

Learning Objectives

- Identify some of the factors that influence people's behaviour in a project environment
- Select and induct new staff into a project
- Increase staff motivation
- Take steps to reduce unnecessary stress and threats to health and safety

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11.1 Introduction

We are going to examine some of the problems that Amanda and Brigitte could meet when dealing with members of their teams. Where possible, we want to base any advice on the findings of writers on organisational behaviour (OB). We will pay special attention where the sources refer to software development environments. Some of these human considerations affect staff as individuals. These will be the subject of this chapter. Others arise from the need for people involved in ICT system development and implementation to work in cooperation with others. These team and organizational issues are the topics of the following chapter. A group is, of course, made up of individuals so despite this division of concerns, the two chapters will have some overlaps.

There will be four main concerns in the current chapter: staff selection, staff development, staff motivation and the continued well-being of staff during the course of a project.

The issues raised in this chapter have impacts at all stages of project planning and execution but in particular at the following points (see also Figure 11.1).

- Some objectives can address health and safety during the project (Step 1).
- Although project leaders might have little control over organizational structure, they need to be aware of its implications (Step 2).

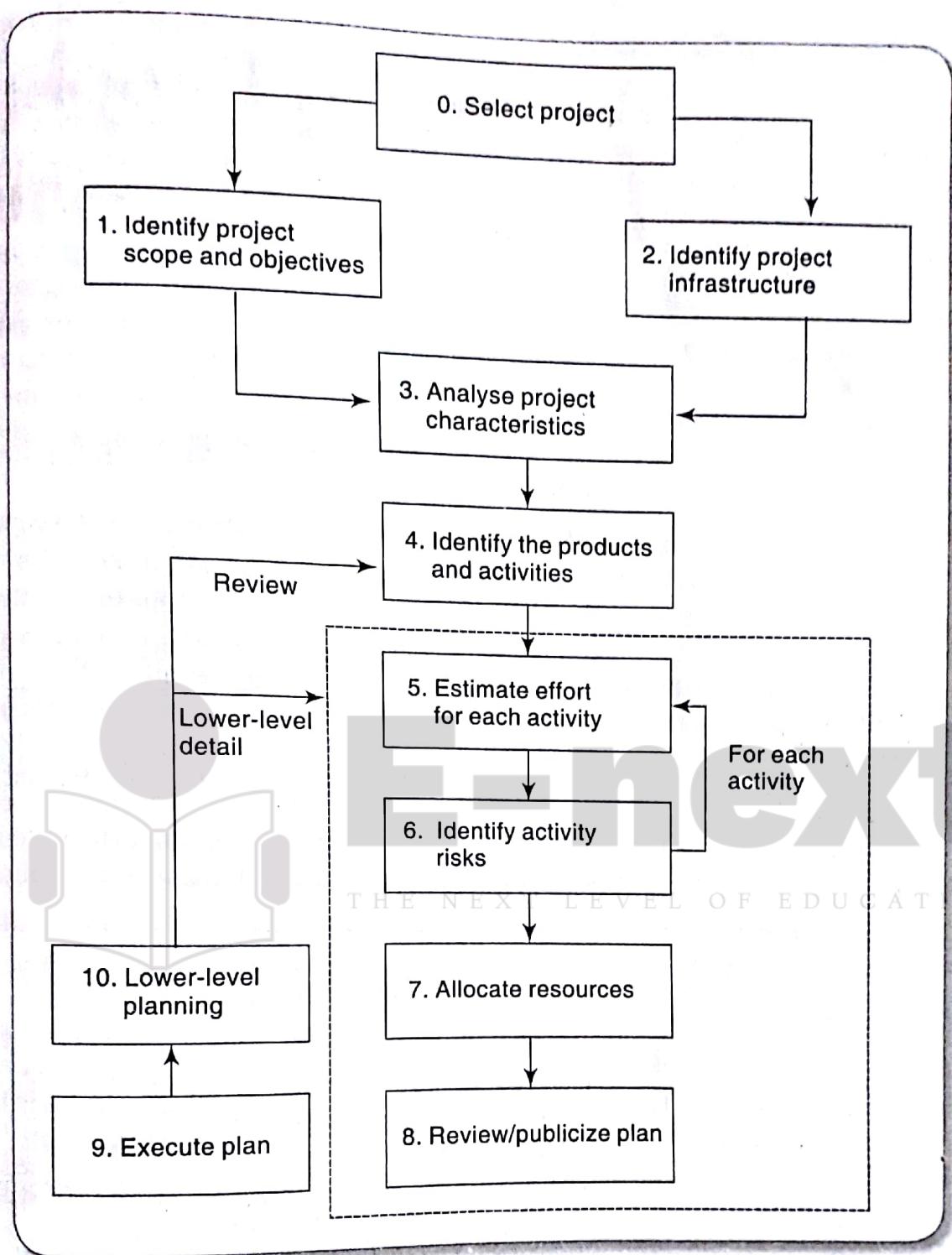


FIGURE 11.1 Some places in the Step Wise framework where staffing concerns are important

- The scope and nature of activities can be set in a way that will enhance staff motivation (Step 4).
- Many risks to project success relate to staffing (Step 6).
- The qualities of individual members of staff should be taken into account when allocating staff to activities (Step 7).

