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15 Project management procedures and systems

15.1 Introduction

I first introduced the concept of project management procedures in Chapter 7, where I said they are an essential element of the quality assurance process. Having well-defined, previously proven, successful ways of managing projects increases the chance of achieving a successful conclusion. However, I did say that the procedures should be used as flexible guidelines, not rigid rules. They should be adapted to the needs of the actual project and to the customer's requirements. In the last chapter, I introduced the need to adopt project management procedures and systems to help manage the projects in a programme. I discussed whether an organization should have a common approach to its procedures or a tailored approach, and showed that the latest research again suggests that the procedures should actually be tailored to the requirements of the particular project.

Similarly, a *project management information system* (PMIS) can be used to help manage the project, and contribute to its quality assurance. Project management information systems were very poorly used in many areas until a few years ago, especially on high-technology projects. On engineering projects, information systems were used to make significant improvements to their management as early as the 1970s, mainly in the management of design information and materials, and in the analysis of risk. However, on high-technology projects, information systems appeared to be used just to play computer games (see Example 15.1). I have left discussion of PMIS until now because, as with teaching children how to do long division before giving them calculators, I think people should learn the principles of project management before using a PMIS. Once a person knows how to manage a project well, they can use a PMIS to make themselves an even better project manager. A bad project manager will use a PMIS to make themselves worse.

In this chapter I shall describe the use of procedures and systems. I shall start by describing procedures and how to develop a procedures manual. I then describe the PRINCE 2 methodology, effectively a standard procedures manual, and what the quality procedure ISO 10 006 says about the use of procedures manuals to achieve quality on projects. I describe the use of project management information systems, the types of package available, how to choose and implement a package, and some of the risks involved.

A delegate on a project management course at Henley Management College in 1989 said he had 20 people on his project team. Three worked in an office and spent all day every day developing plans in one of the more popular systems. No useful information came out of that room, the three people tended not to interact with the other members of the project team, so their plans bore no relation to what was being done. That meant 15 per cent of the project team spent their day playing computer games.

An associate director at Coopers and Lybrand said to me that a managing consultant working for him was doing a job that should have only taken about two weeks. However, every week the managing consultant presented him with a plan developed in the same package that showed where he had slipped a week in the last week. The managing consultant seemed to spend every week updating the plan, and not doing the work. He gave the managing consultant a paper-based reporting tool, and the work was finished in two more weeks.

Example 15.1 The misuse of project management information systems

15.2 Procedures manuals

Having project management procedures is an essential part of quality assurance. Following flexible guidelines which represent previously proven successful ways of delivering projects increases the chance of achieving a successful outcome for your project; redesigning the management process from scratch on every project increases the chance of getting it wrong. Procedures manuals are the medium by which an organization codifies its standard management processes. In this section I describe the purpose of procedures manuals, the essential approach to manuals, and a suggested structure.

Purpose of procedures manuals

There are several reasons why organizations develop procedures manuals:

A GUIDE TO THE MANAGEMENT PROCESSES

Even the most experienced managers may occasionally need to remind themselves of the procedures to be followed in certain circumstances. A procedures manual can serve as a useful *aide-mémoire*.

CONSISTENCY OF APPROACH

It helps in cross-project coordination if all projects within an organization are being managed in a consistent manner.

COMPANY RESOURCE PLANNING

In particular, when calculating the resource requirements of all projects being undertaken by the organization, and setting priorities between them, it is important that the resource requirements of each project are calculated in a consistent manner.

COMMON VOCABULARY

Likewise, it is important when making comparisons between projects, that it is done from a common basis, and that requires a common vocabulary. Lack of understanding of terminology can even create problems within project teams (see Example 15.2).

TRAINING OF NEW STAFF

Project managers often first learn their profession by 'sitting next to Nellie'. Following what they are doing in a procedures manual can help to reinforce their learning. Furthermore, if training courses are structured around the manual, it can serve to remind them of what they learned as they begin to apply it in the working environment.

DEMONSTRATION OF PROCEDURES TO CLIENTS

Often, as part of their terms and conditions of contract, clients demand to see proof of best practice in project management. This is an assurance to the client that the contractor is able to meet the agreed goals (of quality, cost and time). A procedures manual goes some way towards providing that proof.

QUALITY ACCREDITATION

Another way of demonstrating that the organization adheres to best practice is to be accredited against a defined quality standard. These standards are described in the next section.

I worked in a company where the word 'commissioning' was taken by the mechanical engineers to mean M&E trials, by the process engineers as the period following M&E trials during which the process was proved, by the plant operators as the period following process testing in which the first product was produced, and by the software engineers as all of those combined in which the computer control system is tested and proved.

A colleague reports working on a project to construct a petrochemical facility for which there were two project managers, one responsible for the design phase, and one for construction. When asked what they understood by project completion, one said completion of M&E trials, one said operating at 60 per cent nameplate capacity. Both were working to the same day, even though the two dates are at least 15 months apart.

He reports another project to develop a computer system where when asked the same question people gave answers ranging from completion of beta test to the system has operated for twelve months without a problem. Again they were working to the same date even though they were again at least 15 months apart.

On all of these projects, some people were going to judge them to be a success, and some a disaster.

Example 15.2 A common vocabulary

The essential approach

The essential approach to procedures manuals is to describe the processes by which the inputs of a project are converted into outputs. Many people make the mistake of defining how each function or department operates, with projects moving through the functions in a step-wise manner. However, there is overwhelming evidence that this is the inferior approach.[1] Problems that arise are:

- it reinforces demarcations and lack of communication between departments
- some people, especially those who implement procedures under the ISO 9000 series[2] and who also think that procedures should be rigid rules to be followed without exception, use the procedures to avoid doing work at the interface between functions or departments and then to blame project failure on others
- it can cause project development cycles to be slowed because projects are undertaken sequentially, rather than with functions and departments working in parallel, (projects become a relay race rather than a rugby match).

What is more successful is to define the processes through the project life cycle, defining how the organization processes a project as an entity, and defining how the functions or departments contribute to that process. The procedures should have as their core a standard project life cycle for the organization. At that level, the procedures define the inputs and outputs for each stage, with the outputs from one stage becoming the inputs for subsequent stages. Each stage of the life cycle can be broken down into a series of steps, each step with inputs and outputs, showing how the inputs for the stage are converted into outputs. The steps can then be broken into substeps, and so on, through a structured hierarchy or breakdown. The number of levels in the hierarchy will depend on the size of project: small project procedures will not go below the single, life-cycle level; large projects may have three or four levels of procedures. What the procedures must do at each level is define:

- the components of the inputs and outputs, comprising data and information, components of the project plan or reports, quality, risk or other control checks, or deliverables of the project
- what is done at each stage or step of the process
- the contribution of each function or department, or of external contractors or other agencies, to the work of each stage or step.

Some approaches to procedures define two types of input to a step, inputs which are consumed by the step and converted into outputs, and controls which determine the nature of the process. I have never fully understood the difference, and think that sometimes it is either arcane or unclear, and that most of the time it contributes no greater understanding of the process and hence is just sophistry. I do not draw the distinction.

