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Project Governance

Getting Investments Right

Edited by

Terry M. Williams and Knut Samset

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Also by Terry M. Williams

MAKING ESSENTIAL CHOICES WITH SCANT INFORMATION

MANAGING AND MODELLING COMPLEX PROJECTS

MODELLING COMPLEX PROJECTS

MANAGEMENT SCIENCE IN PRACTICE

Also by Knut Samset

EARLY PROJECT APPRAISAL: Making the Initial Choices

PROJECT EVALUATION, MAKING PROJECTS SUCCEED

MAKING ESSENTIAL CHOICES WITH SCANT INFORMATION

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21 20 19 18 17 16 15 14 13 12

Contents

List of Tables and Figures

Tables

Figures

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Introduction

Terry Williams and Knut Samset

Large projects are complex undertakings which represent major investments. Commonly, significant problems arise later on because of failure at the start of a project in terms of establishing appropriate governance, choosing the concept, analysing the proposal and environment, and maximising the utility of the investment, all within complex and political decision-making structures. While project management to 'do the project right' has for long been the priority, project governance to ensure that 'the right project is done' has been a secondary concern among many practitioners and is underrepresented in literature. In recent years, a number of initiatives have been made to improve governance systems, and considerable research efforts have been made in this field.

Many of these advances however have been normative views of 'best practice' often without rigorous understanding underlying them. This book therefore takes a theoretically rigorous but intensely applied approach to understanding how the project governance actually works in the reality of large complex projects. For this, we have to understand the complexity of the social geography and political environment, the stakeholders and their interests and power. We have to consider the complexity, systemicity and interrelatedness within project decisions and the ambiguity implicit in all major projects; psychological and political biases within decision-making groups is another area. We have to ensure alignment between organisational strategy and the project concept, and prepare for turbulence within the project environment.

The Norwegian Concept Research Programme www.concept.ntnu.no has taken this step to sponsor a book that would provide a resumé of the state of the art in this domain. Leading experts in the field, currently based in the US, UK and Norway although originating from half a dozen or more countries, have all contributed. All are well-respected in the academic environment but their knowledge and experience are grounded in the experience and study of actual projects – and indeed, there are many case-studies used as the bases of the arguments in the book. This is a guide for practitioners, and also for decision-makers and their advisors, and also for postgraduate (at least) students studying how complex projects actually work.

The volume starts where it should. Chapter 1 sets the project in its business and organisational context: where it comes from, and who it has to deliver to. We look at the organisational strategy, stakeholder needs and the organisational project portfolio; we refer outwards to the wider context of the organisation, both business and political. Crucially, we look not only at a project but at how the project governance framework is constructed to fit the organisation and its environment. Focussing on one project, we look at the project proposal and how quality-at-entry can help to assure project performance. We consider what 'success' means, following the strategic alignment in Chapter 1, and give practical guidance as to what a proposal for a project is and what it needs to consider. Financing mechanisms for projects are also discussed here as a critical part of the proposal. Once we have a proposal, Chapter 3 looks at assessing the proposal, looking at uncertainties and considering tools for assessment. Once the project is given the go-ahead, we have to design how to carry out the project, and Chapter 4 gives practical but theoretically grounded guidelines for the issues involved in project design. Once a project starts though, it doesn't follow the mechanistic road-map laid out for it. Chapter 5 considers how decision-making and project progress actually occurs in a complex human-dominated project domain, using sociological theory to explain why projects differ from the behaviour that the accepted normative discourse would imply. A real case-study helps to explain project behaviour and practical advice is given for how to improve project performance. Chapter 6 follows this up with a similar analysis at the level above the project, in the groups of organisations and consortia that undertake modern complex projects; again, the analysis is theoretically well-grounded but uses a real case study, and gives practical advice. Finally Chapter 7 rises a level again to look at the complex political and administrative environment that surrounds major public projects, bringing us full circle to the discussion in Chapter 1.

We trust that you find the arguments of this book reflect your lived experience of modern complex projects, that you find these arguments well-founded and compelling, that you find the exploration of real case-studies interesting and educational, and finally that as well as understanding project behaviour better, you find the practical frameworks and techniques proposed useful and successful, improving your project governance and delivery.

1

The Influence of Strategic Context on Project Management Systems: A Senior Management Perspective

V. K. Narayanan and Robert DeFillippi

1.1 Introduction

Unlike project leaders and project team members who execute specific projects, the senior management of an organisation is responsible for setting the context and guidelines within which projects are executed, thereby playing a determinative role in the execution and success of the projects. Consider the following examples.

> During the 1990s, fast cycle approaches (Meyer, 1993) were introduced in the *pharmaceutical industry* as pharmaceutical firms grasped the importance of being the first to reach the market with a new drug. It was the senior management of the firms who initiated the fast cycle approaches to drug development projects. But these approaches predictably created significant changes in the conduct of project teams and project management. They imposed stringent timelines on drug development projects, but richly resourced them and shifted the risk profile of the fast cycle projects relative to regular projects. They also altered project execution. Project teams were expected to innovate in procedures, ignore standard decision-making processes when necessary and even bring recommendation to the senior management for the termination of their projects when warranted.

> In many firms, senior managers wrestle with the question of how and when to structure a project management organisation (PMO) to optimise the value of project managers. A PMO's longevity is often limited, indicating that the organisation's leadership has not truly understood its merits, or that the leadership is too fluid in an organisation to become an integral part of the system. Some organisations choose to include project managers as part of discrete solution teams, with a small corporate group overseeing the project management methods, training and other responsibilities. Other organisations choose to centralise the project managers in one organisation, which receives direction and guidance from a centralised PMO (Curlee 2008).

During the late 1980s, the National Aeronautical and Space Administration (NASA) had met with a series of failures in its space exploration projects, partly due to its existing knowledge retention and transfer process, both of which then relied on explicit knowledge and Information Technology (IT) driven mechanisms, and did not effectively capture the tacit dimensions of past wisdom, that were far more important to the effective execution of a project or programme manager's job. Several veteran NASA project managers were getting close to retirement, exacerbating the knowledge retention problem. Further, the risk management processes were ineffective, due to the emphasis on getting projects completed faster and cheaper. In response, NASA introduced extensive Knowledge Management (KM) processes, to improve programme and project management effectiveness.

In many industries, such as aerospace and IT, where an organisation generally will have to initiate a series of projects (project) managers not only attend to the management of projects, but also serve as the leaders, making critical project-related substantive and process decisions. In these industries, the managers have enough technical knowledge to be able to make substantive decisions. However, in many pharmaceutical and large biotech firms, the roles of leader and manager are split between two individuals. The leader is usually one who has an advanced medical degree or a PhD in a related discipline, and the manager is someone with PM expertise who assists the leader. Although some pharmaceutical firms have tried to unify these two roles within a single individual, they have been less than successful. Industry characteristics have been primarily responsible for this dichotomy of roles in the bio-pharmaceutical sector.

During the last decade, revolutionary advances in IT have brought web-based products and social networking that offer the promise of enhanced productivity and effectiveness in project management. Some project management (PM) organisations are adopting new strategies, using web-based project management services (WPMS), new extranet application in the domain of project management, to stay competitive and to engage a new generation of PM talent (Nitithamyong and Skibniewski, 2004).

In the popular recorded music industry, musical trends can quickly emerge and consumer tastes rapidly change. As a result, leading recording companies have developed global project management systems for coordinating project initiatives, focused on the identification and acquisition of talent worldwide. For example, Polygram (now part of the 'Big Four' recording company, Universal Music Group) established in the late 1990s a global network of arts and repertoire (A&R) project teams that would search the local bars, clubs, concert halls and back alleys of globally diverse urban settings, in search of the next new sound and the next new musical artist who could be promoted and marketed either worldwide, or to specialised niche music markets (Doz, Santos and Williamson, 2001).

The central issue of the chapter

Each of the project management challenges illustrated by the above vignettes requires, for its resolution, the involvement of the senior management of the focal organisation. As sponsors of projects, senior managers release resources, approve or make relevant decisions and in general determine the organisational premises under which project management function is conducted. They also determine or legitimise the initiation and termination of specific projects, and, in many cases, they are the arbiters of the organisation's project portfolio. Their behaviour sets the context for the innumerable negotiations that take place between the manager of a specific project and the rest of the organisation. Thus the project management function in an organisation is imbued with a *systemic* characteristic, exhibiting regularities of form and behaviour, structures and processes that encapsulate multi-level coordination. Hence, from the vantage point of senior management, we can talk about a project management (PM) *system* which embraces the variations observed in the life and conduct of specific projects in a specific organisation.

The central objective of this chapter is to focus attention on the role of senior management of an organisation in PM, and to make the case that their influence, although often felt covertly from the viewpoint of specific projects, is determinative of the conduct and success of such projects in the organisation. We further argue that the choice of the PM system is a strategic one, and should be made deliberately so as to align it with the strategic realities of the corporation. Thus we argue that senior managers are ultimately responsible and accountable for the choice of the PM systems and the conduct and success of the projects within their organisations.

