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1 Projects and their management

1.1 Managing change through projects

Projects touch all our lives, in working and social environments. However, traditionally most managers have not been directly involved in the management of projects. Bureaucracies have been viewed as providing an efficient, stable and certain environment in which to conduct business.[1] Change was mistrusted. Managing change was limited to specialist, technical functions, and its introduction was carefully controlled. That has now changed.[2] Change is endemic, brought on by an explosion in the development of technology and communications. Rather than being the preferred style of management, bureaucracies are viewed as restricting an organization's ability to respond to change, and thereby maintain a competitive edge.

The last 40 years characterized this changing emphasis. The 1960s were a decade of mass production. Manufacturing companies strove to increase output. Production methods and systems were introduced to facilitate that process. High production rates were achieved, but at the expense of quality. During the 1970s, to differentiate themselves companies strove for quality. By imposing uniformity, and restricting their product range, managers could achieve quality while maintaining high production. In the 1980s, the emphasis shifted to variety. Every customer wanted their purchase to be different from their neighbours'. No two motor cars coming off the production line were the same, and non-smokers would rather have a coin-tray in place of the ash-tray. Companies introduced flexible manufacturing systems to provide variety, while maintaining quality and high production. In the 1990s, customers wanted novelty. No one buying a new product wanted last year's model. Product development times and market windows shrank, requiring new products to be introduced quickly and effectively.

Organizations must adopt flexible structures to respond to the changing environment. Now, at the start of the new century, in order for organizations to gain competitive advantage, that is not enough. Organizations need to be in an almost constant state of flux to improve their ways of working and business processes.[3,4] Many clients expect to make every product bought an individual bespoke design, and so every product becomes a mini project.

The project-based organization is becoming common,[5,6] and project-based management is becoming the new general management. Project management is a skill all managers require in their portfolio of skills. The Management Charter Initiative has identified that of the UK's four million managers, one million, at least, work in project-oriented companies.[7] This book provides the general manager in the project-oriented company with a structured approach to the management of projects.

In this chapter, I describe the structured approach and its three dimensions: the project, the process of managing the project and the levels over which it is managed. I then explain the importance of the process approach and introduce a model for the strategic management of projects. Next, I cover two issues, one dealing with the nature of projects, and one the nature of project management. The first is a classification of projects based on how well defined are the project's goals and the methods of achieving those goals, which influences the choice of strategy for managing the project. The second is an analogy of project management as sailing a yacht, which challenges traditional concepts of management. I end the chapter by explaining the overall structure of the book.

1.2 Definitions

Projects come in many guises. There are traditional major projects from heavy engineering, or WETT, industries: water, energy, transport and telecommunications. These are significant endeavours involving large dedicated teams, often requiring the collaboration of several sponsoring organizations. On the other hand, most projects with which most of us are involved are smaller. Projects at work include: engineering or construction projects to build new facilities; maintenance of existing facilities; implementation of new technologies or computer systems; research, development and product launches; or management development or training programmes. Projects from our social lives include: moving house; organizing the local church fete; or going on holiday. So what do we understand by projects and project management? In spite of our thinking that we understand what projects are, it proves very difficult to give a definition on which people can agree, even people working in the traditional engineering industries. Previously, I derived the following definition of a

project which most people find acceptable (except see Example 1.1):

> A project is an endeavour in which human, financial and material resources are organized in a novel way to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives.

I had a student on the MBA programme at Henley Management College who took exception to my definition. He worked on projects, he said, which were repetitive, and neither unique nor novel. They were maintenance projects in British Telecom. He said my definition was wrong; he did not have the humility to see that his application of the word might be wrong. Of course that was not the point; his maintenance projects had some features of projects and some of routine operations, and therefore needed a hybrid management approach. He did not see that the purpose of a definition is to aid understanding, not to be precise and prescriptive.

Example 1.1 Maintenance 'projects' in BT

However, the modern style is not to attempt a precise definition for something which is not precise. It is more common to identify those features of the endeavour we plan to undertake which differentiate it from the features of other endeavours, routine operations. In the process, we recognize that rather than having either projects or routine operations, we have a spectrum of endeavours ranging from the routine to the unique, novel and transient. As we move along that spectrum we use management approaches designed for the routine or the unique, novel and transient, or something in between. Jain[8] at a conference in St Petersburg in 1995 gave the following definition of project management:

> Project management is the art and science of converting vision into reality.

I find this neat, because it is imprecise, and from it I can derive the features of projects and their management, and the three dimensions of project management which form the structured approach of this book. Converting vision into reality requires us to do work, and that endeavour, being based on a new vision, will be different from anything done previously, and being different, or unique, will require people to develop novel working relationships. Further, the endeavour will be transient, having a beginning, middle and end, as we will want our output within a certain time. The process of conversion implies a life cycle, in which we take our vision, and convert it first into a mission (a definition of business objectives, or things we would practically like to achieve), then into project objectives (things the project will produce which we can operate to achieve our mission), and then into objectives and tasks for teams and individuals to undertake to

deliver the higher level objectives. Finally, to complete the conversion process, we must ensure the work is brought to a conclusion, which means we must ensure the work is finished, that the project outputs are achieved, and that the mission and vision are delivered. In this process we have also defined a hierarchy of objectives, vision, mission, deliverables, team and individual goals. The above discussion implies many of the traditional definitions of projects. The following were given in the previous edition of this book:

> a human endeavour which creates change, is limited in time and scope, has mixed goals and objectives, involves a variety of resources and is unique;
>
> a complex effort to achieve a specific objective, within a schedule and budget target, which typically cuts across organizational lines, is unique and is usually not repetitive within the organization;
>
> a one-time unique endeavour by people to do something that has not been done that way before.

Other definitions talk about managing a complex sequence of activities. Project management is about managing people to deliver results, not managing work. These definitions all emphasize this.

1.3 The three dimensions of project-based management

I now describe the three dimensions of project management derived above, and the features of projects and their management to show how the management of people in novel relationships to deliver novel results is different from the management of people in routine ways to deliver routine results.

The project

It is annoying when project managers try to grab the moral high ground by saying projects are about delivering objectives within constraints of time, cost and quality. All of business, all of life, is about trying to deliver objectives within constraints of time, cost and quality. By trying to grab the moral high ground in this way project managers do themselves no favours, because they fail to focus on what is special about their discipline, the uniqueness, novelty, transience and implied risk. In business there are repeat objectives, which require us to do repetitive things, and there are new objectives which require us to do unique, novel and transient things. With unique, novel and transient things, it is just more difficult to achieve the constraints of time, cost and quality, because there is less previous experience on which to base our plans, and therefore greater risk of failure.

FEATURES

Thus we derive the essential features of projects, Table 1.1. A project is an endeavour, a package of work, designed to produce some novel, unitary objective from which we expect to derive new benefit. The endeavour is unique, novel and transient. The transience creates urgency, a need to complete the work and obtain the benefit to repay the money spent. The novelty requires us to create new ways of working, and hence to integrate the working of people from across established organization structures. The uniqueness creates uncertainty; you cannot predict the future, and therefore you cannot be certain that the planned ways of working will deliver the objectives you want.

Now this uncertainty creates the first dilemma of project management: how much planning to do. There are those that say there is no point doing any planning, you cannot predict the future, so you might as well start and knife-and-fork your way through the project. Well, there are two little sayings about those who use this approach, the second credited to the managing director of a French pharmaceutical company:

> if you fail to plan, then plan to fail;
>
> we never seem to have time to plan our projects, but we always have time to do them twice.