The structure of procedures manuals

In order to achieve these requirements the typical structure of a procedures manual may be:

PART 1 – INTRODUCTION

This explains the structure and purpose of the procedures manual.

PART 2 – PROJECT STRATEGY

This describes the approach to project management to be adopted by the organization, and the basic philosophy on which it is based. It will cover issues such as those described in Chapters 3 and 4. It describes the project model, introduces the stages of the life cycle to be followed (Part Three), and explains why they are adopted. It also explains the need to manage project management functions, and also the need to manage risk.

PART 3 – MANAGEMENT PROCESSES

This describes the procedures to be followed at each stage of the life cycle. The inputs, outputs and their components are listed, and the management processes required to convert the former to the latter are listed sequentially. Example 15.3 presents the contents page of a manual for an information

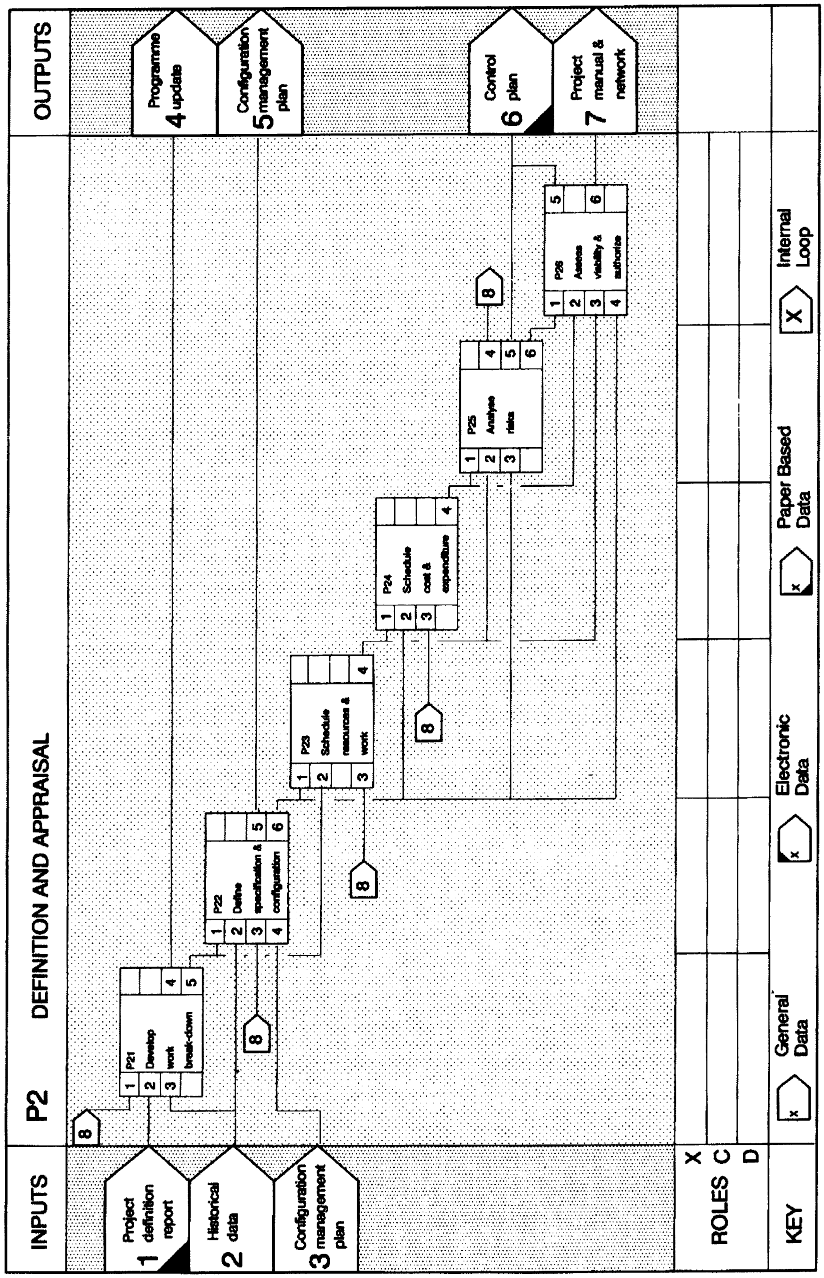

Figure 15.1 Pictorial representation of stage P2: *Definition and appraisal*

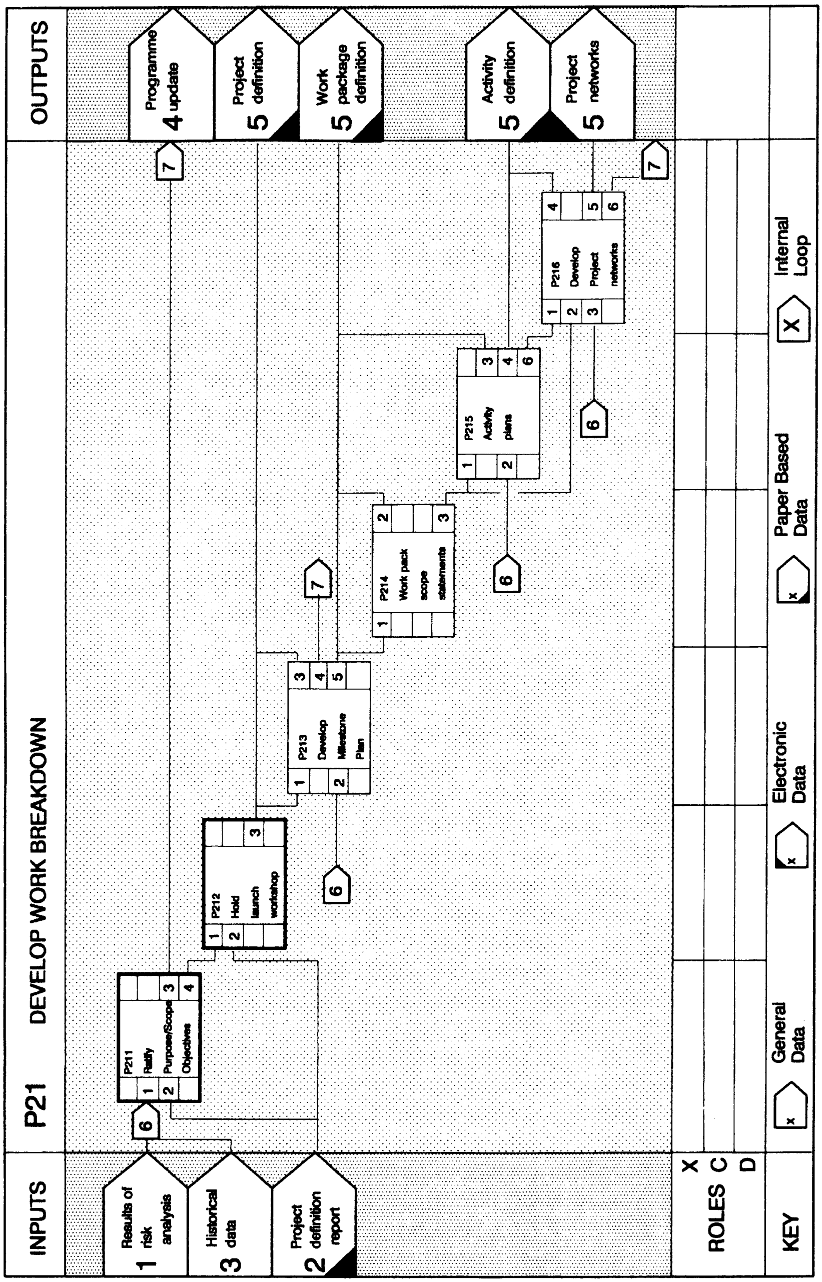

Figure 15.2 Pictorial representation of step P21: *Develop work breakdown*

systems project, which shows that in some areas the breakdown was taken to between one and three levels below the project stage. It is adapted from manuals I have prepared for clients.

