with a degree in Mathematics is writing the report generation module while the programmer with a degree in Business Studies is struggling with a module to calculate the eigenvalues of a matrix.
- There are five terminals, connected to an overloaded mainframe, shared between the 25 staff; the semicolon key on one of the terminals works only intermittently.
- The staff are housed in a single large room in a converted aircraft hangar. A formal “flexitime” system is in use and employees pay great attention to it, in order to maximize their time off.
- The main subject of conversation at coffee breaks is the appointments pages of *Computer Weekly*.
- Although the company pays competitive salaries, at least once a month there is a leaving party for a member of the team.
- No one shows any interest in what the software is for.
- The company has tried hard to recruit good programmers and, when they first join the project, new recruits seem to perform very well but, after three months, they are indistinguishable from their colleagues.

The inevitable lateness and poor quality of the software coming from this team is primarily a result of management failing to pay attention to the factors (1), (2) and (3) above. This failure results in lack of motivation on the part of individuals and the team as a whole, which, in turn, affects newcomers to the project. There is a gradual decline in the average ability of the team because the most able tend to be the ones who leave first.

We have seen some of the things that demotivate people; what are the things that motivate them? Assuming that the basic necessities of life are taken care of, people are motivated by such things as:

- self-esteem—the feeling that they are doing a worthwhile job and doing it well;
- the esteem of others—their peers, their superiors, their inferiors and their customers;
- satisfaction of social needs—the sense of belonging to a group;
- a sense of security;
- financial rewards.

The relative importance of these will vary from individual to individual and from organization to organization. Surprisingly often, financial reward will be found to be low in the order of priorities. A good manager will try to discover what it is that motivates each of his staff.

It is important that the outcome of good performance in a job should be seen to be an improvement in the factors that motivate the individual. While salary increases are usually welcome, they may not be the most effective way of rewarding good performance. Managers can make clear that they value their staff by consulting them and taking notice of their advice. If working conditions are unsatisfactory they can strive to get them improved. In environments where the salary structure is inflexible and promotion is at the whim of committees that take little notice of performance in the job, this may be the only means the manager has of motivating his staff. Its effectiveness will naturally depend on the respect that the staff have for their manager.

While financial reward may be comparatively ineffective as a motivating factor, it can paradoxically be an effective demotivating agent if it is seen to be grossly inequitable. This happens if salary increases are seen to be given to those who complain loudest rather than to those who perform best. It can also happen through careless recruitment. A particularly bad example was a case where new graduates were being recruited to a company at salaries higher than those then being paid to the graduates recruited in the previous year.

2.4.2 Performance appraisal

The importance of giving staff clear objectives and of measuring their performance against these objectives led, in the 1970s, to the development of a style of management known as management by objectives (MBO). The term has fallen out of favour but the central idea is now widely practised; indeed, it has spread from the business environment, in which it started, to many other areas, such as school teaching, to which its appropriateness is debatable.

The central idea is that of performance appraisal against agreed targets. Managers are required to agree with each of their subordinates what the subordinate's objectives in his or her job should be over the next time period, typically six or twelve months. At the end of the time period, the subordinate's performance is assessed against these objectives and new objectives agreed for the next time period.

In order to make such a scheme work, there are several important points which must be appreciated by all concerned:

- Both manager and subordinate must participate in setting the subordinate's objectives. They should agree that the objectives are both feasible and desirable; this will mean the managers explaining their objectives to their subordinates. They must also identify major obstacles to achieving the objectives.
- It is very desirable that the attainment or otherwise of the objectives should be objectively verifiable. Thus an objective such as "to ensure that the complete sales statistics for the previous month are available by the third working day of the following month" is acceptable whereas "to improve the level of morale in the department" is not. However, this should not be allowed to have the effect of placing

undue emphasis on those aspects of the subordinate's job which can be quantified at the expense of equally important but non-quantifiable aspects.

- The subordinate's job must be sufficiently homogeneous to make it probable that the objectives will remain valid throughout the time period. If, for example, the subordinate is a communications expert whose job is to provide advice and assistance as necessary to project teams and proposal writers throughout a software organization, the work is likely to consist of a large number of short tasks which cannot be programmed more than two or three weeks in advance. In these circumstances, it may be difficult to establish any objective more concrete than "keep yourself up-to-date and keep your customers happy". Even this is better than nothing; it does make it clear to the subordinate that time should be spent on keeping knowledge up to date and gives grounds for asking for the time and money to attend conferences and suppliers' briefings.
- Continuing commitment from all levels of management is required. In the software industry, at least, this is perhaps the most difficult thing to achieve. It is not that managers do not appreciate the value of performance appraisal against agreed objectives. More usually, the problem is that appraisal interviews are never as urgent as the next crisis and so get put off indefinitely.
- Staff reviews carried out under the scheme should be diagnostic rather than purely evaluative. In other words, the purpose of the review should be to identify the reasons behind any failure to meet the objectives rather than to take the subordinate to task for failure. Since the review will be the starting point for the objectives for the next period, there is little point in setting the same objectives without some understanding of how performance can be improved.
- It is undesirable that the review procedure should be too closely linked with the salary review procedure. Quite apart from the fact that this may inhibit frankness during the review, there are many factors other than performance over one time period that must be taken into account in a salary review: the state of the market for people with the same skills as the person being reviewed; the need to keep the salaries of employees with similar skills and responsibilities broadly comparable across the company; and the profitability of the company. A subordinate who is perceived as a high-flyer and has succeeded in achieving two out of four very challenging objectives may well merit a larger salary increase than one of lesser potential who has succeeded in achieving more modest objectives completely. On the other hand, trade union pressure has led some universities to introduce schemes that expressly prevent the results of any appraisal being used in promotion procedures.