You must have a plan; you need a framework within which to coordinate people's activities, the delivery of materials and the use of resources, including money. However, the one thing you can guarantee about your plan is that it is wrong, that is not the way the project will turn out. You must have it as the framework for coordination, but you must be ready and willing to change it as the project progresses. There are those, on the other hand, who think they can eliminate all uncertainty by planning in minute detail, that by developing a highly detailed plan, they can cover every eventuality, that they can predict the future. There are two problems with this approach. The first is it costs time and effort to plan. There is an empirical rule, that says if a certain amount of effort, x, is required to produce a plan of a given accuracy, then to double the accuracy requires

Table 1.1 The features of projects

Goal	*Features*	*Pressures*	*The plan*
Unitary	Unique	Uncertainty	Flexible
Beneficial	Novel	Integration	Goal oriented
Change	Transient	Urgency	Staged

four times as much effort, $4x$, and to double it again requires four times as much effort again, $16x$. Further and further planning gives decreasing return, less value for the effort, and you eventually reach a point where you are putting more effort into planning than the value of the information you get out. You eventually have to stop planning and start managing the risk (and this is what is so special about projects – the risk). The second problem is you cannot eliminate the risk and uncertainty, you cannot predict the future, but if you make the plan too complicated, too sophisticated, then it becomes inflexible and less able to respond to changes as they occur.

So we must have a plan, we must accept that it will not be completely accurate and so will need to be flexible and to change. To make the plan flexible we will see later that it must be goal oriented.

PROJECT, FACILITY, PURPOSE

Jain's definition implied a hierarchy of objectives, and the simplest way of viewing that is shown in Figure 1.1. The project itself is an endeavour, the work to be done. But we do not do it for its own sake, we do it to achieve some output (called 'the facility' throughout this book). The facility may be a new building, manufacturing plant, computer system, organization structure or ways of working, design, etc. It is something we want. However, we do not produce the facility for its own sake; we make it to

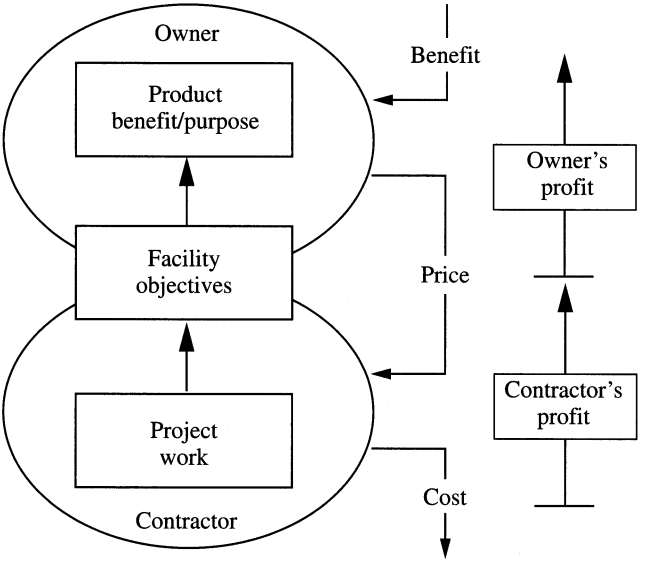

Figure 1.1 Project, facility, purpose

operate to satisfy some purpose or produce some benefit. Now, this is the same for routine operations, the plant is operated to produce product, which is sold to produce benefit. However, here the two differ again. In the routine operation, the plant is operated today to produce product tomorrow, which is sold the next day. Here we have instant feedback about how well we are doing, and we can make minor changes to the plant, small touches on the tiller, to bring the process back on course and to achieve the profit we want. On a project we do the work today, to produce the facility next year, and achieve the benefit the year after. By the time we achieve the benefit, the project team is disbanded, and it is not possible to put the work right to achieve the benefit we actually wanted. This reemphasizes the risk, and encourages people all the more to plan in great detail. Rather than focusing on the work, on a project you must focus on the desired results, continually reminding yourself of the purpose of what you are doing, to try to ensure that all the work done delivers essential project objectives which are necessary to achieve the purpose or expected benefit.

Figure 1.1 also illustrates that there are two groups of people involved on the project, called here the owner and the contractor. The owner pays the contractor to do the work, and in the process buys the facility. They then operate it to achieve the benefit. They make their profit from the difference between the benefit they receive from operating the facility, and the price they pay the contractor. The contractor does the work of the project. They receive money from the owner to do the work, and make their profit from the difference between the price they receive and the costs they pay to do the work. Here we see for the first time that different people working on the project can have conflicting objectives, different views about what constitutes success. The owner increases their profit if they can get the price down, and the contractor can increase theirs if they get the price up. If the owner and contractor are ICI and Foster Wheeler, respectively, we understand that conflict. Its resolution is part of the making of the contract between the two parties. However, if they are both part of the same parent organization, the production and engineering departments of ICI, say, then you may assume that they are all part of the same organization and share the same objectives. They don't!

FIVE FUNCTIONS OF PROJECT MANAGEMENT

The last feature of the project is the five functions of project management, five system objectives that need to be managed (Figure 1.2). These are the scope of work, the project organization (the people who will do the work) and the quality, cost and duration. Many books on project management focus only on the last three of these, many really describe only the management of the last two, and some only the last one. In Figure 1.2, I deliberately drew the

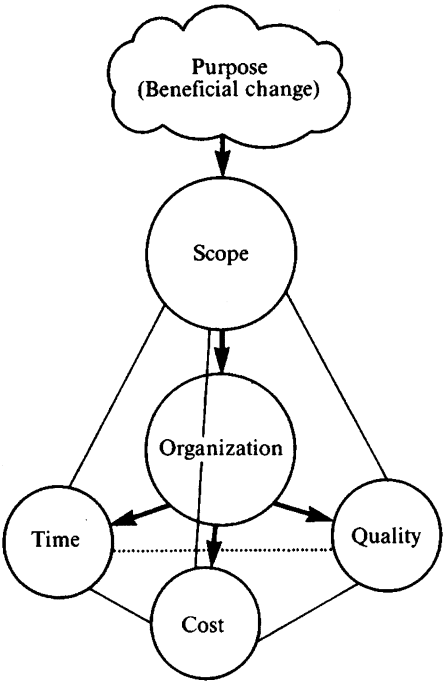

Figure 1.2 The five functions of project-based management

balls for scope and organization larger than the other three, as these two are the essential functions of project management: without work there would be no project, and without the people, the work would not get done. I have also shown the definition of the scope quite clearly driven by the purpose, or expected benefit. The other three functions, quality, cost and time, are just constraints. They are important constraints, but just constraints. Furthermore, the balance between them will differ from project to project. The so-called 'time/cost/quality triangle' (Figure 1.3) is used to illustrate this. Some project managers treat time as the only important function, and focus on that to the detriment of the others. Certainly there are projects for which time is of overriding importance, the Olympic Games for instance. The time the athletes will start parading up the stadium is known six years in advance, and if they are late, the whole world will be watching. The organizers cannot ring up the athletes two weeks before they are due to start, and tell them to come two weeks later. They must start on time. It is certainly the case that a tight time schedule focuses the mind, but on other projects cost is more important, and on yet others the quality is sacrosanct – but without the work and the functionality it produces there will be no benefit.

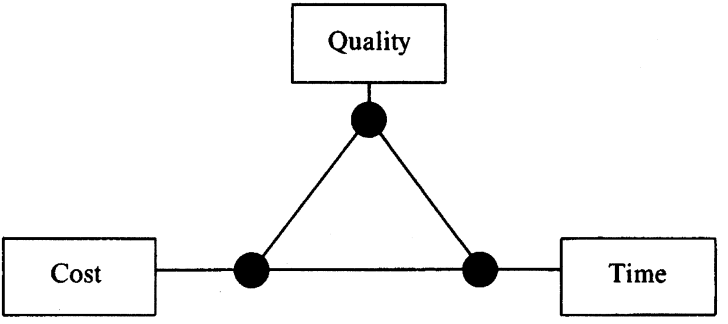

Figure 1.3 The time/cost/quality triangle

Figure 1.4 shows various tools and techniques used to manage the five functions. Table 1.7, in Section 1.5, summarizes these, and shows where in the book they are covered.