In the procedures manuals of Example 15.3, I drew pictorial representations of the processes to achieve each stage or substage in the life cycle. Figures 15.1 and 15.2 are those for successive levels of breakdown. Where there is a lower level of definition, the process is shown as a fine box. Where the process is the lowest level, it is shown as a bold box. Against each bold box were listed the inputs, outputs and steps required to achieve it.

PART 4 – SUPPORTING PROCEDURES

This part explains the administrative procedures used throughout the project. It may describe the method of managing the five objectives – scope, organization, quality, cost and time – or it may explain some administrative procedures, such as programme management, configuration management, risk management, or methods of data collection (including time sheets), or the role of the project support office. Only those important in the particular environment will be necessary.

APPENDICES – BLANK FORMS AND SAMPLES

The inputs and outputs may have standard formats. It will be useful to include the blank forms, and completed examples in the appendix.

TRIMAGI COMMUNICATIONS INFORMATION SYSTEMS DEPARTMENT

Project Management Procedures Manual

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- INTRODUCTION
- PM PROGRAMME MANAGEMENT
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ADDENDA
1 Current resource and material codes
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AUTHOR: JRT	ISSUE: A	DATE: 30 APRIL 200X

Example 15.3 Contents page for a procedures manual for an IT project

Tailoring procedures to the requirements of the project

One thing which must be made clear is that procedures should be treated as flexible guidelines, not rigid rules. There are people, I am afraid I call them quality nerds, who say that procedures, especially those implemented under the ISO 9000 series of quality guidelines, once written, must not be changed or the organization will be *'non-compliant'*. Well, there are two things about quality:

– quality is about delivering what is fit for the customer's purpose
– quality is about continuous improvement.

Both of these issues require you to adapt the procedures, project by project, and the second requires you to sit down at the end of every project to see how well you did, and to update the procedures before the next project (see Example 15.4). I also showed in Section 14.4 how different project types and different resource types require different procedures. Hence you must allow some flexibility within your procedures to allow them to be tailored for different project types, particularly by size of project, and different resource types. Further, at the start of every project, the team must sit down and decide how the procedures need to be adapted to deliver a product which meets the customer's needs. It can help to have a procedure to guide this process. Usually the changes required will be minimal, or there will be something extraordinary about the project.

I was asked to bid for project management training at an organization who had just had their major biennial quality audit from one of their major customers. Before the customer had come, they had got out the results of the previous audit, and made sure all the points raised were covered. The customer found 40 exceptions, particularly a lack of structured risk management. But, wailed the company, they picked up on things that were not covered last time, and they then had no interest in risk management. I pointed out that anyone who read the project management literature, on both sides of the Atlantic, would see that risk management is now a major issue, and that methods of risk management have radically improved over the last two years. If they had been tracking the project management literature, they would have be improving their risk management processes.

Example 15.4 Updating the procedures

15.3 The PRINCE 2, ISO 10 006 and the PMBoK

There are several standard project management procedures available, and several project management information systems available give strong guidance on the project management process. Here I describe two of the more common standard procedures, PRINCE 2 and ISO 10 006.[2,3] I also briefly describe the main source document for ISO 10 006, the *Guide to the Project Management Body of Knowledge*, published by the Project Management Institute of North America.[4] None of these, in fact, proscribes the procedures and organization should follow. All three give guidelines as to important issues that need to be covered in organization procedures, but leave it to the organization to actually design their own procedures within the guidelines set.

PRINCE 2

In January 1983, PROMPT II,[5] supported by the CCTA, was adopted as the government's standard for project management, to be used in particular on IS and IT projects in the public sector. In March 1989, after the introduction of a number of new features, the name PRINCE was adopted to differentiate the government version from others. After a major research project, with extensive consultations, PRINCE 2 was launched in October 1996. This incorporated a number of improvements, and was designed to be applicable to a wider range of projects than just IS/IT, although the basic principles of PROMPT have been retained. PRINCE 2 has been designed to meet all the requirements of the international quality standard, ISO 9000, and will subsequently also concur with the project specific standard, ISO 10 006.

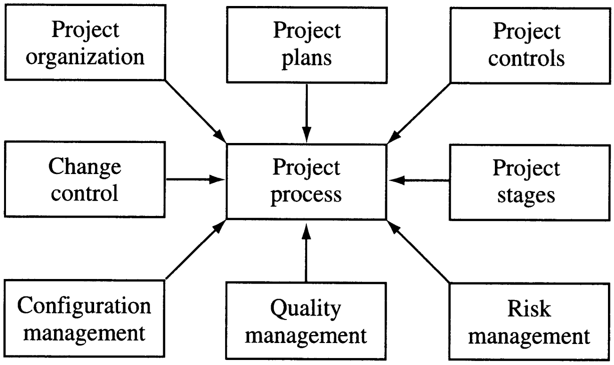

Figure 15.3 The PRINCE 2 components

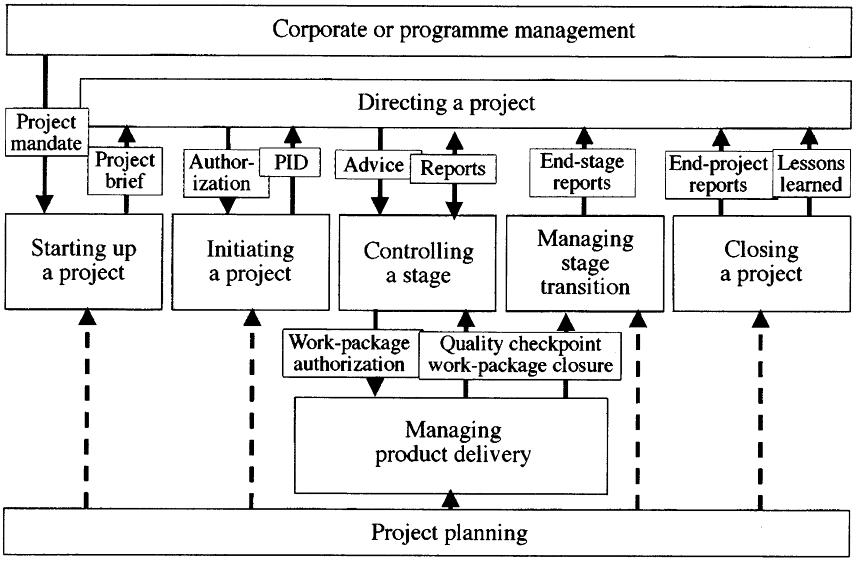

Figure 15.4 The PRINCE 2 project process

PRINCE 2 has as its core a multi-stage project management process, supported by eight components providing standards, techniques and guidelines on key project management support functions (Figure 15.3). The project management process (Figure 15.4) has six components representing the management of the project life cycle:

1. Starting-up a project.
2. Initiating a project.
3. Controlling a stage.
4. Managing product delivery.
5. Managing stage boundaries.
6. Closing a project.