We acknowledge a few boundary conditions within which we portray our conceptualisation. First, we view our construct of project management system as a hypothesis, which requires significant refinement, research and practical attention in the future. Although the concept is informed by our extensive dialogue with senior managers of selected industries, limited research has been directed to this concept, since, in our opinion, the project management literature tends to underplay the role of senior management. Second, our own research experiences are confined to the pharmaceutical, aerospace, electronic (including IT) and cultural industries, and as a consequence, we will confine our illustrations to these, although we expect that senior managers in other industries, where projects are the norm, will be grappling with similar challenges. Finally, we use the generic term 'project' to signify product, process and system development projects; we are unsure about the applicability of our ideas to other forms of projects (e.g., change management).

This chapter is organised as follows: in the next section, we summarise the emerging perspectives on project management (PM), perspectives that have brought us to the doorstep of a strategic orientation. This orientation reflects changes in PM practice triggered by macro-environmental change. In section 1.3, we identify the key environmental shifts that are driving changes in PM, illustrating these shifts with our experience in the four industries. However, these environmental shifts are interpreted by the senior management, who craft appropriate strategies for their firms, and these strategies in turn set the context in which changes in PM are initiated. So, in the ensuing section, we outline a framework to analyse changes in PM practices, and develop the construct of the PM system to accommodate the many decisions by which the senior management alter the conduct of PM in their organisations In section 1.5, we hypothesise a stage model of PM system. In section 1.6, we outline a set of principles for the choice of PM system and in the final section, we argue for greater attention in research to the macro level issues involved in PM.

1.2 Emerging perspectives on project management

The 2011 *Oxford Handbook of Project Management* suggests that our understanding of Project Management as a discipline is entering a third wave, characterised in part by: (1) an interest in the theoretical foundations and history of project management; (2) an awareness of the importance of context – societal, sectoral, enterprise (the firm), business unit, project; (3) an interest in the challenges of innovation, learning and knowledge integration; (4) an appreciation of the role of governance and control to foster and assure effective use of resources within and across organisations; (5) a strategic perspective towards project management (Morris, Pinto and Söderlund, 2011).

We summarise these characteristics to anchor our development of PM system.

Theoretic foundations and history

An important theoretic perspective informing third wave project management is the *contingency perspective*, namely the notion that the effectiveness of specific project management practices depends upon their appropriateness to the specific conditions of the macro organisational, strategic and environmental context in which projects are managed (Burns and Stalker, 1961; Shenhar and Dvir, 2007). This contingency perspective represents a significant theoretic advance over universalistic one-size-fits-all principles that are often attributed to the field of PM (Lenfle and Loch, 2010).

A second trend noted in the historical evolution of project management is the expanding scope of application of project management tools from discrete projects to portfolios of projects, and, in the third wave, to *enterprise-level project management* tools and practices (Bolles and Hubbard, 2007). Advances in enterprise-wide software applications for many functions of business have provided one impetus for similar advances in project management. However enterprise-wide project management has also expanded beyond software tools, to include organisational, human resource, and knowledge management tools and practices associated with programme management and project management systems that have enterprise-wide scope.

Importance of context

The context for project management practice has expanded to include four ever-larger PM arenas of application (Artto, Davies, Kujala and Prencipe, 2011):

Management of a project – addresses a single project.

Management of a project-based firm – addresses activities of a firm involved in governing/managing multiple simultaneous or sequential projects for the firm's business purposes.

Management of a project network – addresses the management of the temporary project organisation across multiple participating firms and other actors, each of which have their own objectives, interests and expectations from the project.

Management of a business network – includes activities in the business marketplace, including several firms and their business interests, often involving multiple projects that serve as temporary business vehicles to enhance each firm's permanent businesses.

All four of these project management contexts pose challenging institutional environments, ranging from locally concentrated to globally dispersed project participants and various regulatory and funding regimes. How programme managers align their activities to accommodate both local and non-local environmental actors and influences is an ongoing challenge of project management systems, and these challenges increase as project management systems enlarge their scope of operations and responsibilities.

Challenges of innovation, learning and knowledge integration

Project management systems face some recurring challenges from an innovation, learning and knowledge management perspective. On the one hand, individual projects are variable in their specific task requirements, and each project thus requires some degree of inventiveness in customising its project solutions to satisfy customer and market requirements. However, project system economies derive from the ability to replicate previously successful project processes and project management solutions to future projects and, where possible, to create economies of scale and economies of repetition over time (Davies and Brady, 2000).

From a learning perspective, this dilemma is one of balancing a project system's capabilities to engage in project knowledge exploitation versus exploration. Organisations may find themselves at risk of losing out on future business growth and profit opportunities, unless they access new sources of project knowledge, project skills and project management capabilities suited to these emerging business opportunities and market requirements (Brady and Davies, 2004).

Governance and control systems

All project management systems include governance and control structures and processes. This topic will be elaborated upon by O'Leary in Chapter 5, but our present concern is with monitoring projects and several contextual factors that are impacting project monitoring as a governance and control issue. One contextual factor is the increasing globalisation of project work, with disparate projects being conducted across the globe. Related to the global dispersion of projects is the global dispersion of project teams, whose individual members are often geographically distant from each other, rather than co-located in physical proximity. These globalisation challenges are both a strategic response to global project opportunities, and the ability to optimise project work quality and cost by taking advantage of the global sourcing of project team resources.

Aiding and abetting this globalisation of project work is the development of collaborative project management software and web accessible tools in support of virtual project work and its monitoring and control (Ollus et al., 2011). A primary political challenge created by this rapidly expanding tool kit of web collaborative tools is finding the right mix of tools and linking them to project management system procedures.

Towards a strategic perspective on project management

A recent survey of project management research identified strategy-focused PM research as the most important project management research subject published in the top management and business journals (Kwak and Anbari, 2009). PM thinking on the interplay between projects and the strategic direction of the business enterprise emphasises the context in which projects are undertaken, and how prior experience and 'contingent' and strategy-relevant project capabilities are crucial both to project performance and to strategy supportive to the sponsoring firm (Winter, Smith, Morris and Cicmil, 2006).

A recent overview of the role of strategy in project management included the following examples (Loch and Kavadias, 2011). Morris (2006) characterised project definition and an appropriate embedding of the project in its environment as the 'most important drivers of success'. Artto and Dietrich (2004) summarised project portfolio tools as key enablers of the strategic management of projects. Some PM textbooks address how projects are embedded in strategy (Pinto, 2006). The Project Management Institute's *PMBOK Guide* indicates that 'projects are often utilized as a means of achieving an organization's strategic plan', and that projects are 'authorized as a result of … strategic considerations' (quoted in Loch and Kavadias (2011) p. 225).

These emerging perspectives have brought us to the doorstep of a strategic orientation, and they reflect the shifts in PM practice triggered by macro-environmental change, a topic to which we now turn.

1.3 Forces driving the evolution of PM function in organisations

Macro-environmental factors

Macro-environmental factors set the context for the internal operations of an organisation, and also drive the evolution of PM function in organisations. We focus on four key contextual influences that have specific implications for PM: (1) Globalisation; (2) Time compression; (3) Technology changes; and (4) Impatient capital.[1]

Globalisation. A significant driver of changes in PM has been the globalisation of business in general and the firm in particular. Consider the following examples:

> For nearly two decades after World War II, the pharmaceutical industry concentrated its efforts to gain regulatory approval of drugs in the US, UK and Western Europe. During the 1990's, when Japan emerged as an important player in the pharmaceutical industry, many of the pharmaceutical firms in the West began to extend drug development projects to include drug approval in Japan. For the project leader, project manager and the project team, this meant additional complexity in project execution: they had to learn to deal with a regulatory regime different from the one in the West, operate within a new time zone, and acquire cultural expertise in working with the Japanese. Currently, the pharmaceutical industry is expanding to the BRIC (Brazil, Russia, India and China) countries, Mexico and South Korea. This will necessitate dealing with still further complexity: the project teams will have to learn to work with weak regulatory regimes, with very different cultural practices, and to address the needs of a largely self-paying market.
>
> When NASA initiated the Space Station Program during the 1980's, they had faced a difficult fiscal environment in the US, ushered in by the Reagan revolution. A cornerstone of the strategy to stabilize future funding was to enter into international agreements, especially with the European, Canadian and Japanese space agencies, under the assumption that the US Congress would be hesitant to cut off funding when international partners were also involved. In turn, the Space Station Program management had to take into account the sensitivities of their international partners, and some of the projects experienced greater complexity in management as a result.
>
> (Lewin and Narayanan, 1990)

> The last several decades have witnessed a steady and irreversible trend toward the globalization of IT firms involved in software development. The number of firms distributing their software development practices

> worldwide keeps increasing, and Distributed Software Development (DSD) is gaining popularity. Since DSD is characterized by distance, time zone and cultural differences, communication is less fluid than in co-localized development groups, leading to problems relating to coordination, collaboration and group awareness.
>
> (Jimenez, Plattini and Vizcaino, 2009)

As the above vignettes illustrate, the increasing trend towards globalisation among industries and firms has had significant implications for the conduct of projects. In all cases, globalisation has heightened the complexity of projects, and hence the need for appropriate management. It has generated the need for project team members with cultural sensitivity, who can work across different geographical time zones, and who can manage greater coordination between project participants. In turn, this has necessitated the development of firm-specific cultural capabilities and environmental awareness, altered forms of governance in the presence of global partners, and complex structures of projects.