1. The scope is managed through product and work breakdown, as described above. We define a hierarchy of objectives from vision, mission, facility, team and individual objectives. This hierarchy is called the *product breakdown structure* (PBS).

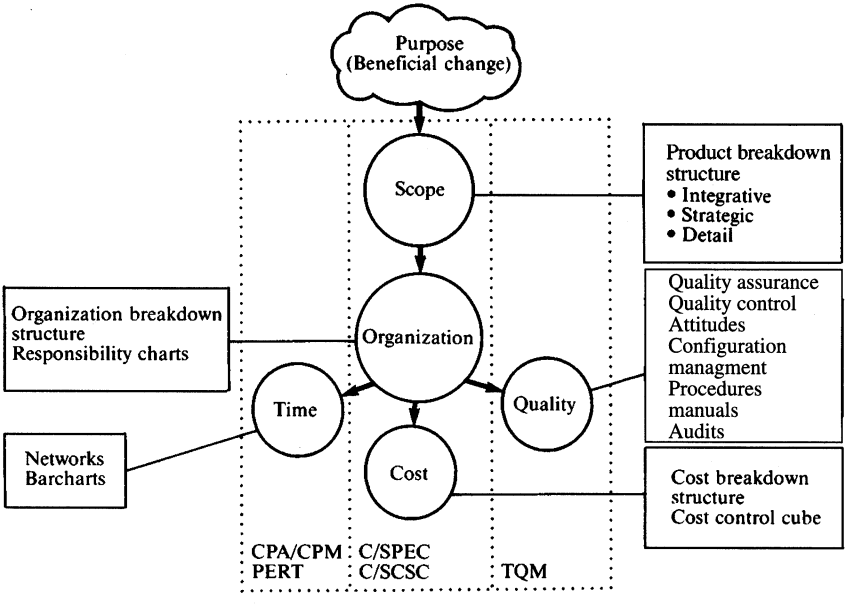

Figure 1.4 The tools and techniques of project-based management

2. Organisation is managed through an organization breakdown, by which we break down the skill sets of the people who will do the work. This is called the *organization breakdown structure* (OBS). At any level of breakdown, the products to be delivered and the skill sets involved define a two-dimensional matrix, called a *responsibility chart*, which indicates who will do what work to deliver the products. Conventionally products are put in the rows and skills in the columns. The cells then represent the work of the project. The hierarchy of responsibility charts defines a hierarchy of work to be done, called the *work breakdown structure* (WBS). Pedantically there is a difference between PBS and WBS. However, on many projects the difference is slight, each product is synonymous with the work to deliver it and so people sloppily refer to them as the same thing. Most of the time I will not draw a clear distinction between them, but occasionally I will, as when discussing *configuration management* in Chapter 7.
3. The cost is managed through a third breakdown structure of cost types, labour, materials, overhead, finance. This is the *cost breakdown structure* (CBS). The three breakdown structures combined produce what is called the *cost control cube*, and are part of a methodology invented by the US military in the 1950s called the *cost and schedule control systems criteria* (C/SCSC).
4. Time is managed using networks and bar charts. Networks are a mathematical tool to help calculate the time scale, bar charts are a communication tool to communicate the schedule to the project team. Networks are part of a methodology variously called *critical path analysis* (CPA), *critical path method* (CPM) or *programme evaluation and review technique* (PERT).
5. Quality is managed using techniques of *total quality management* (TQM) including quality control, quality assurance, configuration management, procedures manuals and audits.

These five functions of project management are the first dimension of the structured approach. They are the five things that need to be managed throughout the project life cycle, together with the risk that pervades all five. They are the subject of Part Two of this book. We turn our attention now to the life cycle or management process.

The management process

The second dimension of the structured approach is the management process, the life cycle that takes us from the vision to reality, from the first idea that there is a potential for achieving benefit to delivering an operating facility that will enable us to achieve that benefit. We cannot go straight from a germ of an idea to doing work. Effectively we need to pull the project up

by its boot straps, gathering data and proving viability at one level in order to commit resources to the next. There are many versions of the life cycle, and we will discuss several here. However, there is growing agreement about a basic four step process as shown in Figure 1.5 and Table 1.2.

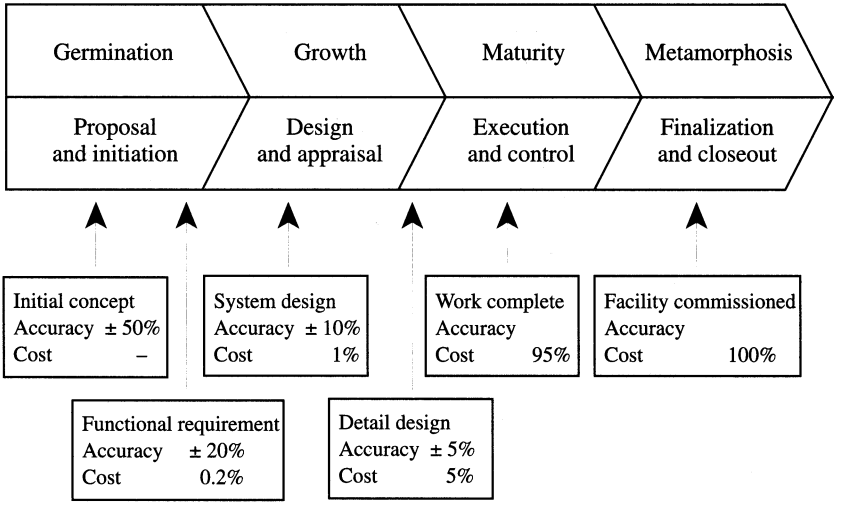

Figure 1.5 Basic four-stage life cycle

Table 1.2 The basic project management life cycle

Stage	*Name*	*Process*	*Outputs*
Germination	Proposal and initiation	Develop proposals Gather information Conduct feasibility Estimate design	Functional design Commitment of resources to design Estimates ±20%
Growth	Design and appraisal	Develop design Estimate costs and returns Assess viability Obtain funding	Systems design Money and resources for implementation Estimates ±10%
Maturity	Execution and control	Do detail design Baseline estimates Do work Control progress	Effective completion Facility ready for commissioning Estimates ±5%
Metamorphosis	Finalization and close-out	Finish work Commission facility Obtain benefit Disband Team Review achievement	Facility delivering benefit Satisfied team Data for future projects

1. We start with a proposal. We believe there is a problem to solve or opportunity to exploit which is of some value to us. For instance, we may think that if we spend £100, we can make £50 per year; two-year pay-back; that is good business. However, at this level of accuracy, the £100 might be as little as £50 and might be as much £150, and the £50 something between £25 and £75. To spend £50 to get £75 per year is wonderful, eight-month pay-back. To spend £150 to get £25 per year is awful, six-year pay-back. However, at the mid-range the project seems worth while so we initiate the project by conducting a feasibility study.
2. During the feasibility study, you gather more information, develop a functional design, and improve the estimates. In our example, say, you show the cost is more like £120, and the benefit £40, still three-year pay-back, probably good business. However, the £120 may range from £100 to £140, and the £40 from £30 to £50. Best and best is now two-year pay-back, still excellent. Worst and worst is almost five-year pay-back, marginal. However, the mid-range value is still worth while and so we commit resources to systems design, and initiate the project proper. On an engineering project, up to this point we have typically spent 0.2 per cent of the cost.
3. In design and appraisal, we develop a fuller systems design and compose a capital expenditure proposal. We prove the viability of our project, and find a sponsor to pay for it. In our example, say, we may confirm the £120 cost, now accurate to £10, and the £40 per year benefit, accurate to £5. We prepare a project manual and move into implementation. On an engineering project, up to this point we have typically spent 1 per cent of the project budget.
4. We can then move into detail design and execution. We now prepare working drawings and detail activity plans. In the process, we spend about 5 per cent of the project budget on an engineering project. We then do the work of the project.
5. We must then complete the project. This requires us to ensure all work is finished. We must commission the facility and transfer its ownership to the users. We must ensure it is being operated in a way that will deliver the benefit expected to justify the cost. We must disband the team in a way that looks after their development needs, and repays any commitments we made to them during the start-up stages of the project. Finally, we must review how we did. We cannot improve performance on this project, but we can improve performance on future projects.