The first two of these are conducted once only at the start of the project, and the sixth once only at the end. The middle three are repeated at each stage of the project. Notice the emphasis on the delivery of a quality product at the completion of each stage and the completion of the project. Notice also the requirement for managing stage boundaries, with both parties on either side of the boundary taking responsibility for the successful handover of the product at that stage. Because PRINCE 2 has been designed by experts to match the requirements of ISO 9000, this is the expert approach to ISO 9000, as suggested above. Figure 15.4 also shows two support elements to the project management process: directing and planning a project. (They say directing, rather than leading or conducting (see Section 1.3).)

As well as emphasizing product quality at the completion of each stage, PRINCE 2 also emphasizes the management of the client/contractor interface, and recognizes almost everybody is a client for some services and a contractor for others. Stakeholders in the project include:

– customers who commissioned the work and will receive the benefit
– users who will operate the product for the customers
– suppliers who provide specialist resources, skills or materials
– subcontractors who provide subproducts or services.

At different stages of the project, these groups will be alternatively client and contractor. Delivery of a quality product and management of the stage boundary requires them to work together in their different roles. PRINCE 2 repeatedly emphasizes that at the handover at the completion of each stage, the customer's business managers must ensure that the business case for the project is still valid as part of the quality control process, and abort the project if necessary. Table 15.1 shows the eight support functions, and their key elements and issues involved, and Table 15.2 identifies its controls.

Table 15.1 The PRINCE 2 support functions

Function	*Elements*	*Issues*
Organization	Corporate/programme managers Project board – senior user – executive – senior supplier Project manager Team manager Project assurance – business – user – specialist Project support	Who says what is needed? Who provides budget? Who provides resources? Who authorizes changes? Who manages daily work? Who defines standards?
Plans	Project plan	Used by project board Created at initiation
	Stage plan	Used by project manager Created end previous stage
	Team plan	Used by team manager Created as required
Controls	See Table 15.2	
Stages	Management stages – commit resources – authorize expenditure Technical stages use of specialist skills	Control points, set by project board, beyond which the manager may not proceed without authority
Change		Changes arise from – requests – off-specification – project issues
Configuration	Identification Control Status accounting Verification	
Quality	Internal to the project – customer quality expectation – project quality plan – stage quality plan	

Table 15.1 (*continued*)

Function	*Elements*	*Issues*
	In the project's context – ISO 9000, ISO10 006 – corporate quality policy – quality system – quality assurance	
Risk	Risk analysis – identification – estimation – evaluation Risk management – planning – resourcing – controlling – monitoring	

Table 15.2 PRINCE 2 controls

Control	*Objective*	*Frequency*	*Made by*	*For*
Initiation Meeting	Approve initiation Stage plan	Start initiation End start-up	Project manager	Project board
Initiation document	Document agreement	End initiation	Project manager	Project board
End-stage assessment	Review status, agree next stage plan	End stage	Project manager	Project board
Checkpoint	Team progress report	Weekly	Team	PM
Highlight	Stage status report	Monthly	Project manager	Project board
Issue	Report change	As required	Anyone	PM
Exception	Predict change	As required	PM	Board
Mid-stage assessment	Review exception plan	After exception report	Project manager	Project board
Tolerance	Allowed change		PM and board	Project manager
Closure report	Confirm project objectives met	End project	Project manager	Project board

Table 15.3 ISO 10,006 recommended project management processes

Process	*Description*	*Clause*
STRATEGIC PROCESS		
– Strategic process	Setting direction and managing realization of project processes	5.2
INTERDEPENDENCY MANAGEMENT PROCESSES		
– Initiation and plan development	Evaluating customer and other stakeholder requirements, preparing a project plan and initiating processes.	5.3.1
– Interaction management	Managing interactions during the project	5.3.2
– Change management	Anticipating change and managing it across all processes	5.3.3
– Closure	Closing processes and obtaining feedback	5.3.4
SCOPE-RELATED PROCESSES		
– Concept development	Defining the broad outlines of what the project product will do	5.4.1
– Scope development	Documenting characteristics of the product in measurable terms	5.4.2
– Activity definition	Identifying and documenting activities and steps required to achieve the project objectives	5.4.3
– Activity control	Controlling the actual work carried out in the project	5.4.4
TIME-RELATED PROCESSES		
– Activity dependency planning	Identifying interrelationships and the logical interactions and dependencies among project activities	5.5.1
– Estimation of duration	Estimating the duration of each activity in connection with the specific conditions and with the resources required	5.5.2
– Schedule development	Interrelating project time objectives, activity dependencies and durations for developing general and detailed schedules	5.5.3
– Schedule control	Controlling realization of activities, for confirming the proposed schedule or taking adequate actions to recovering from delays	5.5.4
COST-RELATED PROCESSES		
– Cost estimation	Developing cost estimates for the project	5.6.1
– Budgeting	Using results from cost estimation to produce the project budget	5.6.2
– Cost control	Controlling costs and deviations from the project budget	5.6.3

Table 15.3 (*continued*)

Process	*Description*	*Clause*
RESOURCE-RELATED PROCESSES		
– Resource planning	Identifying, estimating, scheduling and allocating resources	5.7.1
– Resource control	Comparing actual usage against resource plans and taking action	5.7.2
PERSONNEL-RELATED PROCESSES		
– Organizational structure definition	Defining project organizational structure to suit the project needs identifying roles and defining authority and responsibility	5.8.1
– Staff allocation	Selecting and assigning sufficient personnel with appropriate competence to suit the project needs	5.8.2
– Team development	Developing individual and team skills and ability to enhance project performance	5.8.3
COMMUNICATION-RELATED PROCESSES		
– Communication planning	Planning the information and communications systems	5.9.1
– Information management	Making necessary information available to project organization members and other stakeholders	5.9.2
– Communication control	Controlling communication in accordance with the planned communication system	5.9.3
RISK-RELATED PROCESSES		
– Risk identification	Determining risks in the project	5.10.1
– Risk estimation	Evaluating the probability of occurrence of risk events and the impact of risk events on the project	5.10.2
– Risk control	Implementing and updating the risk plans	5.10.4
PURCHASING-RELATED PROCESSES		
– Purchasing planning and control	Identifying and controlling what is to be purchased and when	5.11.1
– Documenting requirements	Compiling commercial conditions and technical requirements	5.11.2
– Evaluation of subcontractors	Evaluating and determining which subcontractors should be invited to supply products	5.11.3
– Subcontracting	Issuing invitations to tender, tender evaluation, negotiation, preparation and placing of the subcontract	5.11.4
– Contract control	Ensuring subcontractors' performance meets requirements	5.11.5

ISO 10 006

ISO 10 006, *Quality Management – Guidelines to Quality in Project Management,* describes the essential elements of a project management process in order to deliver a quality result. The introduction to the guidelines says, as I did in Section 7.3, that there are two elements in achieving quality on projects, the quality of the process and the quality of the product. Failure to meet either of these two elements will have a significant impact on the project's product, the project's stakeholders and the project organization. It then emphasizes that the achievement of quality is a management responsibility, with the attitudes and commitment to achieving quality instilled at all levels of the organization. The standard recommends that creation and maintenance of process and product quality requires a structured and systematic approach, which is aimed at ensuring that the customers' and other stakeholders', needs are understood and met. The approach should also take account of the organization's other quality policies. As I have said, the guidelines do not recommend a project management process; all it says are what it recommends as the essential elements of such a process. Table 15.3 contains the recommended elements of the process. Table 15.4 contains other recommended elements of the process contained in other ISO standards.