Time compression. A second major factor that has been altering the PM practices across industries and firms has been time compression, with the attendant acceleration of product and process development, and the projects associated with each. Time compression is most evident in the shortened *product life cycles* and shortened *development times* (Narayanan, 2001). Product life cycles – the evolution of sales of a product over time from its introduction to when the market reaches maturity – have been shrinking over the last several decades (Qualls, Olshavsky and Michaels, 1981). Similarly, development time – the time taken to develop a specific technology into a marketable product – has also been declining in many industries (Burrus and Gittines, 1994).

Time compression has imposed the need for building speed in organisations, that is, the ability to learn, adapt and innovate at increasingly faster rates. Some have referred to this capability as agility. In turn, project management practices are changing, due to the imperative of speed. Consider the following examples:

> Agile software development has been one response to the quest for speed in IT-related industries. This approach refers to a group of software development methodologies aiming for more nimble and lighter development processes, making them more responsive to change (Lehtonen, 2009) These methodologies prefer software development to documentation, delivering many versions of the software in short iterations, and updating it according to customer feedback. Risks inherent in the agile methodology are limited documentation and customer non-alignment (Hossain, Ali Babar and Paik, 2009; Suprika and Date, 2010). Agile proponents, however, claim that the advantages outweigh the risks, and that

these methods are suitable for problems characterized by speed, change, uncertainty and turbulence in real world problem domains.

During the 1990s, when Dan Goldin was appointed NASA Administrator, his mandate was to increase mission performance, cut costs and reduce NASA's size. Goldin's most noteworthy management reform was to move NASA away from producing billion dollar missions toward less expensive and more innovative projects that were given a faster timetable. NASA's project portfolio began to shift from a relatively small number of large projects to a large number of smaller projects. Goldin argued that by breaking up programs into a larger number of smaller and more diverse programs, if there was a failure, NASA would not lose a whole program. Goldin also underscored the need to evolve systems, so that when failure occurred, it would not propagate across the whole system, or disable an entire single mission spacecraft.

(Harvard Business Review, 2002)

During the 1980s, as fast cycle approaches began to diffuse through the pharmaceutical industry, it became clear that any single pharmaceutical firm did not have the resources to fast track every attractive project; instead each firm had to select a few high potential projects to fast track, leaving other projects to continue with the then standard operating procedures. Thus, within many organizations, regular projects were staffed with individuals who increasingly felt left out of the opportunities for rapid career advancement that opened up for members of the fast cycle teams. Human resource practices had to evolve, not only to support the continuing mix of fast track and regular projects, but also to create new career progression paths for individuals and to diffuse the tension between fast track and regular teams developing in the organization.

The London advertising industry is geographically centered in one square mile, roughly bounded by the London district of Soho. Due to the *short lead times* for developing new advertising in response to fierce product brand competition, the London based advertising industry has evolved an agile ecology for organizing projects in which teams of advertising firm 'creatives' can work in partnership with other resource suppliers from the media, public relations, or design firm sectors to co-create advertising campaigns and associated support media materials. These rapidly formed temporary project alliances are fostered by the geographic co-location of project resources, and the history of previous engagement by members of these diverse but complementary organizations in previous projects.

(Grabher, 2002)

The search for agility in organisations, triggered by time compression, has created new imperatives for the project management function. In the face of constrained resources, organisations have had to re-conceptualise their portfolio of projects (as in the case of NASA) and innovate new approaches to project management (as in the case of IT). In addition, they have had to grapple with building new capabilities in general, deal with human resource linkages (as in the pharmaceutical industry) and create ecosystems (as in the case of the advertising industry).

Technology changes. Technological changes have transformed the industrial landscape during the last two decades, and these changes affecting project management are not limited to those created by the information technology revolution. Technological changes have opened up new product market opportunities and rendered many products and services obsolete. They have ushered in hitherto unforeseen possibilities to enhance productivity and render operations more convenient and effective. In turn, they have transformed business models and had an impact on the conduct of projects in organisations. Consider the following examples:

> High-throughput screening of chemical compounds began to be adopted in pharmaceutical companies during the late 1970's, which revolutionized the timelines involved in discovery. Recently, high-throughput screens have been developed for biological processes as well. Whereas in traditional pure protein high-throughput drug screens, individual compounds from a small molecule collection are tested to determine whether they inhibit the enzymatic activity or binding properties of a purified target protein, phenotypic high-throughput drug screens investigate the ability of individual compounds from a collection to inhibit a biological process or disease model in live cells or intact organisms. Although their validity is not yet fully understood, they are expected to transform the practices of all pharmaceutical companies. In turn, they will have implications for the timelines and conduct of projects.
>
> The advances in information technology have altered the conduct of project execution in many ways. With the development of personal computers and the Internet, documentation and transmission have become faster and easier; video-conferencing has made communication easier, and, in a global project, more convenient; and the tools of collaborative work have made coordination of documentation easier. The influx of social media and the rapid advances in this IT subsector, together with the movement to cloud computing, are expected to have implications for the conduct of project management.
>
> One of the consequences of the digital revolution has been the increasing dependence of media news and entertainment organizations upon audience-generated content (whether digital images or audios). The role of the customer as a co-producer of media content can be seen in many media industries (e.g. interactive advertising, interactive television, video

> games etc.). How project teams incorporate their user communities into their development processes is a project management challenge facing all media organizations.
>
> (DeFillippi, 2009)

Technological change can impact project management in two ways. Where a technology can improve or facilitate project management (as in the case of social media), a project organisation may adopt it without input from senior management. Even here, if there are issues of intellectual property or confidentiality considerations, there may be implications for risk, and senior managers will need to be consulted. However, when technology requires significant commitment of resources, or affects the larger organisation, the requisite changes are likely to be initiated by the senior management (e.g., phenotypic high-throughput screening or movement, or cloud computing). In either case, technology change alters the conduct of project management (e.g., co-production with consumers in media organisations). The history of the past three decades should alert us to the contingency of technology change, a feature that is *continually* going to affect project management.

Impatient capital. Arguably the most influential factor on the behaviour of senior management in corporations in recent years has been the operation of financial markets, which (from the vantage point of senior managers) exert significant pressure for reasonably quick returns on investment. In the United States, for instance, institutional investors (pension funds, mutual funds, or other money managers) increasingly own the shares of publically traded companies. Their portfolios are highly diversified, and they tend to make their decisions on limited information that is oriented to predicting stock price movements. The system encourages them to focus on easily measurable items such as quarterly earnings and, in turn, this encourages the firms to undertake investments for which returns are readily available (Porter, 1992). Although the Japanese and European systems are somewhat different, the national systems may be converging, partly as a result of globalisation. The impatient capital brings with it the requirement of a shortened payback period that accentuates the pressures of time compression.

The heightened influence of capital markets has cascaded to the level of projects and project management. Consider the following examples:

> In 1995, private industry, as represented by the National Security Industrial Association (NSIA), was allowed to assess the utility of the earned-value criteria, a concept first introduced to the American defense contracting community when the Government issued the Department of Defense (DOD) and NASA Guide to PERT/Cost in 1963. After a long study, the NSIA subcommittee came up with its version of the criteria, reworked

> significantly to be more palatable to the project management community. The industry standard was called the Earned Value Management System (EVMS). The DOD endorsed this major development in December 1996.
>
> (Nagrecha, 2002)

> The pharmaceutical industry is currently in a stage of transition as it evolves away from the era of the blockbuster drug, toward an era of specialized care products and personalized medicine. Many big pharma have also diversified to include vaccines, animal health, consumer health care products, nutraceuticals and cosmoceuticals, all of which have increased the complexity of project portfolios. The changing landscape of the industry has resulted in slowing revenue growth and declining R&D productivity, and has fostered an era of mergers and acquisitions, strategic alliances and joint ventures in drug development, and the selling of low-profitability or non-core businesses (Narayanan, Douglas and Tribbitt, 2010). There has been a significant movement away from executing discovery projects in house, instead entering into sponsored research agreements with universities or setting up research outfits in emerging economies.
>
> In software development projects, announcement of early termination of 'failing' projects is greeted with a positive response from the capital markets, highlighting the notion that when a firm decides not to throw good money after bad, the investors view the termination decision favorably.
>
> (Pinches, Narayanan and Kelm, 1996)

> Within the film and video game industries, the high risk and uncertainty associated with escalating costs of content development have fostered a bias toward the selection of projects based on established brands and franchises of previously successful content offerings. Within television, there is a trend toward more rapid cancellation of programs that fail to meet the expectations of their investors and sponsors.
>
> (DeFillippi, 2009)

The influence of the impatient capital has prompted firms to institute sophisticated approaches to risk and value assessment of projects, rapid termination of failing projects, outsourcing, off-shoring and restructuring of value chains, and to search for productivity enhancement tools and processes, such as knowledge management.

Although the environmental factors enumerated above may influence the conduct of project management, it is more likely that firms reformulate their business strategies to respond to the environment, before they undertake changes in the project management conduct. Put another way, the changes in PM are driven more by the strategies that senior managers shape in response to the environmental changes.