11.2 Understanding Behaviour

People with practical experience of projects invariably identify the handling of people as an important aspect of project management. People like Amanda and Brigitte would want to know whether the effective and sensitive management of staff comes only from experience or whether expert advice can help. Such advice may be more convincing if it is based on evidence that has been gathered through some kind of research.

This research into individual and group behaviour in software and ICT development environments needs to adopt social science research methods. This type of research requires a different mindset to that usually needed by software developers. Although the development of systems is usually based on user requirements that can be interpreted in more than one way, the end result is a system that works in a perfectly consistent way. The developers who produce such systems will inevitably have a tendency to see things in terms of deterministic systems where once a sequence of inputs is known, the outputs can be forecast with some certainty.

Such systems are perceived as being governed by mechanistic laws, just as there are in the physical sciences such as chemistry. This mindset tends to favour experimentation as the means of establishing the relationships between inputs and outputs and is sometimes referred to as a *positivist* approach. Attempts have been made to extend this model to social systems. However, because social systems, including business organizations, are so complex, it is not possible to predict their outcomes with any certainty. What can be done is to detect statistical relationships within such systems that can be expressed as generalized models or theories.

The discipline of *organizational behaviour* has evolved theories that try to explain people's behaviour. These theories are often structured as '*If A is the situation then B is likely to result*'. Attempts are made to observe behaviour where variables for A and B are measured and a statistical relationship between the two variables sought. Unlike physical science it is rarely, if ever, that it can be said that B *must* always follow A.

An *interpretivist* school of thought can be contrasted with the positivist one, particularly in relation to the extension of the quantitative and experimental methods from the physical sciences to people and organizations. Interpretivists point out that many concepts are not objective but are inter-subjective ones created by human beings. For example, later in this chapter we will examine whether there are particular personal characteristics that are associated with successful software developers. Some studies have found personal characteristics that seem to be strongly associated with 'software engineers' while other studies have found none. One question here would be how 'software engineer' is defined. Would someone who customizes and installs off-the-shelf packaged software count as a 'software engineer'? Would the description 'software engineer' cover the role of the ICT business analyst? Furthermore, how would you define 'successful'? Is it someone who can write lots of code very quickly? Or someone who knows where to find the right existing software to do a job? One way of resolving such questions would be to look closely at specific ICT environments and observe the different types of role that people undertake and the tasks and skills associated with such roles. The typical way of doing this is an in-depth study of a small number (perhaps only one) of instances of a particular type of organization which produces a description of how things are done in that context.

The two viewpoints labelled positivist and interpretivist can both be valid and useful. In the types of research that underpin the material in the current chapter on individuals in work environments the quantitative (or 'positivist') type predominates. In the following chapter on working in teams the research drawn upon tends to be more qualitative and based on case studies in the interpretivist tradition.

In the real world there will be a wide range of influences on a situation, many invisible to the observer. It is therefore difficult to decide which set of research findings is relevant. A danger is that we end up with a set of maxims which are little better than superstitions. However, by examining these issues people can at least become more sensitive and thoughtful about them.

Work Psychology by J. Arnold, C. L. Cooper and I. T. Robertson (2004) 4th edition, FT Prentice Hall, is a good general text on these topics.

In what follows we will be making references to workers in the OB field such as Taylor, McGregor and Herzberg. Rather than overwhelming the reader with references, we recommend the reader who is interested in exploring this topic further to look at some of the books in the Further Reading section at the back of the book. Where we have given references these tend to be for works related specifically to an ICT environment.

11.3 Organizational Behaviour: A Background

The roots of studies in OB can be traced back to work done in the late 19th and early 20th centuries by Frederick Taylor. Taylor attempted to analyse the most productive way of doing manual tasks. The workers were then trained to do the work in this way.

Taylor had three basic objectives:

- To select the best people for the job
- To instruct them in the best methods
- To give incentives in the form of higher wages to the best workers

Frederick Winslow Taylor, 1856–1915, is regarded as the father of 'scientific management' of which OB is a part.

'Taylorism' is often represented as crude and mechanistic. However, a concern for identifying best practice is valid. In the more mundane world of software development, the growth of both structured and agile methods is an example of an emphasis on best practice. Both Amanda and Brigitte will be concerned that tasks are carried out in the proper way. More contentious is Taylor's emphasis on the exclusively financial basis of staff motivation, although Amanda and Brigitte will find many colleagues who hold Taylor's view on the importance of 'performance-related pay'. Unfortunately, Amanda and Brigitte are likely to have very little control over the financial rewards of their staff. However, they should be encouraged by findings that motivation rests not just on such rewards.

The research that obtained these findings was done at the Hawthorne Works of Western Electric in Chicago, hence the 'Hawthorne Effect'.