Table 15.4 Other relevant quality processes

Process	*Standard*	*Clause*
Approvals	ISO/IEC Guide 2	
Corrective action	ISO 9004-1:1994	15
	ISO 8402:1994	4.14
Documentation	ISO 9004-1:1994	17
	ISO 8402:1994	3.14
Inspection	ISO 8402:1994	2.15
Preventive action	ISO 8402:1994	4.13
Process control	ISO 9004-1:1994	11
Quality assurance	ISO 8402:1994	3.5
Quality audits	ISO 9004-1:1994	5.4
	ISO 9000-1:1994	4.9
	ISO 10011	4.9.3
Quality improvement	ISO 9004-1:1994	5.6
	ISO 9004-4:1993	
Quality planning	ISO 8402:1994	3.6
Quality system	ISO 8402:1994	3.6
Reviews	ISO 8402:1994	3.9
		3.10
		3.11
Specification and design	ISO 9004-1:1994	8
Traceability	ISO 8402:1994	3.16

Table 15.4 *(continued)*

Process	*Standard*	*Clause*
Training	ISO 9004-1:1994	18.1
	ISO 9000-1:1994	6.4
Validation of tools/techniques	ISO 8402:1994	2.18
Verification	ISO 8402:1994	2.17
	ISO 9004-1:1994	12

PMI's PMBoK

ISO 10 006 is derived to a large extent from the *Guide to the Project Management Body of Knowledge* developed by the United States Project Management Institute.[5] This was written as a guideline to the project management knowledge areas that need to be used on all projects, and describes those areas. It is accepted that there may be other knowledge areas in project management, but these do not need to be used on every project. Table 15.5 contains the contents of the guide to the PMBoK.

Table 15.5 Contents of the Guide to the PMBoK

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PROJECT MANAGEMENT FRAMEWORK
1 Introduction
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1.3 What is project management
1.4 Relationships to other management disciplines
1.5 Related endeavours
2 The project management context
2.1 Project phases and the project life cycle
2.2 Project stakeholders
2.3 Organizational influences
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2.5 Socioeconomic influences
3 Project management processes
3.1 Project processes
3.2 Process groups
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3.4 Customizing process interactions
PROJECT MANAGEMENT KNOWLEDGE AREAS
4 Project integration management
4.1 Project plan development
4.2 Project plan execution
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Table 15.5 (*continued*)

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5.2 Scope planning
5.3 Scope definition
5.4 Scope verification
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6 Project time management
6.1 Activity definition
6.2 Activity sequencing
6.3 Activity duration estimating
6.4 Schedule development
6.5 Schedule control
7 Project cost management
7.1 Resource planning
7.2 Cost estimating
7.3 Cost budgeting
7.4 Cost control
8 Project quality management
8.1 Quality planning
8.2 Quality assurance
8.3 Quality control
9 Project human resource management
9.1 Organizational planning
9.2 Staff acquisition
9.3 Team development
10 Project communications management
10.1 Communication planning
10.2 Information distribution
10.3 Performance reporting
10.4 Administrative closure
11 Project risk management
11.1 Risk identification
11.2 Risk quantification
11.3 Risk response development
11.4 Risk response control
12 Project procurement management
12.1 Procurement planning
12.2 Solicitation planning
12.3 Solicitation
12.4 Source selection
12.5 Contract administration
12.6 Contract close-out

15.4 Project management information systems

I have mentioned several times the possibility of using a computer-based project management information system (PMIS). I explained in Chapter 7 how they can help status accounting in configuration management; in Chapter 8 how they can help formulate the cost estimate, and gather cost information to calculate earned value and draw S-curves; in Chapter 9 how they can perform complex time and resource scheduling, and what-if analysis; in Chapter 10 how they can help analyse risk and formulate appropriate contingency plans; in Chapter 12 how they can generate work-to lists and turn-around documents, and gather and analyse control data; and in Chapter 14 how they help manage the data required by programme management. However, I avoided presenting project management as a computer exercise. This was deliberate. The manager must understand and follow the principles of good project management, and the methods, tools and techniques described in this book. Only after mastering the approach, should managers use a computer system to perform some routine processes, to handle the vast quantities of data involved, or to simplify complex analyses. In the remainder of this chapter, I shall describe the use of computer systems in project management. I shall describe the types of system available and their use, how to evaluate and implement systems, and the implications of the use of the systems. I start with the rationale of the use of systems.

I shall occasionally refer to examples of PMIS software. The main system I refer to is Project Manager Workbench, produced in the UK by ABT International, a company of, and formerly part of, Hoskyns and CAP Gemini. Project Manager Workbench (PMW) was first written by ABT, an independent American company. The main reason I refer to PMW is because it is the one with which I am most familiar (I first used the early DOS version in 1984), and it is one of the systems which I think has the best theoretical basis. Almost all systems now run in a Windows 95 or Windows NT environment, although there are still a few available that run on a mainframe. The main trend at the time of writing (in early 1998) is to deliver the system support to project teams over the INTERNET or corporate INTRANET. I was first aware of a company writing its own system in Lotus Notes in 1995, and at the time of writing most of the standard packages are appearing in Java and HTML versions. If I am going to make one prediction about future trends in project management, it is that given the distributed nature of modern project teams, when you come to read this the main vehicle for delivery of PMIS support will be via the corporate INTRANET.

Rationale

Why is there a need for a PMIS? Most organizations have an extensive range of computer-based information systems, accounts, payroll and manufacturing control. It might be argued that these could be adapted to provide control for most projects. However, functionally oriented systems are not appropriate for the management of projects, because they have many unique requirements, including:

INTEGRATION ACROSS THE ORGANIZATION

Projects cut across functional boundaries, whereas most systems are designed in a way which supports the functional hierarchy and hence reinforces demarcations and boundaries between functions.

THE TRANSIENT EVOLVING PROCESS

The PMIS must support the changing control requirements throughout the different stages of the project (see Tables 15.1 to 15.5).

FAST RESPONSE TIMES

Reports need to be produced weekly, whereas other control systems operate on a monthly cycle.

Questions

So what do we require a PMIS to do. Graham[6] suggests we should not ask what data we need to store and manipulate, but instead we should ask what questions PMIS must answer. He suggests that there are three groups of questions, relating, unsurprisingly, to functionality, time, and cost and resources.