Business strategy

As environments shift, organisations should, and indeed actually do, reformulate their strategies. Strategic shifts are accompanied by changes in target markets and product offerings, and internal organisational arrangements, including value chains, structures and systems, and placement of influential managers. These changes inevitably impact upon the conduct of project management. Consider the following examples:

> In the wake of globalized markets, firms have available the options of global switching. One form of global switching is when a product is developed in one region of the world and later transported to another region. Another form of global switching is when different value chain activities are located in different regions, and the development activity thus moves across the globe. If global switching is adopted, it enhances the complexity of the development project.
>
> (Narayanan, 2001)

> As a result of economic pressures, Aerospace and Defense companies are creating development chains, where a greater share of the development and design work is being shared with the suppliers. Traditionally, such suppliers used to perform the manufacturing tasks after the completion of development work, but nowadays they also have responsibility for more complex design and development work. Two well-known firms experienced project challenges due to difficulties in controlling and integrating the work of supply chain partners: Airbus had to postpone its A380 by two years, and Boeing is facing delays in its 780 'Dreamliner' program by at least two years, with no clear final date for delivery.
>
> In the last decade, the imperative of revenue growth prompted Pfizer to acquire Wyeth, a large pharmaceutical company. During the integration of Wyeth into the parent company, a number of its research labs were shut down and sold off, and the total project portfolio was reshuffled, leading to discontinuance of projects, both for strategic reasons, as well as due to the restrictions imposed by the Antitrust Division of the Federal Trade Commission. The voluntary discontinuance was not necessarily because the projects were underperforming, but was for reasons such as duplication, lower priority ordering and lack of insufficient total resources.
>
> (Narayanan, Douglas and Tribbitt, 2010)

Senior international business strategy scholars have described how corporations in many industries are becoming global knowledge prospectors, whose project capabilities are focused on the identification of new technologies (e.g. Acer in PC products), or new artists and music talent globally (PolyGram), and then integrating these globally sourced projects into their company's portfolio of product or service offerings (Doz, Santos and Williamson, 2001). Their case studies richly illustrate how the organization of innovation-focused project management systems within global companies can be directly supportive of their company's global competitive strategies.

Strategy, representing a cluster of interrelated decisions by the top management of a firm, serves both as a bridge that connects internal operations and the external environment, and as an absorber of the environmental uncertainty for the conduct of projects.

Implications for project management

As we have illustrated above, environmental change and the resultant strategic shifts will reverberate through the organisation to affect the conduct of project management. Major strategic shifts also bring in their wake alteration in many facets of organisation, including organisation structure and systems, and of course, project portfolios. These shifts require the *designing* of corresponding changes in project management practices. This is actually a major responsibility of the senior management, as it requires the altering of many factors not directly under the control of a typical project manager. The design influences the effectiveness of project execution, although its influence is often not transparent. Put another way, the responsibility for ensuring the consistency between environmental and strategic contingencies and project management practices rests with the senior management.

In summary, both environmental and strategic changes have created challenges for the conduct of project management. PM literature has begun to appreciate this, and emerging perspectives in PM have begun to adopt a strategic orientation. We build on these ideas, but argue that a useful vantage point for the strategic orientation is the decisions made by senior management, that set the context for the conduct of PM. In this sense, ours is a top down view, unlike those who have advocated a bottom up view. However, given the realities of power in hierarchically structured organisations, the capacity to influence the context is concentrated in the upper levels of an organisation, and a top down view seems to be a realistic, and needed, but complementary stream of thinking in PM. To capture the changes in PM triggered by various external forces and strategic necessities, we offer a general framework for the analysis (and design) of PM practices in organisations from the vantage point of the senior management, and then introduce the concept of the project management system to highlight the multiple levels of influence wielded by the senior management.

1.4 Towards a strategic view of PM systems

A framework for analysis

Our framework for analysing PM systems is anchored in four ideas:

1. The general economic and political environments influence the PM system indirectly through the strategic context of the firm, which is created by the decisions of the top management. This assumption reflects the 'strategic choice' perspective (Child, 1972), which has laid out how the top management has degrees of freedom to navigate their environments.
2. A firm's project portfolio is a reflection of its underlying business or corporate strategy. It is thus related to the strategic context, although feedback from projects during execution may alter the portfolio. The feedback may lead to discontinuance, or to different priority ordering, in case 'new' scientific or technological information, which has been unearthed during execution, warrants such revision of priorities.
3. A firm's strategic context sets the contingencies under which the PM system is either (a) designed, or (b) evolves. These contingencies include size, variety and number of projects, together with the central premises under which projects will be executed, such as the stringency of timelines, the expected interface with external and internal agents and the degree of innovation expected (to name a but a few).
4. Finally, we view organisational ecology as an additional driver of the PM system. We use the term 'organisational ecology' to capture both the tacit dimension of organisational culture, and the explicit dimensions of structure, economic exchanges, systems, and processes. Indeed, when a business strategy shifts, many elements of the ecology are redesigned; that is, business strategy is a driver of ecology. Thus, although top managers influence the organisational ecology, the tacit organisation culture, and sometimes the system of economic exchanges, are left unchanged. These relatively stable elements of ecology generate pressures for conformity and continuity on member conduct throughout the organisation, and hence they influence project conduct in subtle ways.

The framework is presented schematically in Figure 1.1. As shown in the figure, a PM system, as reflected in its five constituent elements – Governance, Structure, Knowledge Processes, Linkage to Human Resource Management, and Metrics and Value Assessment – is primarily a response to the imperatives created by the strategic context, although both the internal organisational ecology and project portfolio also influence its characteristics. In what follows, we develop the construct of PM Systems.

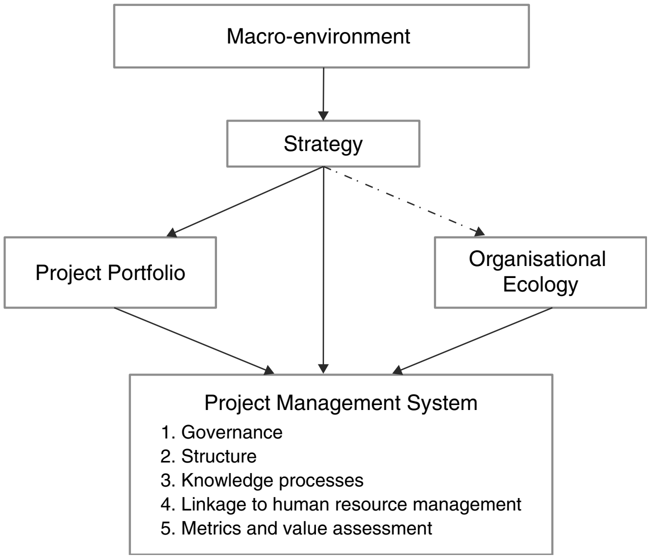

Figure 1.1 A framework for analysis

The concept of a PM system

By Project Management (PM) system, we signify the *macro-organisational facets that are relatively stable, and specific to the conduct of project management* in an organisation. By macro-organisational facets, we refer to the structures, processes and linkages widely understood by its members to be characteristic of the organisation's mode of operation and somewhat distinctive to the focal organisation, thus setting it apart from other organisations. We limit our focus to the domain of project management, although other macro-organisational characteristics may impact the design and functioning of PM systems. For example, the budgetary control system in an organisation may affect the design and functioning of a PM system, but to the extent that it is organisation-wide and not specific to PM, we consider it to be exogenous to the PM system. Finally, we view the PM system in an organisation as relatively stable, and its characteristics more enduring than specific projects. PM systems undergo changes, but in our conception such changes are infrequent, enabling us to ascribe some stability to these systems.

Following the theme we articulated in the introduction, we consider the design, operation, modification and abandonment of PM systems to be the responsibility of the senior management of an organisation. PM systems both enable and constrain the management of projects, thus setting boundaries to the variations in behaviour of projects and project teams. Unlike project leaders and members who are the heroes (or villains) of successful (or failed) projects, as the architect of the PM system in an organisation, senior management is primarily responsible for the PM system's strengths and weaknesses, that is, our concept of the PM system highlights the role of the senior management in an organisation.

Although organic evolution of a PM system is to some extent inevitable (and often necessary) in an organisation, two fundamental assumptions fuel this chapter:

> First, a *conscious recognition* of the facets of the PM system in an organization is useful to multiple stakeholders in the organization. In other words, although the concept of 'PM system' is itself an abstraction and thus likely to be implicit and unrecognized in an organization, bringing the characteristics of the system to the awareness of senior management in and of itself is a valuable activity. This explication has both descriptive and prescriptive utility.
>
> Second, we are biased toward *rational choice* in the architecture of PM systems. Thus, although processes leading up to a specific architecture are likely to be laced with intra-organizational politics, the ultimate architecture should exhibit some congruence with the external and strategic contingencies of an organization. In this sense, we are in sympathy with 'the contingency theorists' in organization theory and strategic management.
>
> (Donaldson, 2001)

The major facets of a PM system

To situate the PM system concept in an organisational context, we identify five *palpable*, but major facets of a PM system: Governance, Structure, Knowledge Processes, Linkage to Human Resource Management, and Metrics and Value Assessment.

Governance.[2] Governance provides a platform for monitoring the execution and progress of projects, ensuring consistency between project objectives and execution, securing the structures and processes necessary for project implementation, identifying points of intervention by senior management, managing stakeholder expectations, and continually clarifying and maintaining the boundaries between the project and the rest of the organisation. In practice, governance typically incorporates *five elements*: stage gate approval process, stakeholder representation, formal roles and responsibilities, quality assurance, and contracts and sign-offs. Each of these elements can exhibit variations across organisations and among project classes within the same organisation. For example, the stage gate process in the UK Government department mentioned by O'Leary in Chapter 5 of this book identifies eight stages: concept, start-up, initiation, design, delivery, acceptance, deployment and closure. The number of stages and the elaboration of each specific stage are both design variables: What may be appropriate for a UK Government department may not be appropriate for a six-month software development project, but may not be detailed enough for a major space shuttle project.