There are many forms of the life cycle, ranging from two steps to ten or more. Several are given in Chapter 18, but I will describe a few here. Figure 1.6 and Table 1.3 show a ten-step problem solving cycle. This effectively

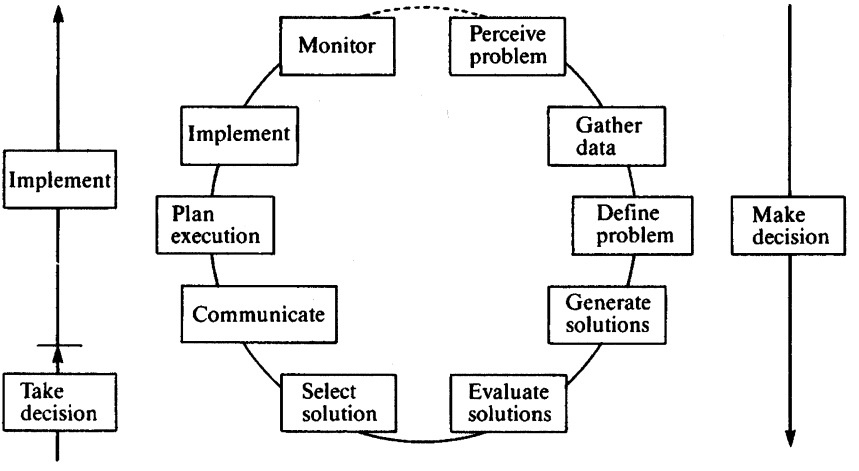

Figure 1.6 The ten-step problem-solving cycle

Table 1.3 Management process derived from the ten-step problem-solving cycle

Step	*Management process*
Perceive the problem	Identify an opportunity for providing benefit to the organization
Gather data	Collect information relating to the opportunity
Define the problem	Determine the value of the opportunity and its potential benefits
Generate solutions	Identify several ways of delivering the opportunity and associated benefits
Evaluate solutions	Identify the cost of each solution, the risk and expected benefit
Select a solution	Choose the solution that gives best value for money
Communicate the solution	Tell all parties involved of the chosen solution
Plan implementation	Complete a detail design of the solution and plan implementation
Implement the solution	Authorize work, assign tasks to people, undertake the work and control progress
Monitor performance	Monitor results to ensure the problem has been solved and the benefits obtained

treats the project as a problem to be solved and applies standard problem-solving techniques. Figure 1.7 is a four-step process due to Henri Fayol.[9] Fayol put the word 'command' in the central box. I did not like this; it is too reminiscent of command and control structures. First I changed the word to 'lead', but then decided that leadership and management are

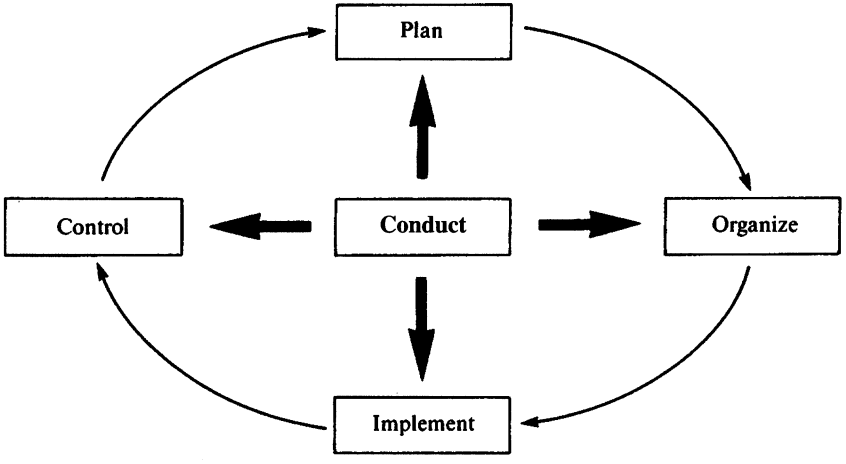

Figure 1.7 Five processes of management

different things.[2] So I put 'direct' in the box, but decided that, too, was reminiscent of command and control structures, and so have now settled on 'conduct'. That is what project managers do, they conduct the team through the project. Figure 1.8 shows that the three versions of the life cycle in Figures 1.5, 1.6 and 1.7 are the same thing, and Figure 1.9 that project management is fractal management. This means that each stage of the project is a little mini-project in its own right, and each part of each stage likewise. Hence the initiation stage has to be planned, organized, implemented, controlled and conducted, and the planning of that stage is undertaken by applying the ten-step problem-solving cycle.

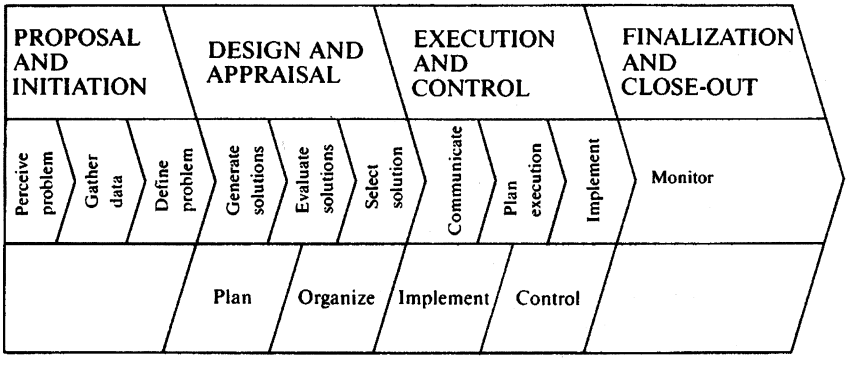

Figure 1.8 Relating the three views of the life cycle

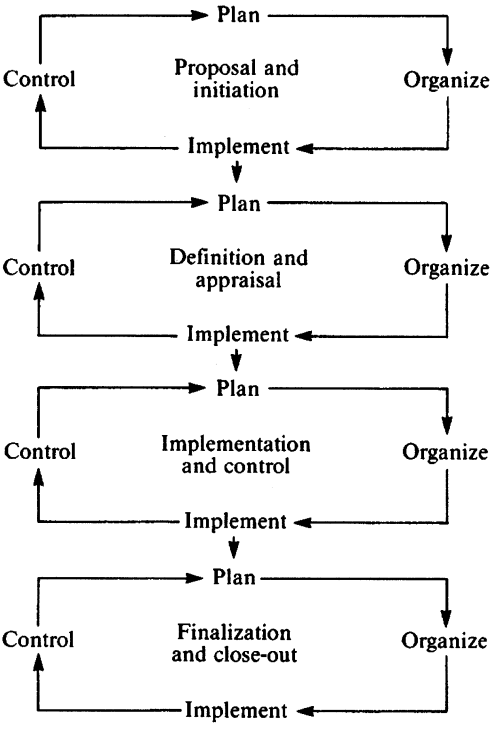

Figure 1.9 Project management is fractal management

What all three of these versions of the life cycle emphasize is that you cannot go from initial idea to doing work in one step. The base life cycle in Figure 1.5 shows that may result in you initiating a project for which you have not properly checked out its viability. You check viability at the current level of accuracy to commit resources to the design at the next level, and so gradually improve your understanding to the point at which you are able to commit significant amounts of money to project execution. The ten-step problem-solving cycle shows that if you go from idea to doing work, you will probably cover up the symptoms of the problem without curing the underlying malaise. Only by solving the problem, in a structured way can you identify and eliminate the root cause.