During the 1920s, OB researchers discovered, while carrying out a now famous set of tests on the conditions under which staff worked best, that not only did a group of workers for whom conditions were improved increase their work-rates, but also a control group for whom conditions were unchanged. Simply showing a concern for what workers did increased productivity. This illustrated how the state of mind of workers influenced their productivity.

The cash-oriented, or *instrumental*, view of work of some managers can thus be contrasted with a more rounded vision of people in their place of work. The two attitudes were labelled Theory X and Theory Y by Donald McGregor.

Theory X holds that:

- The average human has an innate dislike of work
- There is a need therefore for coercion, direction and control
- People tend to avoid responsibility

Theory Y, on the other hand, holds that:

- Work is as natural as rest or play
- External control and coercion are not the only ways of bringing about effort directed towards an organization's ends

A 'reward' does not have to be a financial reward – it could be something like a sense of achievement.

- Commitment to objectives is a function of the rewards associated with their achievement
- The average human can learn to accept and further seek responsibility
- The capacity to exercise imagination and other creative qualities is widely distributed

One way of judging whether a manager espouses Theory X or Theory Y is to observe how staff react when the boss is absent: if there is no discernible change then this is a Theory Y environment; if everyone visibly relaxes, it is a Theory X environment. McGregor's distinction between the two theories also draws attention to the way that expectations influence behaviour. If a manager (or teacher) assumes that you are going to work diligently and create products of good quality then you are likely to try to meet their expectations.

11.4 Selecting the Right Person for the Job

B. W. Boehm considered the quality of staff the most important influence on productivity when constructing the COCOMO software cost model (Chapter 5).

Taylor stressed the need for the right person for the job. Many factors, such as the use of software tools and methodologies, affect programming productivity. However, one of the biggest differences in software development performance is between individuals. As early as 1968 a comparison of experienced professional programmers working on the same programming task found a ratio, in one case, of 1:25 between the shortest and longest time to code the program and, more significantly perhaps, of 1:28 for the time taken to debug it. Amanda and Brigitte would therefore be rightly concerned to get the best possible people working for them.

P. M. Cheney (1984) 'Effects of individual characteristics, organizational factors and task characteristics on computer programmer productivity and job satisfaction' *Information and Management*, 7.

What sort of characteristics should they be looking for? Is an experienced programmer better than a new graduate with a first-class mathematics degree? It is dangerous to generalize but, looking at behavioural characteristics, the American researcher Cheney found that the most important influence on programmer productivity seemed to be experience. This is not surprising as the impact of experience is the most important factor in software productivity in Boehm's COCOMO models – see Chapter 5. Cheney found that mathematical aptitude had quite a weak influence in comparison.

J. D. Couger and R. A. Zawacki (1978) 'What motivates DP Professionals?' *Dataamation*, 24.

Amanda and Brigitte will want staff who can communicate well with each other and with users. Unfortunately, the American researchers Couger and Zawacki found that information systems (IS) professionals seemed to have much weaker 'social needs' than people in other professions. They quote Gerald Weinberg: '*If asked, most programmers probably say they prefer to work alone where they wouldn't be disturbed by other people.*' We see many who are attracted to writing software, and are good at it, but do not make good managers later in their careers.

Later surveys, however, have *not* found significant differences between IS and other staff. An explanation of this could be that IS has become broader and less purely technical in recent years.

Recruitment process

It must be stressed that often project leaders have little choice about the people who will make up their team – they have to make do with the ‘materials that are to hand’. Recruitment is often an organizational responsibility: the person recruited might, over a period of time, work in many different parts of the organization.

Meredith Belbin usefully distinguishes between *eligible* and *suitable* candidates. *Eligible* candidates have a curriculum vitae (CV) which shows, for example, the ‘right’ number of years in some previous post and the ‘right’ paper qualifications. *Suitable* candidates can actually do the job well. A mistake is to select an eligible candidate who is not in fact suitable. Suitable candidates who are not officially eligible can, on the other hand, be ideal candidates as once in post they are more likely to remain loyal. Belbin suggests we should try to assess actual skills rather than past experience and provide training to make good minor gaps in expertise. It seems to us to show that policies that avoid discrimination on the grounds of race, gender, age or irrelevant disabilities can be not just socially responsible but also a shrewd recruitment policy.

R. Meredith Belbin
(1996) *Team Roles at Work*, 2nd edition,
Butterworth-Heinemann.

A general approach might be the following.