During the last decade, in addition to the five elements identified by O'Leary, two other elements have emerged as significant focal points for governance:—(1) *The degree of outsourcing,* and (2) *Information Technology*. Amid the deconstruction of value chains, and outsourcing of key functions, project management has to take into account players outside an organisation's hierarchic control. Similarly, although project teams usually have some degree of autonomy in the choice of IT tools, and PM system may determine the harmonisation of tools across projects, the choice of the IT infrastructure often rests outside the PM function. This raises questions pertaining to technical interfaces: Should existing IT infrastructure drive PM or should the IT be responsive to the needs of the project manager, or both?

Structure. In the PM system, structure refers to the organisation-wide facet, not to the composition of a specific project. The four generic structural questions address: the organisational logic for projects, the location of specific projects, the need, role and functions of a central office, and the linkage to senior management:

1. The organisational logic refers to the operation of project teams: whether project team members operate within a matrix (either partly or fully dedicated) with the (project team) members having dual lines of accountability, both to the project leader and to the heads of their homes in the organisations, namely the functional departments, or as 'tiger teams' reporting solely to the project team leader (Meyer, 1993).
2. Linked to the organisational logic, is the question of locating a specific project in an organisation: whether a project should be located within a unit, and if so which, or if it should be run from central office. This is particularly true in multidivisional organisations, or when an organisation has embarked on a disruptive technology project (Bower and Christensen, 1995) The story of the Merced chip project in Hewlett-Packard's Enterprise Systems Group is illustrative: Since ESG viewed the Merced chip as disruptive to its existing business, the project languished, an outcome that could have been avoided had the project been located elsewhere.
3. As the number of projects in an organisation increase, the feasibility or attractiveness of central coordination may prompt the creation of a Project Management Office (PMO), with the attendant issue of its hierarchic location. An illustrative question is to whom a PMO should report.
4. Finally, to provide the concerns of projects a pathway to the senior management of an organisation, informal or formal linkages may be established with the creation of liaisons, champions or sponsors.

In large multidivisional and/or global firms, and in major non-profit organisations, such as NASA, additional structural questions may need to be addressed. Thus multidivisional firms may have to resolve the tensions between centralising and decentralising the PM structures, tensions that come especially to the fore when interdivisional projects are emphasised. Should PMO be distributed, that is, should we develop separate PM offices in various divisions, or should they be centrally administered? Similarly, geographically dispersed global enterprises, and the choice of global versus local PM structures, may be of concern.

Knowledge Processes. Underlying the concept of a PM system is the notion that significant gains in effectiveness and productivity of projects can be harnessed by viewing the history and portfolio of projects, not as isolated endeavours in an organisation, but as interrelated, with significant potential for knowledge transfer. The lessons may emanate from the history of the organisation's past and current projects, as well as transportation of lessons from other organisations' experience. These knowledge management or learning processes may evolve informally, but may also be consciously designed. In the NASA vignette (see Introduction), KM (Knowledge Management) was formally introduced, with a focus not merely on explicit online knowledge capture and transfer process, but on the tacit knowledge held by experienced programme managers. Thus, in addition to providing engineers with a history of design decisions of successful projects and risk management tools to project managers, the KM function made mentoring of novices the responsibility of senior project managers and scientists.

Linkage to Human Resource Management. The fourth element of a PM system is the degree to which it is linked to human resource management in the organisation. Linkages may include selection, performance appraisal, and career development of leaders and project team members. The central thrust of the linkage is not merely the involvement of the official HR office of an organisation, but the extent to which HR issues are taken into account in PM decisions. For example, what strategies do we adopt to manage the tension between the need for talented individuals for the performance of specific projects and the need to develop individuals for future leadership roles? Should performance assessment reflect the realities on the ground (e.g., we have a matrix), or some relatively easy to administer template (e.g., we will leave the performance appraisal to the functional head)? Should we buffer the project leaders of discontinued or failed projects from the (organisational) cultural pressures that may decry failures? Is there a career path for project leaders within the organisation, or will we rely on the labour market to take care of their careers?

Metrics and Value Assessment. PM systems may emphasise different outcomes as value generating. Variation may be observed along process and outcome dimensions, both in terms of the specific metrics and the complexity of imposed metrics. By 'process', we refer to the timelines, adherence to budgets, conformance to standards, and quality assurance metrics. By 'outcomes', we refer to ultimate objectives of the projects that may range from successful launch of a product (e.g., FDA approval of a drug) to economic outcomes such as return on investment. Complex PM systems may value organisational outcomes, such as internal cultures that encourage project teams themselves to recommend termination, given the economics of the project. Finally, PM systems may also differ in terms of their attention to value assessment over the life of a project: initiation, execution, and post completion.

We propose that different organisations configure these elements of a PM system differently, contingent upon their strategic and organisational contexts. We argue that the characteristics of a PM system both constrain and facilitate the execution of projects. To the extent that the PM system offers clarity for execution, it helps to buffer projects during execution from internal political distractions on the one hand, and ambiguity of roles and overlapping procedures on the other. For example, projects that are exploratory are afforded insulation from normal organisational processes, and from the relatively more stringent pressures of exploitation projects. Similarly, project managers understand legitimate means of escalating their concerns within the organisation, if the projects have a sponsor.

Our framework has both diagnostic and prescriptive utility. By offering a scheme to conceptualise the key elements of a PM system, over which senior managers have and should exercise control, it enables us to describe the system within a specific organisation; in this way it serves a diagnostic function. But the scheme also enables an organisation to orchestrate or fine-tune its existing PM system for enhanced effectiveness. We take up each one of these ideas in the ensuing sections.

1.5 Evolution of project management systems: A model of stages

We present a typology of PM systems that represent increasingly complex project management constellations of system components and project management competencies needed. These five types also represent increasingly advanced stages of PM system maturity. The typology captures specific constellations of the five constituents of PM system – governance, structure, knowledge processes, linkage to Human Resource Management, and metrics and value assessment. We use the term 'stage' to signify each constellation. To underscore the differing levels of complexity of each stage and each step in the level of maturity of the model requires additional capabilities to be built into the organisation. Although many organisations may have evolved over stages due to their growth and/or learning from prior PM system experience, we view the adoption of a specific stage as a rational response to the external and strategic contingencies facing an organisation. We identify five stages of PM systems: (1) Ad hoc; (2) Allocative; (3) Portfolio based; (4) Integrative; and (5) Value focused. A comparative summary of these stages is presented in Table 1.1. First, we will discuss each stage before we make some general comments about the stages.

Table 1.1 A comparative summary of the stages of project management systems

Dimensions	**Ad hoc**	**Allocative**
Conception of projects	A set of independent projects	A set of independent projects constrained by resources
Conception of PM approach	Idiosyncratic approach to PM determined by project leader and project charter	Increasing variety
Resources	Resources based on relationship between project sponsor and project leader	Limited resources
Organisation of Projects	PM team staffing with flexible project roles defined by project leader	Ad hoc Formalisation of roles Emergence of PMO
Control systems	Control based on project leadership relationship to project sponsor	Ad hoc, fine tuning of control Separate IT
Metrics and Value Assessment	Metrics rooted in technical details and standard PM operating deliverables: quality, cost and time	Calculative metrics based on risk-adjusted returns and economic benefits versus cost logic V
Learning	Tacit learning at the team level	Tacit learning at the team level
Linkage to HR	Limited linkage to HR	Some linkage for team member selection

Dimensions	**Portfolio based**	**Integrative**	**Value focused**
Conception of projects	Portfolio of related projects prioritised	Portfolio of related projects prioritised	Portfolio of related projects prioritised
Conception of PM approach	Explicit recognition of heterogeneity	Explicit recognition of heterogeneity	Heterogeneous, dynamic and strategic
Resources	Limited resources allocated according to contribution to project portfolio	Limited but flexible	Limited but flexible
Organisation of Projects	Systematic Organisation differences based on type of project	Fully formed, Matrix/ PMO	Fully formed, Matrix/ PMO
Control systems	Control systems to formulate economic exchanges	Economic exchanges	Economic exchanges Projects as options
Metrics and Value Assessment	Cost-benefit calculus varies with type of project and contribution to portfolio	Continual assessment; termination	Continual assessment; termination

(*continued*)

Table 1.1 Continued

Dimensions	Portfolio based	Integrative	Value focused
Learning	Attempts to diffuse learning across personnel and across projects	Emergence of KM function	KM integrated
Linkage to HR	Emergence of PM as a career	Fully linked to HR	Fully linked to HR

Ad hoc PM system

Organisations typically begin their project management journey through the ad hoc creation of independent projects in response to requests from senior management. Formally approved projects are organised as temporary project teams that can be created and disbanded at the discretion of their sponsors. Each project team has its own organisational sponsor. The project leaders are responsible for securing resources and mobilising the organisational and political support of the project sponsor to protect the team from competing demands placed upon its members by those organisational units from which project resources (primarily project personnel) have been loaned for the accomplishment of the project's charter and associated deliverables. Successes are celebrated as the achievement of project leaders and their teams.