Two industry-specific versions of the life cycle are given in Tables 1.4 and 1.5. Table 1.4 is the life cycle used by the World Bank. This quite closely follows the 10-step problem-solving cycle, and shows that the banks' concern is in solving the true needs of economic development. Table 1.5 is a version proposed by the European Construction Institute for the engineering construction industry.

Table 1.4 Stages in the project life cycle used by the World Bank

Identification of project concepts
Preparation of data
Appraisal of data and selection of project solution
Negotiation and mobilization of project organization
Implementation including detail design and construction
Operation
Post-project review

Table 1.5 Stages in the life cycle proposed by the European Construction Institute

Concept
Feasibility
Front-end design
Project plan
Specification
Tender and evaluation
Manufacturing
Construction
Commission
Operation and maintenance
Decommission
Disposal

The levels

The third and final dimension of the structured approach is the levels over which the project is managed. There are three fundamental levels, the integrative, strategic and detail levels.

THE INTEGRATIVE LEVEL

The purpose is stated, and the facility required to deliver it is defined through quantitative and qualitative objectives. Areas of work and categories of resource required to undertake them are defined, and basic parameters or constraints determined for time scales, costs, benefits and performance. Any risks and assumptions are stated. The *Project Definition Report* (Chapters 5 and 11) is a tool used to record this information. A *functional design* of the facility is developed. This defines the basic features or processing steps of the facility required. For a chemical plant or computer program this will be a *flow chart* showing inputs and outputs from each major processing element. For a training programme it will be the definition of the major elements of the programme, and the learning objective of each.

THE STRATEGIC OR ADMINISTRATIVE LEVEL

Intermediate goals or milestones required to achieve the objectives are defined. Each milestone is the end result of a package of work. The responsibility of organizational units, functions and disciplines for work packages is defined. Work packages are scheduled in the project, and budgets developed. At this level the manager aims to create a stable plan which remains fixed throughout the project. This provides a framework for the management strategy, and allows changes to be contained within the third level. Responsibilities are assigned to organizational units. The *milestone plan* (Chapter 5) and *responsibility chart* (Chapter 6) are tools used for this purpose. A *systems design* of the facility is developed. This shows what each of the major processing elements does to deliver its outputs, and includes a design of the processing units within each element. For a chemical plant, the systems design is based on a *piping and instrumentation diagram*, and includes specifications of all the pieces of equipment. For a computer program, it describes what each subroutine within the program achieves, how each handles the data and the hardware architecture. For a training programme, it will break each element into sessions, and describe the format and learning objectives of each session.

THE TACTICAL OR OPERATIONAL LEVEL

The activities required to achieve each milestone are defined, together with the responsibilities of named people or resource types against the activities. Changes are made at this level within the framework provided at the strategic level. The *activity schedule* (Chapters 5 and 12) and *responsibility chart* are tools used for this purpose. A *detail design* of the facility is developed. This provides enough information to the project team to make parts of the facility, and assemble them into a working whole which meets the purpose of the project. For a chemical plant, this includes piping layout and individual equipment drawings. For a computer program, it includes the design of data formats, the definition of how each subroutine achieves its objectives, and the detail specification of the hardware. For a training programme, it will include the script and slides of lectures, structure of exercises and, perhaps, details of testing procedures.

Youker[10] gave a much wider view of the levels (Figure 1.10). This illustrates a cascade of objectives at different levels of management, from development objectives for the parent organization down to task objectives for individuals. At each level, the strategy for achieving the objectives at that level will imply the objectives at the next level down. I quite like this model because it gets away from hair-splitting arguments about visions, missions, aims, goals, etc (although I did use some of these words earlier in this chapter). We just have

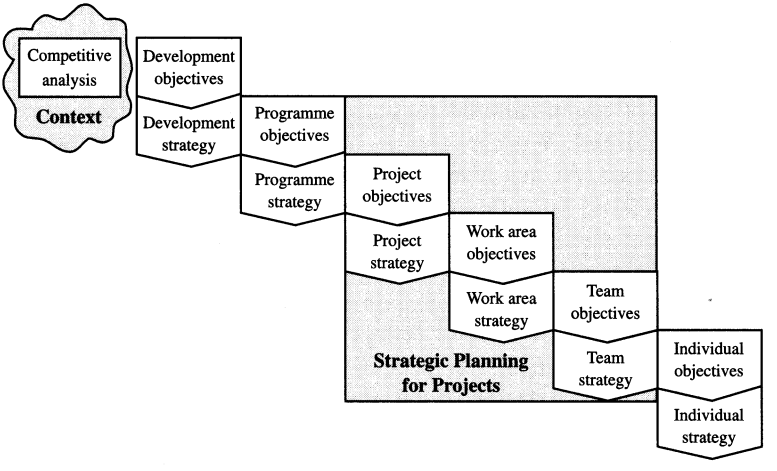

Figure 1.10 Cascade of objectives

objectives at different levels of management. Youker, who used to work for the World Bank, illustrated this by reference to a project to develop a palm-nut plantation in Malaysia (Example 1.2), a project he had helped finance while with the World Bank. I show in the example how this project illustrates an important point, that often our projects do not deliver their full potential until we have completed other projects in the programme of projects of which they are a part. Sometimes, as in the case of the palm-nut plantation, we will get no benefit at all. Table 1.6 shows the components in the PBS and the work elements in the WBS that result at different levels of Youker's cascade. This also acts as something of a vocabulary for the use of these words in this book. (Throughout the book I recognize that people may want to use different words to me. What I hope they will focus on is the concept, rather than the words being used.)

Table 1.6 Standard product and work breakdown structures, PBS and WBS

Level	*Product*	*Example 1.2*	*Work*	*Duration*
	Vision	Good life		
Development	Mission	Economic growth		5 years
Programme	Aim or purpose	Oil industry		2 years
Project	Facility	Plantation	Project	9–18 months
Work area	Subfacility	Cultivation	Work area	9–18 months
Team	Milestone	Orchards	Work pack	2 months
Individual	Deliverable	Planted trees	Activity	2 weeks
		Dig holes	Task	1 day

The project is a palm-nut plantation. The work areas are things like:

- the cutting down of the jungle and the planting of trees
- the development of an establishment to run the plantation
- the development of systems for gathering, storing and shipping nuts.

A team will be given objectives to plant areas of trees, and on a given day, an individual will be given a bag of trees, and told to plant them. (This illustrates quite nicely that the lower the level the more the product and the work are synonymous, and that the higher the level the more the objectives have many ways of being achieved, and thus are not so directly related to the work that will deliver them.) Working upwards, the programme of which the project is a part is the development of a palm-nut oil industry for Malaysia, and the development objectives are economic growth and employment in Malaysia. (This also illustrates that the higher up the hierarchy the less specific are the objectives.)

There is one final point. The project is part of a programme to develop a palm-nut oil industry. Other projects in the programme include:

- the creation of distribution systems to take nuts from plantations to factories
- the building of factories to process nuts into oil
- the creation of distribution systems to take oil from factories to customers.

Now, the palm-nut plantation project will not deliver any benefit until these other projects are completed. If all we do is develop a palm-nut plantation, all we will end up with is mountains of useless nuts. We can give those nuts a notional value, and work out the returns on the plantation, but we cannot realize those returns until we have completed all the projects in the programme. Many of our projects are like this, we can only get the full benefit from the project when we have completed other projects in the programme.