QUESTIONS OF OUTCOME

Graham suggests that there are three questions of outcome:

1. *What product will the project deliver?* Which requires configuration management and status accounting information, and product delivery controls as suggested by PRINCE 2.
2. *Will it be successful?* Which requires the identification of stakeholders and their expectations. It also needs market intelligence and information about the competition.
3. *What market segment will it satisfy?* This is related to the second question, but looks at the functionality of the product, the benefits it will supply, and the market segment it is aimed at.

These questions are the most important, because they usually have the greatest impact on the value of the project's product, but they are also the most difficult to gather data on and answer, because they are qualitative rather than quantitative.

QUESTIONS OF SCHEDULE

This of course is the classic question, 'When will it be ready?' Associated questions relate to the delivery of prototypes, the achievement of milestones and of stage reviews.

QUESTIONS OF COST AND RESOURCE

These questions relate to how much money is required, what other resources are required and when. Remember from Chapter 8 that I said that knowing the timing of the expenditure is as important as knowing the total expenditure.

Design of systems

In order to meet these requirements, a system should have two components, the planning system and the control system, and Figure 15.5 shows the former inside the latter. The control system has three major components answering each of the three sets of questions above:

- the client's requirements answering the questions of outcome
- the management system, answering the questions of when, and issuing work-to lists and processing turnaround documents (Chapter 12)
- the resource monitoring systems.

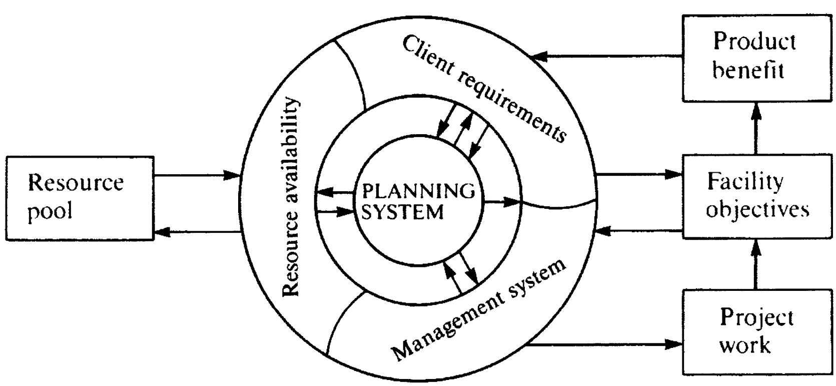

Figure 15.5 The fully integrated PMIS and its links to the context of projects

The planning system may have many components, interfacing with these three control systems. Figure 15.6 shows 16, together with history files. Figure 15.7 shows three major components of a system for programme

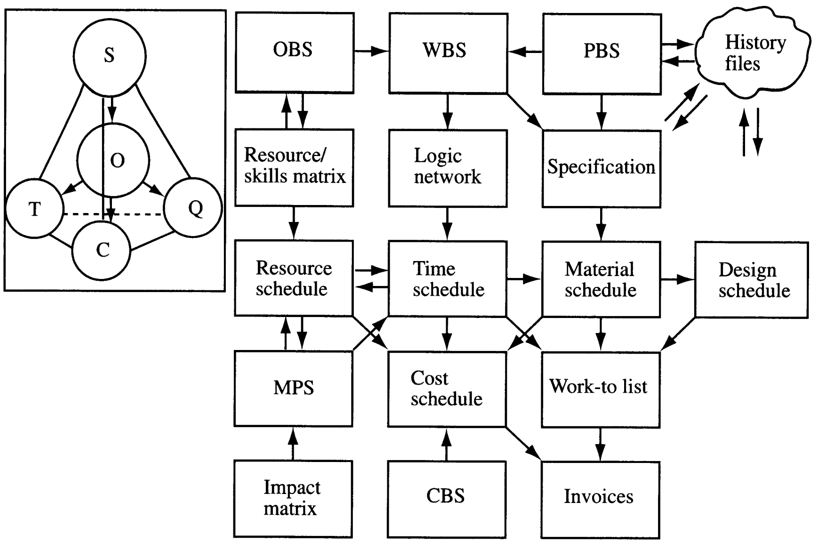

Figure 15.6 Modules contained in the planning systems of an integrated, modular PMIS

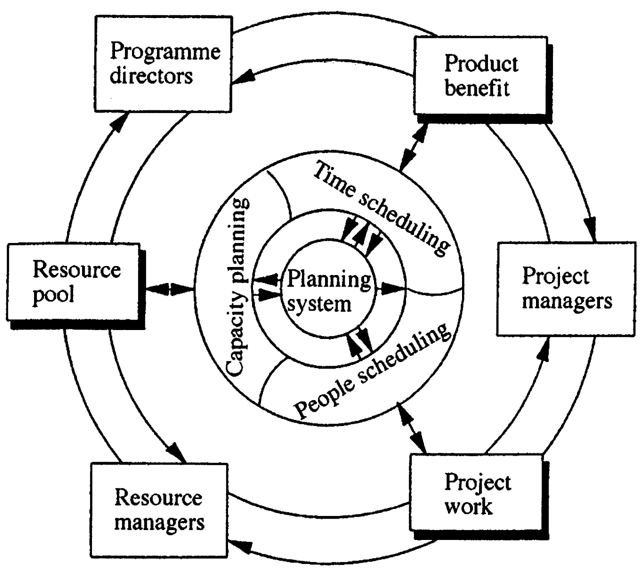

Figure 15.7 Information-systems requirement of programme management

management, the capacity planner, the project management system, and the people and resource scheduler. These three components are in fact all incorporated within the systems proposed in Figures 15.5 and 15.6. ABTI, the providers of Project Workbench take a slightly different approach (Figure 15.8). Their system has a project management system, with capacity planning just done at the highest level of work breakdown, and a people management system. These two systems are joined by their repository, where all the data is held. The project management system is used to plan individual projects and programmes (based as much as possible on historical data). The project information is fed into the repository, which produces work-to lists for individuals. These are presented in the form of predicted time sheets. Individuals then feed in their progress data in the form of completed time sheets, which re-enters the repository and is converted into project progress data. Their repository is able to take project planning data from other systems such as Microsoft Project 98.

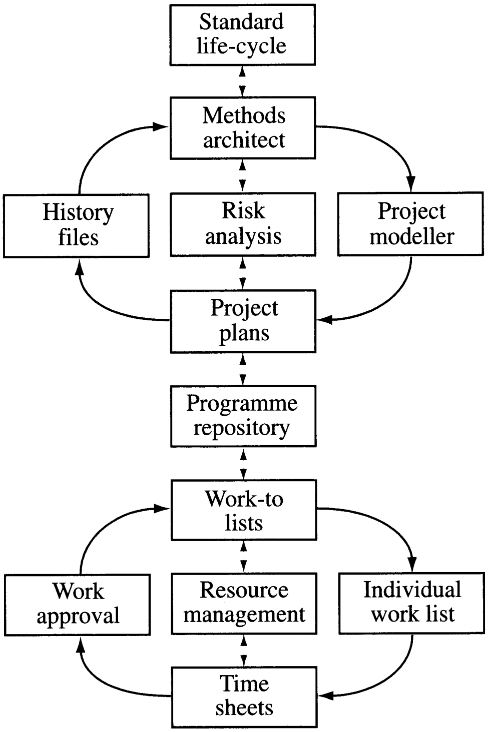

Figure 15.8 The ABTI Project Improvement Cycle

15.5 Types of package

There are several types of project management information system available.