The staffing and organisation of project resources are also ad hoc at this stage of the PM system evolution. Some projects may be completely staffed by members within a single operating unit, and thus these projects are deeply influenced by the culture and control systems specific to the operating unit sponsoring the project. Other projects may have sponsorship by more than one operating unit with the firm, and thus the project team's operating cultures and internal control systems may represent a blend of the operating unit cultures and control legacies represented in the project team. An additional distinction arises for those projects initiated as independent entities from any single operating unit of the organisation, as might be the case where the project is exploring a new market for a new offering that is not within the scope of any existing operating unit. Such exploratory projects are likely to develop their own distinctive set of project operating practices that are appropriate to the new market or business opportunity targeted in their project charter.

Some projects within an ad hoc project management system may be simple extensions of a functional unit's current core products or services, and the organisation of these projects will represent modest departures from organisational conditions found within the sponsoring unit. However, other projects may include substantially innovative project deliverables. Such projects may well be organised as substantially autonomous units, with distinctive leadership, control and governance arrangements suited to the perceived requirements of such breakthrough innovation projects.

Thus, within an ad hoc PM system, some projects may succeed in securing greater organisational autonomy and resource support, based upon the nature and perceived strategic importance of the project, the organisational clout and commitment of the project's sponsorship and the organisational status and persuasiveness of the project's leadership in attracting talent to the project team. In a sense, the firm is akin to a market place for project proposals, and different project proposals may result in idiosyncratic project charters with ad hoc arrangements for resource support and organisational control and governance.

Also, within an ad hoc PM system, the allocations of project staff will not be centrally controlled, but will instead arise from the various requests made by project sponsors and project leaders to those operating unit heads to allocate some of their staff's time to different projects. Some staff will have scarce and valuable talent, that will result in their being asked to participate in more projects than other personnel, whose expertise is less in demand, or is more widely distributed across the firm. Project resource bottlenecks will typically be resolved through negotiations between various project sponsors and the supervisors of those personnel targeted for staffing critical roles on ad hoc project teams.

Finally, within an ad hoc PM system, each project is characterised by the unique task requirements and deliverables summarised in its project charter. In these circumstances, a great deal of project learning is tacit, and such learning occurs at the team level as project teams experiment with and improvise solutions to the project task challenges assigned them. Lessons learned from such projects are typically internalised by the project participants, and transferred when a new project team is created, composed in part of participants on previous projects where relevant prior experiences may be shared.

Overall, the ad hoc PM system works best in a firm comprised of a limited number of highly related product or service offerings (with limited strategic scope). Under these circumstances, project members can easily move from project to project in an ad hoc manner, based upon their shared knowledge of their organisation's overall product or service offerings. Ad hoc project management systems are also favoured when the firm is primarily composed of project teams of sufficiently small scale to allow face-to-face interaction between co located project team members. This facilitates the sharing of tacit knowledge gained over time, both within a project, and as team members move from ad hoc project to ad hoc project.

Ad hoc PM system systems thus have the virtue of flexibility and agility in accommodating a wide range of project offerings and their corresponding leadership, resource support, organisational control and governance requirements. These agility and fast response project system capabilities have been celebrated by management gurus such as Tom Peters, who has argued for the virtues of ad hoc project-based management practices over more rigid and slower moving bureaucratic business practices (Peters, 1999).

A celebrated example of an ad hoc PM system is the Danish hearing aid maker Oticon, whose so called spaghetti organisation for managing its operations was grounded in ad hoc, self organising project teams that were recomposed over time in response to new business opportunities. A recent reassessment of Oticon over its past twenty-five years' success suggests that the original ad hoc form of project management has evolved over time to accommodate the needs for more systematic selection and evaluation of its projects and management of its project teams, while retaining core elements of its original ad hoc project management system (DeFillippi and Lehrer, 2011).

As the number and complexity of projects increase within an organisation, it becomes increasingly desirable for PM systems to evolve beyond their ad hoc character, and to develop new capabilities and processes for allocating limited budgetary resources.

Allocative PM system

In the Allocative PM system, the firm introduces more centralised and standardised processes for allocating limited budgetary resources to launch and fund projects and to justify their termination. Many of these can be identified by their use of a committee structure responsible for reviewing, approving and funding project requests. The staffing and composition of these committees are an important determinant of how the Allocative PM system may operate within its charter. For example, in some organisations the project funding committee may be composed of heads of those operating units, which introduce new projects to the committee for review and approval.

Within an Allocative PM system, the use of standard risk-adjusted project valuation tools is valued as a politically neutral means of reviewing and approving competing project proposals. Additionally, the use of such project valuation tools provides everyone involved in the project management system, from project sponsors and project leaders, to project evaluators and funding authorities, with a common language for communicating with each other about project priorities, and a common set of standards for evaluating the merits of substantively diverse project proposals, whose technical and business details might be beyond the expertise of members of a project review committee. The use of Allocative PM system metrics and criteria for scoring project proposals is seen by advocates as a means of reducing or supplementing the subjectivity of an ad hoc PM system. A similar rational and calculative logic can be applied to the review of project progress later on in the project development process, and projects that were initially approved, but which failed to meet required scores at various stages of the review, can be terminated on an objective basis.

The use of Allocative PM system to assess the costs and benefits of project proposals and project progress have allowed firms of much greater strategic scope and project complexity to manage their various project endeavours. Indeed, historians of the evolution of project management practices have associated the development of Allocative PM system with Robert McNamara's 1960s introduction into the Department of Defense of Program Planning and Budgeting System (PPBS), which emphasised the up-front analysis, planning and control of projects. The success of the McNamara revolution in the Department of Defense (exemplified in the Polaris development project), and later in NASA (the Apollo mission), led ultimately to the commercial dissemination of more control-oriented models of project management, with the use of cost benefit analyses of initial project proposals, and phased evaluations of project progress against performance, cost and time schedule milestones (Lenfle and Loch, 2010). By the early 1970s, the basic elements and tools of Allocative PM system were well in place and have been continuously improved in subsequent years.

Overall, the Allocative PM system appears to work best under conditions of relative environmental certainty and market stability. The control orientation of Allocative PM system optimises progress within a steady state of project deliverables and market requirements. As long as the external context is relatively stable, or evolving in a predictable direction, the focus of Allocative PM system on internal control and project-phased evaluations of resource expenditure against project progress can be an effective and efficient programme management approach.

However, a series of critiques have emerged in response to the perceived shortcomings of exclusive reliance on the calculative tools of the Allocative PM system (Lenfle and Loch, 2010). One critique questions the objectivity of such project review metrics, because of the implicit assumptions built into such metrics regarding time horizons and market and technical uncertainty. In a nutshell, the standard project valuation tools based on discounted cash flow analyses or internal rates of return typically favour funding those projects which have lower technological uncertainty (typically product improvement or cost reduction projects), serve already known markets and have shorter time horizons for financial payback or positive returns on project investments. Therefore, these project valuation tools will systematically exclude funding those projects for which there is less known and predictable market demand, for which the product or service improvement embodies a high degree of technical uncertainty and challenge and for which the time horizon for payback on project investment is uncertain, or longer term (Hayes and Abernathy, 1980).

A second limitation of such project valuation tools is that they provide no guidance in determining what role each project can play in building a coherent portfolio of project investments that factor in multiple time horizons and the firm's strategy for building value over these multiple time horizons. Some projects may serve to add incremental economic value to an existing offering in a relatively short time period. Other projects might provide a more strategically significant role in creating a project platform for launching a series of subsequent follow-on project offerings over an intermediate time horizon. Yet other projects might play a role as an option for the firm to invest in potential but unproven future market place opportunities over a yet longer time horizon. Also, some projects create value primarily by enhancing short-term cash flow or profitability, whereas other projects lay the foundations for future profitability. The exclusive reliance upon risk-adjusted project valuation tools does not answer some of the strategic considerations needed to more deeply understand and assess the potential value of strategically diverse project proposals.

As a result of these limitations, PM system may evolve to incorporate more explicitly strategic considerations in managing their portfolios of projects.

Portfolio PM system

The evolution towards a Portfolio PM system is an important transition step for firms and their project sponsors and project resource suppliers. Firms employing Portfolio PM system typically have developed a sufficiently large number and variety of projects such that they can no longer evaluate each project on a case by case basis, even if each proposal can be converted into a standard risk-adjusted return scorecard for project evaluation. Moreover, firms that employ Portfolio PM system are also likely to have in place portfolio based strategy systems for evaluating the contributions of their business units to a firm's overall competitive advantages and market leadership in multiple businesses. Whereas the previous Allocative PM system might be sufficient for firms trying to make sense of a single competitive market or single strategic business situation, the evolution towards a Portfolio PM system makes it possible for reviews of projects that contribute to the corporate strategy of a firm, which typically involves allocation decisions to invest, to varying degrees, in different business opportunities, according to their relative contributions to the firm's overall business portfolio.

The Portfolio PM system was intellectually supported by a series of publications in the early 1990's by Harvard Business School Professor, Kim Clark and his Stanford University Business School co-author, Stephen Wheelwright, who suggested a comprehensive approach to utilising portfolio based thinking to organise project work (Wheelwright and Clark, 1992). They developed a typology for comparing different types of development projects, and portrayed these projects in a portfolio matrix. They carefully delineated how development projects could serve different strategic purposes, and they associated these different purposes with differing sets of external conditions (market and technology uncertainty) and internal conditions (degree of change required in current operating conditions). Their work suggested that firms needed to assess their portfolio of development projects and whether there were sufficient resources allocated to projects serving distinctively different strategic purposes. The focus of their writings was to enable firms to develop strategically informed portfolios of development projects that could simultaneously support: (i) derivative projects (the enhancement or incremental improvement of existing product or service offerings); (ii) platform or next generation projects (new business development); (iii) radical breakthrough projects and (iv) research and advanced development (blue sky) projects (Wheelwright and Clark, 1992).