Example 1.2 Cascade of objectives for a project to develop a palm-nut plantation

1.4 The process approach

I said earlier that project management is the management of the unique, novel and transient, and functional hierarchical line management is the management of the routine. Then during the discussion of life cycle, I emphasized that the life cycle is a process that converts the project's inputs into desired outputs for the customer. Contained in this discussion are two perspectives on management:

- the management of the routine versus the management of the unique, novel and transient
- a discrete, internally focused approach versus a process-based, customer-focused approach.

Comparison of these two parameters together defines four types of management (Figure 1.11) (the first of many two-by-two matrices to be introduced). Traditional functional, hierarchical, line management is the discrete approach to the management of the routine. The work is artificially broken up to match the existing functional structure of the organization, to which it is assigned, and the product moves through the organization like a baton in a relay race, except that rather than being physically passed between successive steps, it is 'thrown over the wall'. Traditional project management, when it was first introduced in the 1950s, followed a similar approach. The project followed a life cycle, but each step in the life cycle became the responsibility of a function of the organization, design, procurement, construction, and the project passed between them also like a baton in a relay race, thrown over the wall. However, in the management of the non-routine, the problems associated with this discrete, internally focused approach became more apparent. It is almost impossible to divide the work up to be the responsibility of one function at a time, and it is almost impossible to define the interface between one function and the next to create a discrete handover. Indeed, companies trying to do this as they write their quality procedures according to ISO 9000 find that they cannot write procedures that cover all eventualities, and soon find themselves repeatedly being 'non-compliant'. Hence on projects, people tend to get driven towards adopting the process approach. The project becomes a process by which the inputs are converted into desired outputs. The Milestone Plan introduced in Chapter 5 is the process flow diagram for the project. The process approach requires four things:

1. Functions may need to work together at some steps of the process.
2. Functions definitely need to work together at the handover from one function to the next at each step in the process.
3. The way functions work together may vary project by project to meet the requirements of the particular customer.
4. As the project passes from one stage to the next, one function to the next, it needs to be approved against the end customer's requirements.

The process approach is that recommended by the PRINCE (PRojects IN a Controlled Environment) methodology developed by the CCTA[11] (the government's Central Computer and Telecommunications Agency), and by ISO 10006, the international procedure for quality in project management[12] (see Chapter 15). It is also the approach adopted in this book. Indeed, that is how I differentiate between project management and project-based management. The former is the discrete, functional approach to the management of the non-routine, and the latter is the process approach.

Figure 1.11 shows the process approach to the routine as the 'military

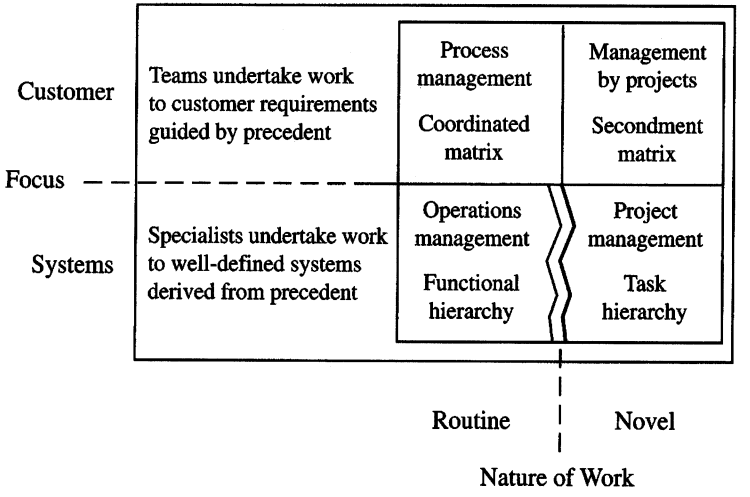

Figure 1.11 Four types of management

approach'. Some people would say that functional hierarchical line management is the military approach. It is not. The military approach is about defining process chains to support the soldier in the front line. During the battle, you cannot extend the time taken to supply him, by having functions work separately, waiting until one function is finished before the next begins. People must be empowered to support the customer within the constraints set by their orders. Functional, hierarchical, line management is used in private industry and parts of the civilian civil service. Finally, note that in the process approach, the customer for the people working on one stage is not just the end customer for the project's outputs, but also people working on later stages. Hence, at the transition from one stage to the next, the product must be checked not just against the requirements of the eventual customer, but the people working on later stages, and the procedures adopted at an earlier stage must be similarly adapted.

1.5 The strategic management of projects

Youker's model implies that at each level of management we need a strategy to achieve the objectives at that level. The project is part of the strategy by which the parent organization achieves its development objectives, but the project manager needs a strategy for undertaking his or her project. In Chapter 4, I give a detailed model of the strategy for undertaking a project. For now, suffice it to say that we should adopt a structured approach to the management of our project. Figure 1.12

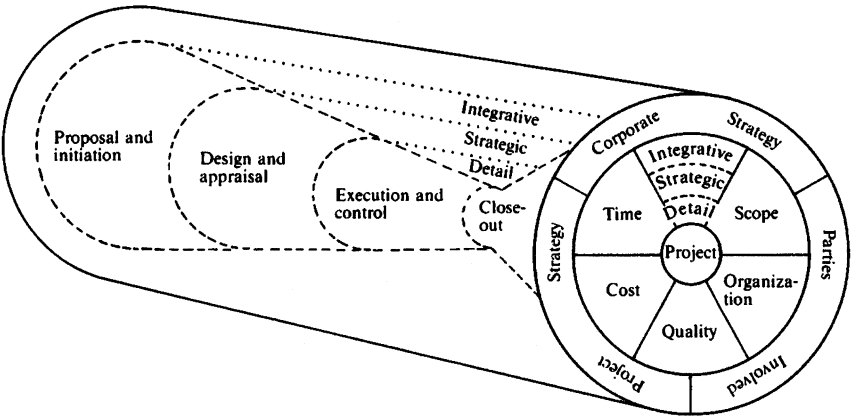

Figure 1.12 The structured approach to project management

combines the three dimensions into a single model for the management of projects. It shows that as we work through the first three stages of the management process, we improve our understanding of the five functions, scope, organization, quality, cost and time. It then shows that on completion of the work, in the close-out stage, we deliver first the completed work, then the commissioned facility and then the operating benefit. The figure also shows the project taking place within a context, which itself has three components: the strategy of the parent organization, which we have already met, the people involved, and the project strategy. Figure 1.13 is a more integrated model of the structured approach, and Figure 1.14 shows how the project plans for scope and organization form a contract between the parties involved in a project. We will meet this again in Chapter 6. Figure 1.2 shows some of the tools and techniques used in the process of managing the project, and these are shown in Table 1.7, which also lists where in the book they are covered.

Figure 1.12 is the basis of the structure of this book. In Part One, I describe the context of the project. Chapter 2 describes the relationship between the project and the strategy of the parent organization, Chapter 3 the views of the parties involved, and Chapter 4 how we judge projects to be successful, what the pitfalls to that success are and how we can develop a project strategy to avoid them. Part Two describes the management of the five project management functions and the risk inherent in them. Chapter 5 explains the management of the scope, Chapter 6 the project organization, and Chapters 7, 8 and 9 the quality, cost and time respectively. Chapter 10 describes the management of risk inherent in projects. Part 3 covers the