- **Create a job specification** Advice is often needed as there could be legal implications in an official document. However, formally or informally, the requirements of the job, including the types of task to be carried out, should be documented and agreed.
- **Create a job holder profile** The job specification is used to construct a profile of the person needed to carry out the job. The qualities, qualifications, education and experience required would be listed.
- **Obtain applicants** Typically, an advertisement would be placed, either within the organization or outside in the trade or local press. The job holder profile would be examined carefully to identify the medium most likely to reach the largest number of potential applicants at least cost. For example, if a specialist is needed it would make sense to advertise in the relevant specialist journal. The other principle is to give enough information in the advertisement to allow an element of self-elimination. By giving the salary, location, job scope and any essential qualifications, the applicants will be limited to the more realistic candidates.
- **Examine CVs** These should be read carefully and compared to the job holder profile – nothing is more annoying for all concerned than when people have CVs which indicate clearly that they are not eligible for the job and yet are called for interview.
- **Interviews, etc.** Selection techniques include aptitude tests, personality tests and the examination of samples of previous work. Any method must test specific qualities detailed in the job holder profile. Interviews are the most commonly used method. It is better if there is more than one interview session with an applicant and within each session there should not be more than two interviewers as a greater number reduces the possibility of follow-up questions and discussion. Some formal scoring system for the qualities being judged should be devised and interviewers should then individually decide scores which are then compared. An interview might be of a technical nature where the practical expertise of the candidate is assessed, or of a more general nature. In the latter case, a major part of the interview could be evaluating and confirming statements in the CV – for example, time gaps in the education and employment history would be investigated, and the precise nature of previous jobs would need to be explored.
- **Other procedures** References will need to be taken up where necessary, and a medical examination might be needed.

A standard form which lists each selection criterion and the degree to which the candidate meets it should be used to ensure a consistent and fair approach.

Exercise 11.1

A new analyst/programmer is to be recruited to work in Amanda's team at JOE. The intention is to recruit someone who already has some experience. Make a list of the types of activities that the analyst/programmer should be capable of carrying out that can be used as the basis for a job specification.

11.5 Instruction in the Best Methods

- Decisions will need to be made about whether a newcomer can more effectively pick up technical expertise on the job or on formal training courses.

This is the second concern that we have taken from Taylor. When new members of the team are recruited, the team leader will need to plan their induction into the team very carefully. Where a project is already well under way, this might not be easy. However the effort should be made – it should pay off as the new recruit will become a fully effective member of the team more quickly.

- The team leader should be aware of the need to assess continually the training needs of their team members. Just as you formulate a user requirement before considering a new system, and a job holder profile before recruiting a member of staff, so a training needs profile ought to be drawn up for each staff member when considering specific courses. Some training might be provided by commercial training companies. Where money is tight, alternative sources of training should be considered but training should not be abandoned. It could just be a team member finding out about a new software tool and then demonstrating it to colleagues. Of course, the nice thing about external courses is talking to colleagues from other organizations – but attending meetings of your local branch of a computer-related professional association, such as the British Computer Society (BCS) in the United Kingdom, can serve the same purpose.

The methods learnt need, of course, to be actually applied. Reviews and inspections help to ensure this.

In the next chapter we will return to this topic from the point of view of integrating outsiders into a new group environment.

11.6 Motivation

The third of Taylor's concerns was that of motivating people to work. We are going to look at some models of motivation.

Taylorist model

- Piece-rates are where workers are paid a fixed sum for each item they produce. Day-rates refer to payment for time worked.

Taylor's viewpoint is reflected in the use of piece-rates in manufacturing industries and sales bonuses amongst sales forces. Piece-rates can cause difficulties if a new system will change work practices. If new technology improves productivity, adjusting piece-rates to reflect this will be a sensitive issue. Usually, radical changes in work practices have to be preceded by a move from piece-rates to day-rates. As will be seen later, the tendency towards dispersed or 'virtual projects' where staff work on their own premises at some distance from the sponsoring organization's site has seen a movement away from payment based on time worked.

Even where work practices are stable and output can be easily related to reward, people paid by the amount they produce will not automatically maximize their output in order to maximize their income. The amount of output will often be constrained by 'group norms': informal, even unspoken, agreements among colleagues about the amount to be produced.

Group norms are discussed further under group decision making.

Rewards based on piece-rates need to relate directly to work produced. Where a computer application is being developed, it is difficult to isolate and quantify work done by an individual, as system development and support is usually a team effort. As one member of staff in a study of software support work said: '*This support department does well because we're a team, not because we're all individuals. I think it's the only way the support team can work successfully.*'

Quoted by Wanda J. Orlikowski in *Groupware & Teamwork*, edited by Claudio U. Ciborra, Wiley and Sons, 1996.

In this kind of environment, a reward system that makes excessive distinctions between co-workers could damage morale and productivity. Organizations sometimes get around this problem by giving bonuses to project team members at the end of a successful project, especially if staff have 'volunteered' considerable unpaid overtime to get the project completed.

Exercise 11.2



A software development department want to improve productivity by encouraging the reuse of existing software components. It has been suggested that this could be encouraged through financial rewards. To what extent do you think this could be done?

Maslow's hierarchy of needs

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The motivation of individuals varies. Money is a strong motivator when you are broke. However, as the basic need for cash is satisfied, other motivators are likely to emerge. Abraham Maslow, an American psychologist, suggested a hierarchy of needs. As a lower level of needs is satisfied then gradually a higher level of needs emerges. If these are then satisfied then another level will emerge. Basic needs include food, shelter and personal safety. The highest-level need, according to Maslow, is the need for 'self-actualization', the feeling that you are completely fulfilling your potential.