Moreover Clark and Wheelwright also linked their portfolio models of development projects to a comprehensive set of normative models for organising and leading these distinctive projects. They distinguished between projects embedded within existing functional units whose project leaders possessed little organisational autonomy or authority to compel project team compliance (lightweight project teams and project managers), from projects organised as autonomous units, with dedicated staff working with a project leader with considerable authority to compel project team compliance (heavyweight project teams and project managers).

Additionally, they viewed the existence of distinctive projects within a company's portfolio as providing learning opportunities for the company's project personnel, who might learn basic skills in one project, and then be promoted to a subsequent project that could utilise their previous experience within a more complex project setting. In one celebrated article, they advocated using projects as the school for the development of company leadership (Bowen, Clark, Holloway and Wheelwright, 1994).

Explicit in their project portfolio perspective was the expectation that firms could systematically develop new technical skills and knowledge in more exploratory projects (so-called breakthrough projects, or Research and Development projects), which could be utilised in the creation of later platform projects that sustain a subsequent family of product or service offerings, to be incrementally improved in follow-on derivative projects. This logic for systematic knowledge management would insure the perpetual creation of market relevant capabilities and project-based product and service offerings to sustain the company over time, despite changing market requirements and other environmental changes (Bowen, Clark, Holloway and Wheelwright, 1994).

The Clark and Wheelwright perspective represents an advanced form of Portfolio PM system, linking project selection and project resource allocation and support activities to project organising, knowledge management and human resource development. It makes learning and capability development a key element in linking the staffing and resource support of specific sequences of projects over time within a company's project portfolio. Hence the full realisation of the Clark and Wheelwright vision requires a company to invest in sophisticated systems for both company-wide knowledge management and a strategic perspective towards the placement of personnel in sequences of project assignments that will develop their technical and project management skills and capabilities (DeFillippi, Arthur and Lindsay, 2006; Wankel and DeFillippi, 2005).

What Portfolio PM system typically do not address is how to integrate the internal project management environment of the organisation so as to take full advantage of potential efficiencies from the integration of a strategic logic into project management leadership and organisation. Organisations thus may seek to evolve a higher level of PM system maturity to further develop these project management capabilities.

Integrative PM system

Organisations operating at this level of maturity appreciate the role of the internal organisational environment in the conduct and success of projects. Thus, instead of relying on 'heroic' project leaders to pull off miraculous projects, these organisations begin to *integrate* the various elements of a PM system to create a facilitating internal environment that elevates the 'average' individual to effectively lead projects. PM system thus becomes a major determinant of project success. Thus senior managers in these organisations recognise project management to be an organisational capability that has strategic import.

Integrative PM system incorporates the major assumptions of the previous portfolio based PM system. First, there is recognition of significant heterogeneity among projects, and, along with it, the idea that project conduct will necessarily have to be different, such that a 'one-size-fits-all' approach to project management is not appropriate. Second, the concept of portfolio is now well entrenched in the organisational mindset, and, along with it, the keen awareness that there are significant interrelationships among various projects. Third, since resources are limited, portfolio management and project prioritisation practices have become standard operating procedure in these organisations. Integrative PM system improves upon the resource allocation practices of its predecessor, and incorporates four additional foci – organisation, economic exchanges, formal knowledge transfer, and linkage to Human Resource function.

Integrative PM system differs from portfolio based PM system in *resource allocation* practices in a couple of major ways. First, although portfolio management involves the use of standard tools and processes, governance addresses not merely project prioritisation taking into account the relationships between projects, but the discovery of opportunities for both new products and value enhancement. These discoveries hinge on the substance of the projects, not project management conduct. They may involve the recognition of the applicability of a therapeutic principle discovered in one group of related drug projects to another group (as in the case of pharmaceutical firms), or the restructuring of the value chains with the know-how derived from suppliers and alliance partners (as in the case of aerospace firms and defence contractors). Second, the resource allocation process is more flexible; particularly in fast moving markets, when different projects move at different execution speeds, the organisation recognises the need for flexible allocation of resources. In short, there is continual assessment of projects, and termination when necessary is fast, and very often understood to be an outcome of change in strategic circumstances, not project execution failure (although that will undoubtedly trigger termination as well).

Integrative PM system requires additional capabilities. First, in this stage, there is explicit attention to the role of *organisation structure and functioning* in PM system. Thus project team members are accustomed to working in a matrix with dual reporting relationships, and the practices such as conflict handling, or performance assessment highlighted in the matrix organisation literature (Davis and Lawrence, 1977) are well embedded in the organisation. Beyond this, however, in many firms at this stage, the continuing presence of a large number of projects prompts the adoption of a central administrative unit, sometimes called a Project Management Organisation (PMO). PMOs serve as a breeding ground for project managers, even though each project manager's stay in the PMO may be temporary.

Second, this attention is matched by the development of strong *linkages to the Human Resource Management functio*n within the organisation. In this stage, the selection, placement, training and development and rewards of project leaders and project team members, sometimes championed by PMOs, become linked to project needs and performance. For instance, Huemann's case study (2010) illustrated the alignment of project and line HRM, including identification of high potential project managers, balancing different career paths, coaching and training of project managers, and annual appraisals linked to feedback in projects.

Third, this stage witnesses the emergence of the Knowledge Management (KM) function in project management. This emergence reflects the awareness that significant productivity gains can be achieved by leveraging organisations' own experience with projects. In the beginning, this may consist of sporadic attempts to explain the reasons for the failure of specific projects, or to derive 'best practices' from successful experiences. These knowledge capture efforts will be coupled with efforts to disseminate the information among project team members. Whereas HRM focuses on formal training and/or certification in project management, these KM efforts try to capture the *organisational level* learning, both the tacit dimensions of project management, as well as what works best in the specific organisational context.

Fourth, intra-organisational exchanges become increasingly characterised by economic reasoning. Discussions between project managers and other units within an organisation are fact based, not authority or turf based, and an appropriate information and control system has evolved to help support these negotiations. The project managers and project team members increasingly appreciate the economic implications of a project (in addition to the operating details of projects) – not merely the senior management of the organisation. This may include negotiations with external partners, the impact of timelines and changes in these, a sensitivity to different factors concerning cost of the projects and so on. Indeed, the project managers may even encourage or recommend termination of projects, or changes in project strategy midstream, an occurrence that is often supported by the senior management, without the risk of stigma to the individuals involved in the project.

These four components – organisation structure, linkage to HRM, the emergence of KM and economic exchanges – set the integrative stage apart from its immediate predecessor. In our view, this stage represents the best in class of today's project management firms. Some of these firms have become incubators of project management know-how, and the tacit knowledge held by them may have enabled them to go beyond the textbook wisdom passed on through formal training courses or certifications in project management.

Value focused PM system

Although the integrative stage itself represents a high level of maturity, we can visualise a fifth stage, which we call value focused, towards which some firms may be progressing. We view this stage as still emerging, and we can, therefore, only sketch some of its contours.

Six key assumptions undergird project management in organisations in this stage. First, there is keen recognition within the senior management (and the rest of the organisation) that project management is not merely a set of skills necessary for project execution but a 'dynamic capability' (Teece, 2009) that serves as the cornerstone of a firm's competitive advantage. Second, and related to the above, the idea that projects can be executed leveraging external resources is accepted in the organisation. Third, projects come to be conceptualised as the 'business' of the organisation, and hence the primary driver of profitability growth. Fourth, and as a consequence, internal structures and systems are viewed as derivative, contingent upon the needs of the PM system. Fifth, project management would have come to be recognised as a career option, which characterises its linkage with HRM. Finally, senior management takes seriously its role as the nurturer of culture appropriate for project management.

These assumptions are likely to be crystallised in concrete practices at the level of PM system. We will illustrate this in terms of how this stage builds on the integrative stage. With respect to resources, the fundamental shift here is to incorporate external resources, and the organisation's confidence in its internal PM capability enables it to leverage partners' resources without detriment to the project execution or loss of intellectual property. The partners are likely to be incorporated into the planning stages of the project, instead of being kept at arm's length. This enables an organisation to extend its access to resources beyond those in its own immediate control.

Although firms may retain the matrix organisational form, as in the case of the integrative stage, the power would have shifted to projects, and some firms may even adopt the tiger team model of organisation (Meyer, 1993). Just as the power of the functional dimension of the matrix declines, the functional managers will be expected to be keepers of functional quality in projects, organisational learning and career management of the project personnel. We might add that this is a new type of leadership role not yet very common in organisations.

Project management will have a significant impact on the design of budgetary control and information systems, intensifying a trend that began in the prior 'integrative' stage. The emphasis on economic reasoning necessitates an information system that highlights the economic reality, rather than an artificial reality created by existing operating procedures and accounting rules (which may often distort the 'true' economic reality). Some projects will be seen as options, which require real options reasoning, rather than the typical Net Present Value analysis that pervades value assessment in much of project management.