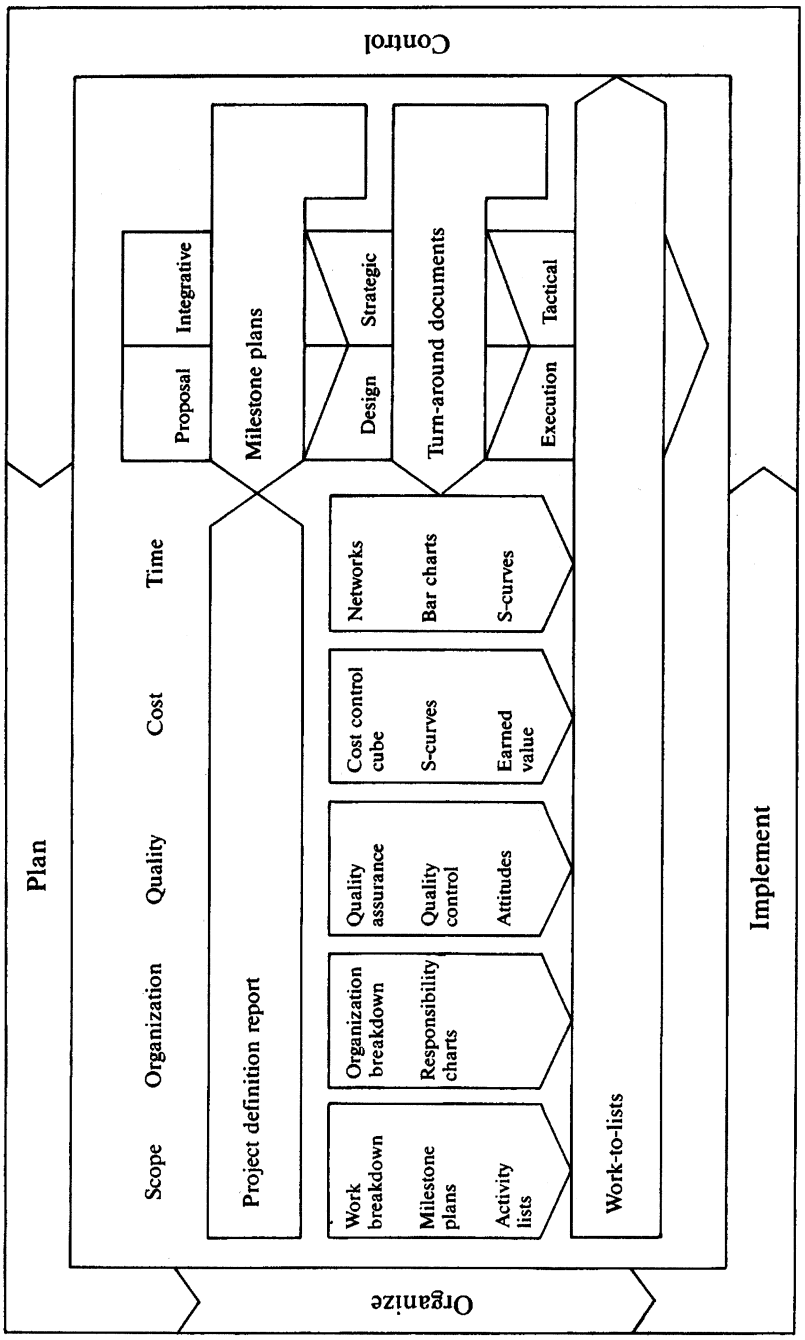

Figure 1.13 An integrated model of project management

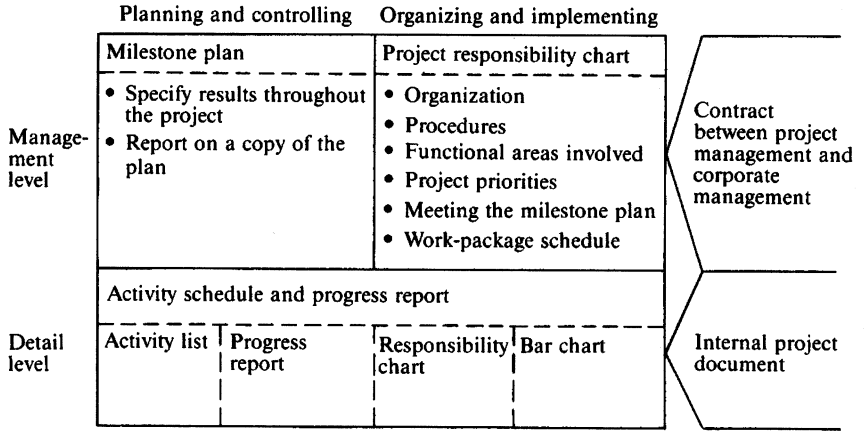

Figure 1.14 A contractual model for project management

Table 1.7 The tools and techniques of the approach

Method	*Techniques*	*Tools*	*Chapter*
Managing scope	Product breakdown	Milestone plans	5
	Work breakdown	Activity schedules	5
	Configuration management		7
	Data management	PMIS	15
Organization	Organization breakdown	Responsibility charts	6
	Organization development		3
Quality	Quality assurance/control	Quality plans	7
	Quality management	Procedures manuals/audits	15
	Analysis	TQM techniques	7
Cost	Cost control cube		8
	Estimating techniques		8
	Earned value		8
Time	PERT/CPA	Networks/bar charts	9
Risk	Risk management		10
Start-up	Start-up workshop	Definition report	11
Definition	Definition workshop	Definition report	11
Implementing	Baselining	Work-to lists	12
Control	Rolling-Waveplanning	Turn-around documents	12
		S-curves	
Close-out		Checklists	13

management process. In Chapter 11, the start-up processes, project definition and feasibility are described. Chapter 12 covers implementation and control, and Chapter 13 close-out. Part Four covers the systems and procedures of project management. In Chapter 14, I consider the management of programmes of projects, and the role of the project support office. In Chapter 15, I discuss the use of procedures, including PRINCE, and procedures manuals. I also consider the use of information systems to support project management. Chapter 16 describes the use of project health checks and audits. I explain two health checks, one which checks whether the working environment in the organization supports the project-based way of working, and the other which checks the health of an individual project. I then describe how to conduct more extensive audits of projects. In Chapter 17, I describe the role of the project manager in managing his or her project team. Part Five considers applications of project-based management. Chapter 18 describes applications of project-based management, with projects from different stages of the product development life cycle, and from different industries. It describes similarities and differences between these different types of project. Chapter 19 describes the management of international projects. Finally, in Chapter 20 I summarize some of the principles of good project management introduced in the book.

1.6 The goals and methods matrix

I want to end this chapter by discussing two further issues relating to project management in general. The first is a classification of projects which will influence some of the thinking throughout this book. The other is a view of management which challenges some of the traditional thinking.

It is possible to classify projects according to two dimensions, the first is how well defined are the goals of the projects, and the second is how well defined are the methods of achieving those goals.[13] This introduces another two-by-two matrix (Figure 1.15) defining four types of projects. (It is assumed you do not have a project until you have a purpose or business objective.)

- *Type 1 projects*: for which both the goals, and methods of achieving those goals, are well defined. These are typified by engineering projects. Because the goals and methods are both well defined, it is possible to move quickly into planning the work to be done, and so you will find on engineering projects an emphasis on activity-based planning.
- *Type 2 projects*: for which the goals are well defined, but the method of achieving them is poorly defined. These are typified by product development projects, where we know the functionality of the product,

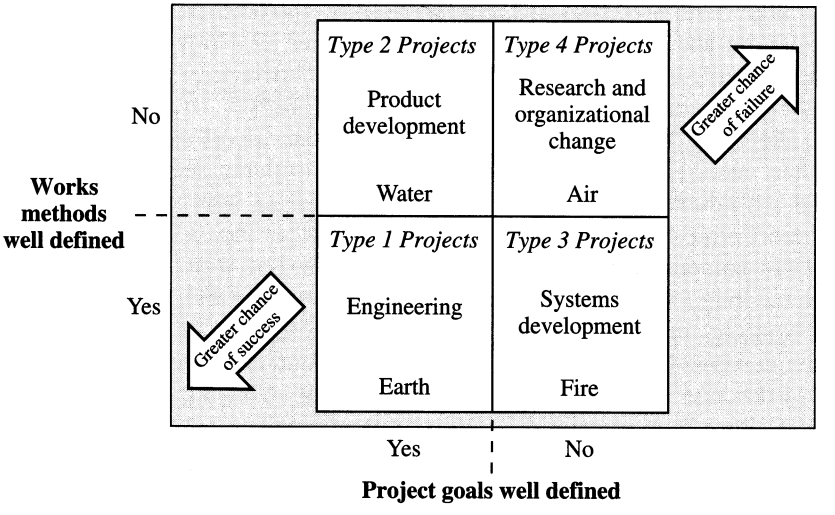

Figure 1.15 The goals and methods matrix

but not how it will be achieved. Indeed, the point of the project is to determine how to achieve the goals. Now it is not possible to plan activities, because the project will determine them. Hence we use milestone planning, where the milestones represent components of the product to be delivered.