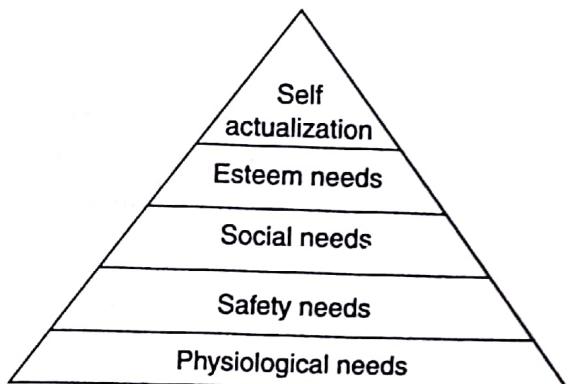


FIGURE 11.2 Maslow's hierarchy of needs.

The hierarchy of needs according to Maslow is shown pictorially in Figure 11.2.

In practice, people are likely to be motivated by different things at different stages of their life. For example, salary increases, while always welcome, probably have less impact on the more mature employee who is already relatively well paid than on a lowly paid trainee. Older team-members might place more value on qualities of the job, such as being given autonomy, which show respect for their judgement and sense of responsibility.

However, salary level can be important to staff approaching retirement because the amount of pension paid can depend on it.

Some individual differences in motivation relate simply to personality differences. Some staff have 'growth needs' – they are interested in their work and want to develop their work roles – while others simply see the job as a way of earning a living.

Exercise 11.3



Newspapers often report on the vast sums of money that are paid to the top executives of many companies. Does this mean that these people are at a low level in the Maslow hierarchy of motivation? Do they really need all this money to be motivated? What do you think the significance of these salaries really is?

Herzberg's two-factor theory

Some things about a job can make you dissatisfied. If the causes of this dissatisfaction are removed, this does not necessarily make the job more exciting. Research into job satisfaction by Herzberg and his associates found two sets of factors about a job:

- *hygiene or maintenance factors*, which can make you dissatisfied if they are not right, for example the level of pay or the working conditions;
- *motivators*, which make you feel that the job is worthwhile, like a sense of achievement or the challenge of the work itself.

Brigette, at Brightmouth College, might be in an environment where it is difficult to compete with the high level of maintenance factors that can be provided by a large organization like IOE, but the smaller organization with its closer contact with the users might be able to provide better motivators.

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Exercise 11.4



Identify three incidents or times when you felt particularly pleased or happy about something to do with your work or study. Identify three occasions when you were particularly dissatisfied with your work or study. Compare your findings with those of your colleagues and try to identify any patterns.

Expectancy theory of motivation

Amanda and Brigette need to be aware of how the day-to-day ups and downs of system development affect motivation. A model of motivation developed by Vroom and his colleagues illustrates this. It identifies three influences on motivation:

- *expectancy*: the belief that working harder will lead to a better performance;
- *instrumentality*: the belief that better performance will be rewarded;
- *perceived value*: of the resulting reward.

Motivation will be high when all three factors are high. A zero level for any one of the factors can remove motivation.

In fact, Vroom's expectancy theory can be given by the following expression:

$$\text{Motivation} = \text{Expectancy} \times \text{Instrumentality} \times \text{Perceived value}$$

Imagine trying to get a software package supplied by a third party to work. You realize that you will never get it to work because of a bug, and you give up. No matter how hard you work you will not be able to succeed (*zero expectancy*).

You are working on a package for a user and, although you think you can get it to work, you discover that the user has started employing an alternative package and no longer needs this one. You will probably feel you are wasting your time and give up (*zero instrumentality*).

Given that the users really do want the package, your reward might simply be the warm feeling of helping your colleagues and their gratitude. If in fact, when the users employ the package, all they do is complain and hold you responsible for shortcomings, then you might avoid getting involved if they later ask for help implementing a different package (*low perceived value of reward*).

11.7 The Oldham–Hackman Job Characteristics Model

Managers should group together the elements of tasks to be carried out so that they form meaningful and satisfying assignments. Oldham and Hackman suggest that the satisfaction that a job gives is based on five factors. The first three factors make the job 'meaningful' to the person who is doing it:

- *Skill variety*: the number of different skills that the job holder has the opportunity to exercise
- *Task identity*: the degree to which your work and its results are identifiable as belonging to you
- *Task significance*: the degree to which your job has an influence on others

The other two factors are:

- *Autonomy*: the discretion you have about the way that you do the job
- *Feedback*: the information you get back about the results of your work

Oldham and Hackman also noted that both the job holders' personal growth needs and their working environment influenced their perception of the job. Some writers have pointed out that if people are happy with their work for other reasons, they are likely to rate it higher on the Oldham–Hackman dimensions anyway. Thus it might be that cause and effect are reversed.

In practical terms, activities should be designed so that, where possible, staff follow the progress of a particular product and feel personally associated with it.

Methods of improving motivation

To improve motivation the manager might therefore do the following.