Networking systems

The very simplest systems perform only critical path analysis (CPA). They give you activities, with durations and dependencies, and calculate early dates, late dates and float.

PERT systems

The majority of systems are based on the Programme Evaluation and Review Technique (PERT):

- *Programme*: a networking system calculates the programme or time scales
- *Evaluation*: the system performs what-if analysis to calculate various alternatives
- *Review*: the system tracks progress for monitoring and control purposes.

Some systems calculate and track the time scale only (as the name implies). The more advanced also maintain resource and cost data. Very few perform status accounting, *the most important question to be answered.* The PERT systems come with given data and reporting structures, but the best allow these to be tailored very simply to the users' requirements. The better ones also allow data to be imported and exported to database management systems, such as Microsoft Excel and Access, or Oracle or dBase, and so you can develop additional functionality if you require it. The very best cover almost all of what you require, with the possible exception of design and material management. These systems are designed to be used with small- to medium-sized projects, and programmes of SMPs. Examples are ABTI's Project Workbench, Microsoft Project 98, CA's Super Project Expert, and WS Technology's Open Plan. There are also tailored versions of Artemis which fall into this category. ABTI's Project Workbench and Microsoft Project 98 are the two market leaders.

Cost and resource management systems

These systems are based around the C/SCSC methodology, the central column in Figure 1.4. They do for resource and cost what the PERT systems do for time. However, most now have a link into a networking or PERT system. The two main examples are Cascade produced by Mantix, and WS Technology's Cobra. Obviously ABTI's Repository is performing much of this functionality.

Application generators

These systems come with the ability for the user to develop whatever functionality they want. The system provides core project management functionality, but the user is able to develop additional functionality in the database provided with the system. These systems tend to be used on large, heavy engineering projects where significant data management is required. Artemis is the market leader, which comes with its own database language. Primavera is also a significant player, and is written in Oracle. Open Plan/Cobra are effectively application generators as they are written in dBase and other proprietary database systems. Just to show that the boundaries are disappearing now, because Microsoft Project runs in Access and Excel, you can in effect treat it as an application generator. The main distinction now really is between systems best designed for use on programmes of small- to medium-sized projects and those designed for use with large, heavy engineering projects.

Distributed systems

Since most systems are now designed to run on PCs, they can be run as stand alones, or on a local or wide area network. Anyone who has access to the LAN or WAN, whether directly connected or accessing via a telephone line, can access the programme plan held on the central server. Often, people on remote sites will have a slimmed down version of the system, providing work-to lists and turn-around documents only, whereas the system on the central server, maintained by the Project Support Office will carry the full functionality. There is now a move to systems operating over the INTERNET or in-company INTRANETs. The development of these systems must be the most significant development expected in the late 1990s and early 2000s, but given the significant changes in the systems in the six years since I wrote the first edition of this book, I am not going to look too far into the future.

15.6 Choosing and implementing systems

Figure 15.9 is a procedure (project plan) for implementing a PMIS. (Although the systems have changed beyond recognition in six years, the basic approach is unchanged.) There are essentially four areas of work:

- diagnosis and business planning
- implementation and Improvement projects
- implementation of best practice in project management
- selection and implementation of the system.

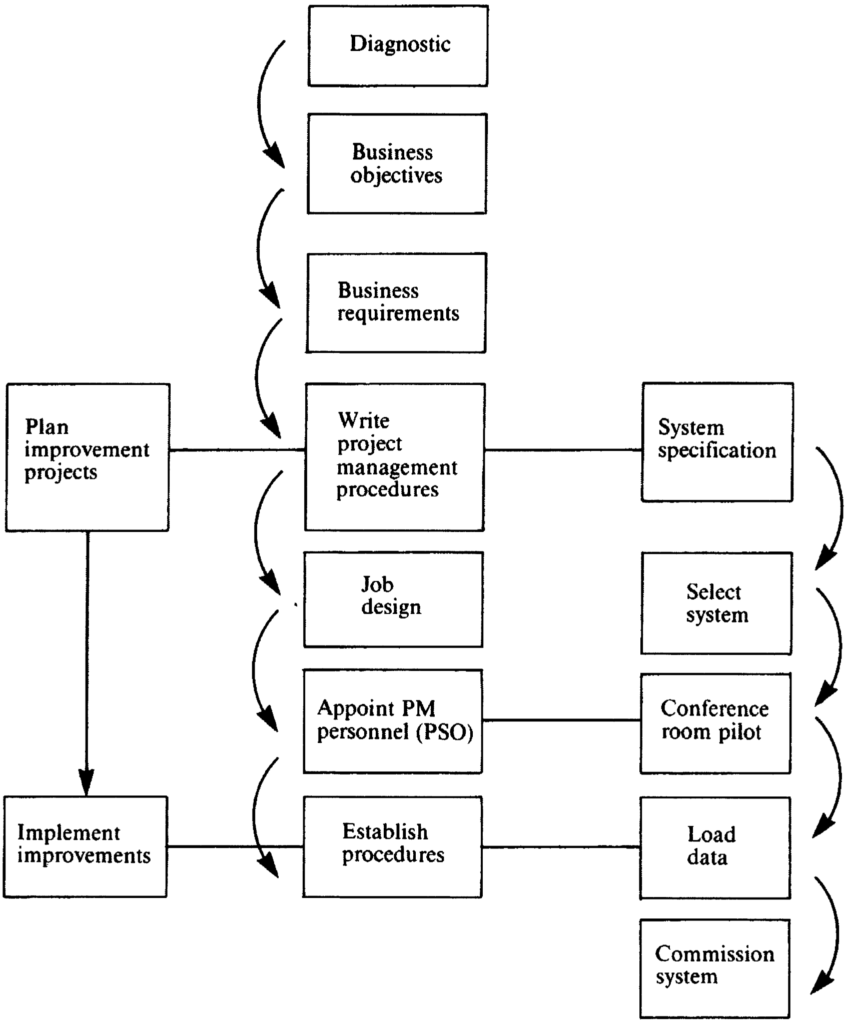

Figure 15.9 Procedure for implementing a PMIS

Diagnosis and business planning

Before you begin to select a system, you must decide its purpose, and how it will be used. There are three steps to this process:

1. *Conduct a diagnostic audit*: This is the vital first step. You must know what you do now, and the strengths and weaknesses of that approach. There are two reasons. Implementing the system will be an opportunity for implementing good project management practice, so you must know

where possible areas of improvement are. However, at the other extreme, you may set yourself an ideal, which is unachievable. It is like asking someone the way to the station, and he says, 'I wouldn't start here!' Unfortunately, you do start here, and so you must know what is a realistic target. The diagnostic audit should be conducted against some definition of good practice, which may form the basis of a procedures manual later.
2. *Set business objectives*: Then, or in parallel, you should define what you want to use the system to achieve. I say in parallel, because it might be worth while to define the ideal, before it is tempered by reality, but the final objectives must be set against the findings of the diagnostic.
3. *Write a statement of requirements*: The SOR is the strategy of how the system will be used, derived from the business objectives. It defines the major stages of managing projects (Part 3). For each stage it defines the purpose and objectives of the stage, the inputs and outputs, and the major processes. The SOR is the document on which the other three areas implementation are based.