- *Type 3 projects*: for which the goals are poorly defined, but the methods well defined. These are typified by information systems projects. When I started to work as a consultant and trainer in project management, it used to amuse me that when people from the information systems industry talked about project management, all they talked about was life cycles and phases. The goals and methods matrix explains why. On an information systems project, to get the users to say what they want is difficult enough, to get them to hold their ideas constant for any length of time is impossible. All people have to hold on to is the definition of the life cycle. Hence on information systems projects you tend to use milestone planning, where the milestones represent the completion of life-cycle stages.
- *Type 4 projects*: for which both the goals and methods of achieving them are poorly defined. These are typified by research or organizational change projects. The planning of these may use soft systems methodologies,[14] and the plan itself will again be milestone-based, but the milestones will represent gateways, go/no go decision points, through

which the research project must pass or be aborted.

We see each of the four types of project require a different approach to their planning and management. In reality, a given project will involve more than one type of project. The example project used from Chapter 5 onwards has engineering work (type 1), product development work (type 2), information systems work (type 3), and organizational change work (type 4). There is a question that does the rounds about whether a non-information systems professional can manage an information systems project. Some say that information systems is a black art, and you need to know the black art to manage the project. If not, the project team may lie to you about progress, and you will not know the difference. How sad to think that the project team may deliberately try to mislead the project manager like that, but if you define the milestones well, it should not matter. On the other hand, there are those who say project management is a generic skill and you can apply it to any discipline. In reality, a young person at an early stage of their career will learn project management in one discipline, and must apply it there. As their skill and maturity grows, they will begin to work on projects with a wider scope, involving many disciplines, like the example project later. You will not have the choice of choosing someone from the one discipline, because the project will cover several. The reality of modern project-based management is that the project manager cannot be a technical expert in all the areas of the project, and perhaps it is best if he or she is not a technical expert, because they can then delegate the work of the project and concentrate on their role which is coordinating the work of others. (See Example 1.3.)

In September 1994 I was at a meeting of the Major Projects Association, and one of the speakers, a partner with Andersen Consulting, said you needed an information systems professional to manage an IS project, and best if it was an Andersen consultant. I was seated next to Don Heath, formerly programme director for the Electrification of the East Coast Main Line, and at the time programme director for Crossrail, a £2 billion project. Don is a civil engineer. I asked Don what proportion of his project was information systems, and he said 10 per cent, £200 million. What was more, 20 per cent was electronics (driverless trains and automatic signalling), 30 per cent was a mechanical engineering (new rolling stock), and only 40 per cent was from his discipline, civil engineering (tunnels and track). So from what the partner from Andersen Consulting is saying, has Don Heath to ignore 10 per cent of his project? Or is it that this experienced project manager is able to develop management systems that enable him to keep track of the entire project.

Example 1.3 Multi-functional project-based management

1.7 Project management as sailing a yacht

I have an analogy of project management, indeed all management, as being like sailing a yacht. This analogy works on two levels.

Microlevel

When yachts are sailing in a race, they sail around in a triangle, the longest leg of which is arranged to be sailing up wind. If while sailing that leg, the crew aims their boat directly at the next buoy, they will be blown backwards. What they have to do is sail across the wind, called tacking, and slowly make their way upwind by tacking back and forth. Hence they achieve the next objective, not by sailing directly towards it, but by sailing for something they can achieve, and then something else they can achieve, and eventually make the objective. There is a joke about asking someone the way to the station, and he says, 'I wouldn't start here, if I were you'. You should not start at this buoy to get to the next one upwind, but you have to, and you do it by taking it in steps you can achieve. All life is like that, all management is like that.

While tacking the current leg, you will choose a sail setting and a rudder setting, and plan to sail so far, say 100 yards, before tacking about. While sailing that leg, you do not say: 'This is my sail setting, this is my rudder setting, good project management is adhering to my plan come what may.' You continually adjust your sail and rudder setting as the wind fluctuates. You monitor the actual conditions and respond accordingly. And if the wind comes around far enough, it may be better to be tacking in the other direction and you will change course.

Macrolevel

Take the example of the 1997 Whitbread Round the World Yacht Race. The yachts sailing in the race will have spent months before the race pouring over weather charts, and will have chosen a strategy for the race based on the normal range of weather conditions. But while they are sailing, they must respond to the conditions they actually encounter. They will have a strategy for the race, but will determine their detail plans as they sail the race, responding to today's conditions and the forecast for tomorrow. In spite of not being able to plan the detail, there are three things they can do:

- they can predict the duration of the race to a very high degree of accuracy, a few days in nine months
- the boats that come first and second, after nine months, are only a few hours apart
- there is a large degree of luck involved.

The crew who win is not the crew with the best detail plan to which they adhere doggedly. The people who win are the ones with the best strategic plan, and who respond best to the actual conditions on the day. But in spite of having to change the plan as the race progresses, the competition are encountering the same conditions, and are very close behind. The most competent crew, with the best strategic plan, is the one that wins. (See Example 1.4.) Our projects are the same.

The crew first into Cape Town in October 1997 were generally regarded as the third best crew. The two best crews arrived a day later, a couple of hours apart, having repeatedly overtaken each other over the preceding few days. The team that won, took a more southerly, longer route, but picked up a stronger easterly wind. They had a better strategy, based on an assessment of the chance of achieving a stronger wind to compensate for the longer route, and their risk assessment paid off.

Example 1.4 The Whitbread Round the World Yacht Race

1.8 Summary

1. There are three dimensions to the management of projects:
   - the project
   - the management process
   - the levels.
2. The project is a unique endeavour, undertaken by people working together in novel ways, over a limited period of time. They work under a sense of urgency and uncertainty, and must integrate their working patterns. To coordinate their efforts they must have a plan which is robust but flexible, and that means it should be goal oriented and staged.
3. The essence of project management is managing the risk and uncertainty.
4. The project is an endeavour to deliver a facility, which will be owned and operated to deliver a benefit to repay the effort to build it.
5. There are six functions of project management, managing the scope, project organization, quality, cost, time and risk.
6. The project life cycle is the process by which the project is undertaken. There are several views of the life cycle, including:
   - the standard view
   - the problem-solving cycle
   - Henri Fayol's five management processes.
7. The standard view is that there are four basic stages:
   - proposal and initiation
   - design and appraisal

- execution and control
- finalization and close-out.

8. Projects can be categorized according to how well defined are the goals and the methods of achieving the goals. This give four types of project with four different approaches to planning:
   - type 1: well-defined goals, well-defined methods, activity-based planning
   - type 2: well-defined goals, poorly defined methods, component milestone-based planning
   - type 3: poorly defined goals, well-defined methods, life-cycle-based planning
   - type 4: poorly defined goals, poorly defined methods, gateway-based planning.
9. Project management is like sailing a yacht:
   - you cannot always achieve your objectives in one step
   - you must continually adapt your plan in response to changing circumstance
   - you cannot plan the detail, you can only plan the strategy
   - even so it is possible to achieve an accurate forecast of the cost and duration of the project
   - the winners are the most competent team, with the best strategic plan, who respond best to the conditions actually encountered.

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