2.4.3 Sub-optimization

It may happen that, in achieving his agreed objectives, a manager may not act in the best interests of the organization as a whole. More generally and more formally, optimizing the performance of individual units within an organization may not optimize the performance of the whole organization. This problem is known as sub-optimization.

Let us consider two examples:

- A division of a software company is flourishing; it has plenty of business and its services are highly regarded by its customers. Unfortunately, its profitability is very poor, around 1 per cent of turnover. A new manager for the division is appointed and told that his primary objective is to raise profitability to 10 per cent over the next twelve months. He succeeds in doing this by increasing the division's charging rates and holding down salary increases; as a side effect, however, the turnover has decreased by 20 per cent and the number of staff by 30 per cent—and this in a period where most of the division's competitors have increased their turnover by at least 50 per cent. Incensed by the sudden increase in charging rates, two of the division's long-standing customers have transferred their business to a competitor and others are threatening to do so; as a result of the salary policy most of the best staff have left to go to work for competitors and the quality of the work produced by those who are left no longer justifies the division's high reputation. Following his success in achieving such a challenging objective, the manager is promoted and is subsequently heard making disparaging remarks about the problems his successor experiences in running the division.

- The XYZ organization is divided into many autonomous, wholly owned subsidiaries; among them are XYZ Tramways Ltd and XYZ SuperRail Ltd. The managing director of XYZ does not encourage collaboration between the subsidiaries because he believes that a spirit of competition among them leads to better performance. The government of Pontevedro decides that the national rail transport system requires modernizing and that, in such a small country, urban and inter-city transport should be run in an integrated fashion. Invitations to tender are sent to a long list of companies all over the world, including XYZ Tramways and XYZ SuperRail. XYZ Tramways decides to bid, in conjunction with ABC Ferrovie who will handle the inter-city side; XYZ SuperRail decides to bid in conjunction with PQR Strassenbahnen. Because of their high reputations and the quality of the proposals, into which they put a lot of hard work, the short list finally contains only the two XYZ companies, with their partners. The final decision is made on price and goes in favour of XYZ Tramways who in the final submission cut their original price by 20 per cent.

Sub-optimization is inevitable in any but very small organizations. Managers and units within the organization will always seek to optimize their performance in terms of the parameters by which they will be judged. To choose these parameters in such a way that optimizing them will optimize the performance of the whole organization is usually impossible. There is much that can be done, however, to mitigate the effects of sub-optimization.

In the case of the software house, the main difficulty was incompletely specified objectives. If the manager's primary objective had been stated as "to raise the profitability of the division to 10 per cent of turnover, while maintaining and, if possible, improving present sales volumes and staffing levels", the problems would probably not have occurred—although the manager would have been less likely to achieve the objective. The lesson here should be familiar from software requirements specifications: do not assume that your readers will take the same things for granted as you do.

The case of the XYZ group points up the dangers of too much autonomy in a decentralized organization. While for the most part the business of XYZ Tramways and XYZ SuperRail will not overlap, they clearly have interests in common. Group policy should encourage collaboration even if only at an informal level; senior staff of the two companies should meet regularly and it should be natural that something like the Pontevedrian tender should be discussed. On the face of things, it would have been better to submit a tender from XYZ Tramways and XYZ SuperRail jointly; however, there might be good reasons for submitting separate tenders with different partners (the Pontevedrians might be thought to prefer a bid which was not exclusively from one country; or two bids might be thought to increase the chances of success by one or the other). What is clearly contrary to the best interests of the group is to engage in a price cutting war at the final stage.

In both cases, the situation might well have been improved by good personal relations among the managers involved and a willingness to discuss their activities with their colleagues. The culture of some organizations seems to lead naturally to this, while in other organizations it is rare.

2.5 Further reading

There are numerous books on management written for engineers. In general, they emphasize the use of quantitative techniques in manufacturing industry and are not appropriate to the software engineering context. However, the first ten chapters of Chapman et al. (1987) provide a readable and more detailed coverage of the material in this chapter and the next, albeit the emphasis is still on traditional manufacturing industry. It also includes comprehensive bibliographies.

Although it is a more elementary book, Beardshaw & Palfreman (1990) serves to set the material in this chapter (and, to some extent, this book as a whole) in a wider context and is very easy to read.

Among more specialized works, more detailed information concerning company law and the mechanics of running a company will be found in Swinson (1990) and in Stamp & Marshall (1992). Prentice & Holland (1993) gives an excellent overview of the current state of the debate on corporate governance. Handy (1994) gives a more specialized coverage of the later sections of this chapter.

Beardshaw, J. & D.Palfreman 1990. *The organisation in its environment*, 4th edn. London: Pitman.

Chapman, C.B., D.F.Cooper, & M.J.Page 1987. *Management for engineers*. London: John Wiley.

Handy, C.B. 1994. *Understanding organisations*, 4th edn. Harmondsworth: Penguin Books.

Prentice, D.D. & P.R.J.Holland 1993. *Contemporary issues in corporate governance*. Oxford: Oxford University Press.

Stamp, M. & A.Marshall 1992. *Westby-Nunn's company secretarial handbook*, 11th edn. London: Longman.

Swinson, C. 1990. *A guide to the Companies Act 1989*. London: Butterworths.