- *Set specific goals* These goals need to be demanding and yet acceptable to staff. Involving staff in the setting of goals helps to gain acceptance for them.
- *Provide feedback* Not only do goals have to be set but staff need regular feedback about how they are progressing.
- *Consider job design* Jobs can be altered to make them more interesting and give staff more feeling of responsibility.

Two measures are often used to enhance job design – job enlargement and job enrichment.

Job enlargement and job enrichment are based on the work of F. Herzberg.

Sarah Beecham et al. (2008) 'Motivation in software engineering' *Information and software technology* 50 860–78.

- **Job enlargement** The person doing the job carries out a wider variety of activities. It is the opposite of increasing specialization. For example, a software developer in a maintenance group might be given responsibility for specifying minor amendments as well as carrying out the actual code changes. Couger and Zawacki found that programmer/analysts had higher job satisfaction than programmers.
- **Job enrichment** The job holder carries out tasks that are normally done at a managerial or supervisory level. With programmers in a maintenance team, they might be given authority to accept requests for changes that involve less than five days' work without the need for their manager's approval.

A comprehensive survey of research into the motivation of software developers can be found in paper published by Sarah Beecham and colleagues in 2008.

11.8 Stress

Quoted in *Death March* by Edward Yourdon, 2nd edition, Prentice-Hall, 2003.

Kent Beck advocates a maximum 40-hour working week as an extreme programming practice – see Chapter 4.

Projects are about overcoming obstacles and achieving objectives. Almost by definition, both the project manager and team members will be under pressure. An American project manager is quoted as saying: '*Once a project gets rolling, you should expect members to be putting in at least 60 hours a week. . . . The project leader must expect to put in as many hours as possible. . . .*'

Some pressure is actually healthy. Boredom can make many jobs soul-destroying. Beyond a certain level of pressure, however, the quality of work decreases and health can be affected. There is good evidence that productivity and the quality of output go down when more than about 40 hours a week are worked. As long ago as 1960 it was found in a US study that people under 45 years of age who worked more than 48 hours a week had twice the risk of death from coronary heart disease.

Many software developers are expected to work overtime on projects for no additional payment. In these cases, a fall in productivity is more than compensated for by the fact that the work is effectively free to the employer.

Clearly, it is sometimes necessary to put in extra effort to overcome some temporary obstacle or to deal with an emergency, but if overtime working becomes a way of life then there will be longer-term problems.

Good project management can reduce the reliance on overtime by the more realistic assessment of effort and elapsed time needed, based on careful recording and analysis of the performance of previous projects. Good planning and control will also help to reduce 'unexpected' problems generating unnecessary crises.

Stress can be caused by *role ambiguity* when staff do not have a clear idea of the objectives that their work is supposed to be fulfilling, what is expected of them by others and the precise scope of their responsibilities. The project manager could clearly be at fault in these instances.

Role conflict can also heighten stress. This is where the person is torn between the demands of two different roles. The parent of young children might be torn between the need to look after a sick child and the need to attend an important meeting to win new business.

Some managers claim to be successful through the use of essentially bullying tactics to push projects through. They need to create crises in order to justify the use of such tactics. This, however, is the antithesis of professional project management which aims at a rational, orderly and careful approach to the creation of complex products.

11.9 Stress Management

As already mentioned, stress is a routine part of almost every body's life, and it is usually agreed that some amount of stress can be beneficial by making an individual focused and more productive. Low stress is usually associated with boredom and leads to drop in performance. However, when the level of stress becomes burdensome, there is a drop in performance due to cognitive (associated with thoughts), emotional and physical strains. Cognitive strain may manifest in many forms such as worrying, forgetting and lacking concentration. Emotional strains can lead to anxiety, restlessness, panic, interpersonal problems, losing touch with friends, irritability and anger. The associated physical strains may manifest itself in the form of shallow breathing, nausea, fatigue, headache, shoulder and back pain, sleep disturbances and hypertension. High stress is sometimes present among software developers and project managers. These roles involve intellectual work, meeting customer expectations and team work. Each of these can be source of stress and when deployed. In the following, we discuss three important categories of stress management techniques.

Imagery, relaxation and meditation

These techniques rely on deep breathing, relaxation, physical exercise, guided imagery, yoga, progressive muscle relaxation and massage therapy. An example of a simple relaxation technique can be rolling the head from side to side. Guided imagery refers to a wide variety of techniques such as simple visualization, metaphor and story-telling to instil positive feeling.

Cognitive behavioural approaches

These techniques involve developing emotion-focused cognitive coping skills, such as, self-monitoring of stress intensity, thought record-keeping and rewriting, time management, assertiveness training and increased social interactions.

Systemic approaches

Systemic approaches focus on altering the factors which contribute to stress. For example, if a team member finds it stressful to work with certain tools and techniques, a switch of job role may be suggested, so that the team member does not have to deal with those tools and techniques which are causing stress.

11.10 Health and Safety

Health and safety issues are more prominent in construction and other heavy engineering projects than in ICT development. Sometimes, however, the implementation of office systems requires the creation of physical infrastructure which can have inherent physical dangers. ICT infrastructure could, for example, be installed in a building where construction work is still going on.