Improvement projects

The diagnostic audit may have highlighted some major weaknesses in the practice of project management, and these can be eliminated through improvement projects. These must be planned and implemented like any other organizational development project, according to the principles of this book. The SOR defines the purpose and objectives of the improvement projects. There are three particular improvement projects:

- implementation of project management procedures
- selection and implementation of the PMIS
- training personnel in the procedures and system.

The first two of these are the other two areas of work. The third is common to both.

Project management procedures

I said above that the implementation of an information system can be an opportunity for improving the operation of the business, especially if a packaged solution which represents best practice is used. A PMIS need be no different. The are four steps to this process:

1. *Write a procedures manual*: The procedures manual will be derived from the SOR, and will therefore presumably be based on the procedures followed in the diagnostic audit. (The structure of a manual was described in Section 15.2.)

2. *Establish the project management function*: The procedures will imply certain project management roles to be fulfilled. These may be simply project managers, or it may include, project leaders, planners, project accountants and administrators. In the latter case, it may be worth while to establish a Project Support Office (Section 14.5). Job descriptions should be written for all the roles. PRINCE 2 gives guidance on this.
3. *Obtain competent personnel*: The jobs must then be filled. Similar jobs may already exist, with incumbents. They may be able to continue as they are, or they may require some training. Alternatively, it may be necessary to recruit and train new people.
4. *Implementation the procedures*: Implement first on a pilot project. This should be a project which has started, but is less than a third finished. They should then be implemented on all new projects, and those which have reached no more than a certain stage of completion. It is usually not worth while implementing them on projects which are more than two-thirds complete, or have less than six months to run (depending on the size of the projects).

Selecting and implementing the system

This is the *raison d'être* of the whole process, and yet the last thing to be considered. However, that is the right approach. You must make sure that you have good project management practice defined and implemented before you rush into using a PMIS, otherwise its use will become an end in itself. The steps in selecting and implementing the system are:

1. *Design and selection*: Working from the SOR, you develop a functional design, system design and detail design of the PMIS. You choose a shortlist of systems against the functional design. You then do a thorough analysis of the shortlisted systems against the systems design. This analysis requires significant input from the vendors, and so out of fairness to them you should limit your shortlist to two, three or, at most, four systems. Table 15.6 contains a list of possible features and selection criteria of the system. A package is chosen, and bespoke work required to raise it to the requirements of the detailed design is fully defined and quantified.
2. *Conference room pilot*: The system is tested on trial data, and the users familiarize themselves with it, making suggestions as to how it might be improved to meet their needs. You need to be careful, though, to make sure you do not make too many changes and thereby making the system too expensive, or worse still, unusable.
3. *Load the pilot project*: The same pilot project as for implementation of the procedures should be used if possible.

4. *System implementation*: The system will be implemented in parallel with the procedures. The same criteria for selecting projects on which to implement it should be used.

Table 15.6 Possible features and selection criteria of a PMIS

Feature/criteria	*Comment*
Overall design	User friendliness
Activity/project/programme capacities	
Input features	By network, bar chart, PBS, etc.
Output features	Nature of reports and ability to tailor
Network notation	Precedence every time
Date and calendar formats	
Resources and cost information	
Risk analysis and management	
Hardware requirements	
Size of project	Small/Medium/Large/Major
Robustness of supplier	User base/support offered

15.7 Assumptions and risks

I shall close this chapter by considering some of the assumptions and risks in using a PMIS. The major risks, as I have stated, are that the system will be overly complicated for the need, that people will use a system only because they think that it is an essential part of project management even when it is not necessary, and that the system will take over from reality, what the system is saying will be given more credence than actual events. Even if all these are conquered, there are other issues:

HISTORICAL RECORDS

One use of the systems is to store historical data. Building up a library of past records may help in project auditing, but will certainly help the project manager when planning new projects. They can reuse data on previous, similar work packages, thus saving a lot of time in planning.

JUSTIFYING THE INVESTMENT IN THE SYSTEM

It is difficult to justify the investment in a PMIS, although some research is now being done.[7,8] Because every project is unique, you cannot say whether the project would have been less efficient if the system was not used. It is only if the organization is undertaking several projects you can look to trends. A company I worked with in the food-canning industry implemented a PMIS in its research and development department, and found that productivity of their

R&D staff increased by 6 per cent in two years. Similarly, if a company knows that all its projects are three months late, and it expects an internal rate of return of 25 per cent on its projects, then late completion is loosing it 6 per cent of its spend on projects annually. For every month on average which an organization could reduce the duration of its projects, it could afford to spend 2 per cent of its annual project spend on a PMIS.

PROLIFERATION OF SOFTWARE

There has been phenomenal growth in the number of project management software packages available on the market. There are probably now in excess of 200. This has contributed to the confusion in the market. In addition, the prospective purchaser is not only presented with this vast range of packages, but is also faced the unique range of features which each package offers. It has been suggested that a Pareto principle applies: 90 per cent of the users resort to only 10 per cent of the facilities offered by project management software; and only 10 per cent seem to make use of most functions.[8] But the reason for this may well be poor vendor support or inadequate training.

INADEQUATE TRAINING

Another factor hindering use of the systems is lack of training. In many organizations, information systems are the domain of the IT department. Microcomputers may be beginning to have some impact on their lives. However, their use in project management requires more than self-help, but the number of formal courses in the use of PMISs remains very limited. Furthermore, project managers who have learnt how to use the systems may get very little training beyond their initial introduction, and so will not learn how to use the advanced features of the systems, as described above.

INFORMATION OVERLOAD

Another concern is the amount of information generated by these packages. This is reminiscent of the problems of the early mainframe programmes. However, effective use of the WBS should overcome this difficulty.

15.8 Summary

1. Procedures manuals are an essential part of quality assurance. Their purpose is to provide:
   - a guide to the management process
   - consistency of approach
   - company resource planning
   - common vocabulary

– training of new staff
– demonstration of procedures to clients
– quality accreditation.

2. Procedures manuals show the process of converting inputs to outputs throughout the project management life cycle. In order to do this, the contents should be:
   – introduction
   – statement of project strategy
   – management processes
   – supporting procedures
   – blank forms and examples.
3. Various standard procedures exist, including PRINCE 2, ISO 10 006 and the PMI *Guide to the PMBoK*. These tend to give advice on the design and contents of procedures rather than offer prescriptive solutions.
4. Project Management Information Systems offer computer support to project management procedures and to data management. The questions that a PMIS must answer are:
   – questions of outcome
   – questions of schedule
   – questions of cost and resource.
5. The essential elements of a PMIS are the planning system and the control system. The planning system holds the data; the control system answers the questions.
6. Types of package available include:
   – network systems
   – PERT systems
   – cost and resource management systems
   – application generators.
7. The essential steps in implementing a system are:
   – diagnosis and business planning
   – implementation of improvement projects
   – implementation of best practice in project management
   – selection and implementation of the system.

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