In this section we are not addressing general concerns relating to the safety of ICT equipment of which any organization using such equipment would need to be aware. Nor are we discussing the safety of products.

created by the software development process. We are focusing briefly on the health and safety issues that relate to the conduct of a project.

Various pieces of legislation govern safety policy and the details of these can be consulted in the appropriate literature. In the United Kingdom, legislation requires organizations employing more than five employees to have a written *safety policy* document. A project manager should be aware of the contents of the document that applies to the environment in which the project is to be undertaken.

Professional Issues in Software Engineering (3rd edition) by M. F. Bott et al., Taylor and Francis, 2001, explores these issues in greater depth.

As far as the project manager is concerned, safety objectives, where appropriate, should be treated like any other project objectives, such as the level of reliability of the completed application or the overall cost of the project. The management of safety should therefore be embedded in the general management of the project.

Responsibility for safety must be clearly defined at all levels. Some points that will need to be considered include:

- Top management must be committed to the safety policy
- The delegation of responsibilities for safety must be clear
- Job descriptions should include definitions of duties related to safety
- Those to whom responsibilities are delegated must understand the responsibilities and agree to them
- Deployment of a safety officer and the support of experts in particular technical areas
- Consultation on safety
- An adequate budgeting for safety costs

Safety procedures must be brought to the attention of employees and appropriate training be given where needed.

This is a very cursory glimpse at some of the issues in this area. For a fuller treatment, the specialized literature should be consulted.

11.11 Some Ethical and Professional Concerns

As we saw above, there is now a legal requirement to act to reduce the threats to the health and safety of employees at work. Yet even if there were no such law, there would be very few who would not at least pay lip service to the moral obligation to prevent foreseeable injury to those at work. This would be an *ethical* judgement. There are bound to be cases where we would agree that people are, unethically, acting in a way potentially harmful to others even though laws have not – yet – been passed to prohibit that precise behaviour.

Some ethical responsibilities are shared by all members of the community, regardless of their position – for example, to alert the emergency services when a serious motor accident has taken place. Other ethical responsibilities affect particular organizations and the people who belong to them. Further responsibilities relate to a person's professional expertise, such as that of the software engineer or IT practitioner.

See Milton Friedman (1970) 'The social responsibility of business is to increase profits' *The New York Times Magazine* 13 September. Available at: www.umich.edu/~thecore/doc/Friedman.doc

It might be thought that organizations have greater ethical responsibilities given their greater power to inflict damage than individuals, particularly when they implement large development projects of various kinds. However, there is an argument – associated particularly with the economist Milton Friedman – that those working for commercial

organizations have a contract to safeguard and enhance the assets of the stockholders of the company. These stockholders are those who have invested money in the company and are legally its owners – they could include ordinary people who have invested their retirement savings in the company. It was argued that pursuing other goals that might benefit the community as a whole at the expense of the stockholders would be dishonest behaviour by the company's employees.

Exercise 11.5



Identify some of the possible objections and criticisms that can be made of the stockholder business ethics model described above.

Another argument for the reduced – or at least peculiar – ethical responsibilities of commercial organizations is that they are competing with other businesses. If my business wins some aspect of this game, then my competitors must lose: investors might lose money and employees their jobs. But, it is argued, that is the way the market works, and as a result consumers benefit from reduced prices. However, in the longer term competition which destroys competitors leads to the domination of monopolies and increased prices.

A rather extreme argument that normal ethical rules do not apply in business can be found in Alfred Carr (1968) 'Is business bluffing ethical?' *Harvard Business Review*, 46(1) 143–53.

Most organizations will, however, recognize that they do have ethical responsibilities. This could be purely out of self-interest. You may, as a potential customer, be wary of entrusting your custom to organizations which are transparently motivated by pure greed. Organizations often express their objectives and aspirations – perhaps in the form of a mission statement – and these tend to include some objectives that relate to matters of the general public good such as concern for the environment.

Despite removing levels of management (delayering) and creating flatter reporting structures, large organizations will always have some sort of hierarchy. As we saw in Chapter 1, the people at the top will specify a general strategy, hopefully consistent with the aspirations of the mission statement. Managers at the next level will take the strategy and devise programmes of work to achieve the strategic goals in their areas of responsibility. When doing this they are making decisions within their designated areas of responsibility. This process will be repeated at successively lower levels in the company until we get to the people who actually implement the decisions.

Any decision that is made will have to satisfy a number of organizational requirements which could appear to conflict. For example, a new ICT application may be needed to meet a legal requirement with a fixed deadline. A high-quality system where reliability and correctness can be guaranteed would require a large team to develop it. This would be very costly and require the normal service to customers to be degraded. Some kind of balance would need to be struck between the need for reliability in the new system and the current quality of customer service. Whatever the final decision, there would be some risk about the final outcomes.

An excellent detailed exploration on these issues is Rosa Lynn B. Pinkus et al. (1997) *Engineering Ethics*, Cambridge University Press, which uses the Challenger space shuttle disaster as a case study.

Among the decisions involving risks will be those allocated to technical experts such as engineers and ICT practitioners. These will have special ethical responsibilities as they have knowledge and expertise that others may not fully understand but upon which they depend. These experts are likely to be entrusted with decisions about the deployment of new technologies.

ICT practitioners are unlikely to be expert in all areas of ICT and its development, so identifying a person's area of expertise is crucial. It would clearly be unethical for an ICT practitioner to pretend to be knowledgeable about some area where they are not. It also follows that if an ICT practitioner has expertise that would prevent a colleague from doing something harmful, it would be unethical for them to remain silent.

The decisions entrusted to these specialists would not only have to be technically justifiable but be unbiased. Accepting what amounts to bribes is clearly an example of unacceptable behaviour. However, recommending a particular technology because it happens to be one that the practitioner is expert in and its adoption would enhance his or her career might not immediately appear to be unethical to an individual.

As noted above, all decisions involve risks and true professionals would need to identify and warn about these risks. We also saw above that organizational actions tend to be implemented in a top-down manner, with the big decisions about strategy being decided first, and then the different elements of the overall plan being examined and more detailed decisions being made. Sometimes these high-level decisions have technical flaws and it would be the responsibility of the software engineer or ICT practitioner to point out such deficiencies.

This responsibility for emerging technical risks is not a matter solely for the practitioner. The organization must have a mechanism whereby such concerns can be communicated to a responsible manager who is competent to evaluate the issue and to take necessary actions. This might include escalating the issue to a higher level of management.

Long-established professions, such as medicine, have ways of certifying the competence of practitioners and enforcing ethical codes of conduct. In the United Kingdom, the British Computer Society (BCS) is a body which has produced *Codes of Conduct and Good Practice* (www.bcs.org/upload/pdf/conduct.pdf and www.bcs.org/upload/pdf/cop.pdf) – as has the IEEE (www.ieee.org/web/aboutus/ethics) and ACM (www.acm.org/about/se_code) in the United States – and various schemes for certifying the competence of different ICT specialists. However, BCS membership is still held by only a small minority of ICT practitioners so there is a long way to go in establishing ICT as a true profession.

THE NEXT LEVEL OF EDUCATION

Conclusion

Some of the important points that have been made in this chapter are:

- People may be motivated by money, but they are motivated by other things as well
- Both staff selection and the identification of training needs should be done in an orderly, structured way where requirements are clearly defined first
- Thoughtful job design can increase staff motivation
- Undue pressure on staff can have short-term gains, but is harmful to both productivity and personal health in the longer term
- Project objectives should include, where appropriate, those relating health and safety

Further Exercises

1. An organization has detected low job satisfaction in the following departments:
 - The system testing group

- The computer applications help desk
- Computer batch input

How could these jobs be redesigned to give more job satisfaction?

2 In Exercise 11.1, a job specification was requested.

- (a) Write a job holder profile of the sort of person who would be able to fulfil the specification in terms of qualities, qualifications, previous education and experience.
 - (b) For each element in the job holder profile that you have produced in (a) above, describe ways of finding out whether an applicant has met the requirement.
- 3 Section 11.8 focuses on the responsibilities of management in relation to staff stress. Evaluate an alternative view that individual staff members need themselves to be responsible for reducing their own stress levels, perhaps through changes in personal working practices.
- 4 Job enlargement sounds like a good thing. Explore what the possible disadvantages of job enlargement might be for both employers and staff.
- 5 For each of the following questions, exactly one of the options is correct. Select the appropriate option.
- (i) Which one of the following may be the highest motivator for a senior manager of a software development organization?
 - (a) Lunch allowance
 - (b) House rent allowance
 - (c) Company-provided car
 - (d) More interesting job assignment at the same pay
 - (ii) Which one of the following is the most accurate ranking of human needs as per Maslow?
 - (a) Self-actualization; self-promotion; social; security and physiological needs
 - (b) Self-esteem; self-actualization; social; security and physiological
 - (c) Self-actualization; self-esteem; social; security and physiological
 - (d) Self-fulfilment; self-esteem; social; security and physiological
 - (iii) Which one of the following has been identified by Herzberg as factor, which, if present, will lead to increased motivation?
 - (a) Good supervision
 - (b) Job security
 - (c) Regular promotions
 - (d) Good salary
 - (iv) If a team member is finding it extremely stressful, which one of the following stress management techniques would be suggested by a systemic approach?
 - (a) Rolling head from side to side
 - (b) Change of job role
 - (c) Deep breathing
 - (d) Increased social interactions

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- (v) Which one is not a factor in job satisfaction according to Oldham–Hackman job characteristics model?
- (a) Skill variety
 - (b) Task identity
 - (c) Task complexity
 - (d) Task significance
- (vi) Which one of the following is a ‘hygiene factor’ under Herzberg’s Motivation-Hygiene Theory?
- (a) Recognition for excellent work
 - (b) Self-actualization
 - (c) Good relations with co-workers and managers
 - (d) Clean work environment