The logic of real options reasoning includes the following elements. All project investments have high upside potential, and yet initial project investments are relatively small and can be terminated based on knowledge gained about the validity of the initial assumptions upon which the project investment was based. Implicit in this real options approach is the investment in a portfolio of projects, each of which contributes differentially to the options available to the firm for investing in its future growth and profitability. Each project within the opportunity portfolio can be analysed, using a set of project planning resource allocation tools that build on previous tools typically found in allocation based valuation approaches, but which incorporate explicitly the uncertainty of initial assumptions underlying projects that explore new growth possibilities. These tools include the creation of an assumption checklist, a reverse income statement (working back from corporate required returns on investments to identify what assumptions must be met in various input assumptions to fulfill required returns), and the examination of the validity of critical assumptions through a process of checkpoint assessments.

The shift in perspective to projects as options also alters the value assessment activities. This stage maintains the emphasis on continual assessment and rapid termination of projects. However, termination in this stage is strategic, and does not necessarily reflect a failed project. For example, the discovery that a competitor may be more advanced in a product development effort that will compete head on with the firm's project, or the realisation that another firm may be better positioned to take advantage of the project may trigger termination. Thus, termination is seen as a value opportunity, and the PM system will have developed routines to create value out of terminated projects through such activities as 'selling knowledge' or licensing products or processes.

Knowledge management now becomes fully integrated across the various levels: projects, cluster of projects and PM system. At the project level, conscious efforts are now common to build routines to capture lessons learned from the experience of running specific projects; this also makes these lessons readily available to the project teams to rethink their processes, thus reducing the time lag between knowledge capture and knowledge utilisation. Clusters of projects are frequently reviewed to elicit generalisable lessons that may be useful for both policy guidance and project execution. PM systems themselves adopt the characteristics of a 'learning organisation' (Senge, 1990). These PM systems represent the cutting edge of the project management practice, and are repositories of advanced knowledge about project management.

In this stage, the concept of a project management career is well understood by managers and employees in an organisation. HR practices have evolved to provide career tracks in project management. In some organisations, PM career tracks may become differentiated according to the type of projects. There is also full recognition that an external labour market for project managers exists, and the more attractive candidates in this market belong to organisations that have arrived at the value-focused stage of PM system. That is, the project managers in organisations at the fifth stage are likely to be 'bid' away from the organisation. However, the organisation has enough depth in its bench of project managers, so losing one or two is not likely to be upsetting to the execution of ongoing projects. In other words, PM in these organisations has become embedded as an organisational level capability and is not dependent on the 'heroic manager'.

As we acknowledged in the beginning, we can only paint the value-focused stage with a broad brush; although some firms may have adopted elements of this stage, a succinct statement of what this stage looks like will have to wait for some time.

1.6 Choice of PM system

How should an organisation arrive at the level of maturity appropriate for its situation? We have underscored our assumption that a conscious and holistic choice of the PM system enables the projects to be executed more effectively than in organisations where the PM system has evolved as a patchwork of components installed in response to specific contingencies. It is our conjecture that an appropriate PM system will lead to reduced and more focused but meaningful negotiations among project teams and the other members of an organisation, effective transfer of knowledge across projects and generations of project managers, and appropriate metrics of evaluation. Before we refer back to the framework (see Figure 1.1) to outline a process for the choice of

PM system, we would like to mention the key principles that should guide the choice of the PM system.

General principles

Four interrelated principles should guide the choice of PM system in an organisation: (1) Cost benefit calculus; (2) Principle of requisite complexity; (3) Principle of congruence; and (4) Implementability.

Cost-benefit calculus. Arguably the most obvious principle for business enterprises, we would argue that the reason for a specific stage of PM system should be that the benefits derived from the PM system outweigh the costs incurred by it. This is a considered judgement of the senior management of an organisation, a judgement that should take into account the costs and benefits that are often masked by the organisation's information and budgetary control systems. It should be clear that as the PM system maturity level increases, an organisation would need to invest a higher level of resources in PM system, and thus incur more costs, a situation that can only be justified by the ensuing benefits that the PM system will bring.

Principle of requisite complexity. As a restatement of the cost benefit principle, but to acknowledge the qualitative judgements in cost benefit analysis, we would further postulate that the maturity of the PM system should correspond to the strategic and environmental contingencies facing an organisation. Thus, installing a PM system either *less* complex or *more* complex than the one required by an organisation would be dysfunctional. In other words, not all firms would need a more advanced PM system. If the PM system is less complex, it will create drag in project execution, due to protracted negotiations; if it is more complex, resources are likely to be dissipated in structure, training and non-value adding processes.

Principle of congruence. As we have noted, a PM system is composed of five major constituents: governance, structure, knowledge processes, linkage to HRM, and metrics and value assessment. In a systemic and holistic design of a PM system, these constituents should be congruent; that is a consistent logic should permeate both the choice of the constituent and the relations between them. For example, if knowledge processes are embedded in an organisation's PM system (as in the third, fourth and fifth level), these should be reflected in structure, HRM and governance.

Implementability. Significant attention from senior management is required to imprint a maturity level on a PM system in an organisation. A PM system requires a set of competencies and commitment of resources during implementation. The more advanced levels require participation by segments of an organisation not immediately involved in projects, such as HRM, budgetary control systems, or IT. Indeed the pressures of project execution in an organisation often create inertial forces thwarting the implementation of a 'new' PM system. The commitment of resources, aligning other segments and ameliorating the execution pressures – all these activities require active engagement of the senior management. The deliberate choice of a PM system thus necessitates continuity of senior management, stability at the top and a recognition that since implementation will take time to complete, senior management need to be engaged for the imprinting to take place. In other words, implementability is a precondition for the choice of PM system.

The framework for the choice of PM system

As we have underscored in this chapter, both environmental and strategic contingencies to a large extent drive the choice of PM system. Although some technology changes may be immediately absorbed into the project execution (e.g., use of social media), typically, the business strategy – the deliberate decisions of top management that insulate the organisation from the uncertainties of markets – becomes the major driver of the PM system.

As we have discussed earlier, shifts in business strategy typically affect projects, both in terms of termination, or reprioritisation of existing projects and initiation of new ones. But beyond these direct consequences, strategy shifts are also occasions for senior management either to fine-tune or redesign the PM system in their organisation. This suggests one of the major implications of our framework (Figure 1.1): When a firm undertakes a strategy shift, and senior managers ponder execution, they should *explicitly* address the adequacy of the current PM system for the new strategy. If the current PM system is not consistent with the new strategy, then a redesign of PM system is necessary.

The principle of requisite complexity would suggest that the maturity of the PM system should match the complexity of the strategic context. The two key drivers of complexity are: (1) the number and diversity of projects an organisation has to execute on an ongoing basis, and (2) whether project management is seen as an operational capability, or a source of competitive advantage in addition. In general, therefore, if the firm has a limited number of projects or, even if numerous, the projects are similar (i.e. not diverse), then lower levels of PM system maturity may be more than adequate. If, however, the projects are numerous and diverse, then intermediate levels are necessary. Finally, as the firm begins to view project management as a source of competitive advantage, then higher levels of maturity are required. We have sketched these ideas in Figure 1.2.

Competencies. Each level of maturity requires an additional set of competencies, and in Table 1.2, we have summarised a set of competencies that senior managers need to embed in their organisation. As shown in the table, competencies are needed at multiple levels – individual, group, senior management and organisational:

In the ad hoc maturity stage, technical and relationship competencies dominate. Project team members should know the technical facets of PM, and the project leader should have not merely technical knowledge of PM, but team leadership and upward influence skills. Senior management may play a mentoring or coaching role, in addition to provision of resources.

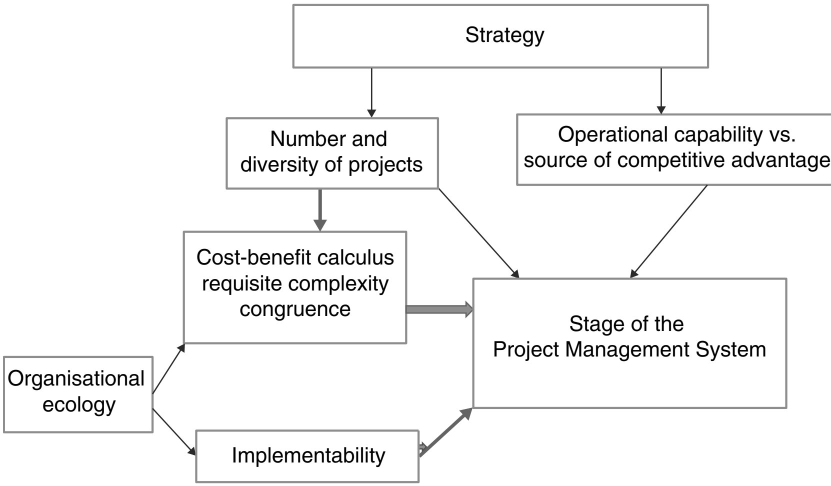

Figure 1.2 Choice of project management system

In the *allocative* stage, analytic competencies will begin to dominate, and additional technical skills in project valuation are necessary at the individual, project leader and senior management level. As a result, their calculative and analytic competencies dominate the discourse of project reviews. Organisational routines will need to be established whereby financial valuation tools are embedded in project evaluation.

In the *portfolio* stage, portfolio investment competencies will begin to dominate and the need for organisational competencies will emerge. Participants in portfolio based PM system need to understand how each project proposal contributes to creating value within a portfolio of multiple projects. Organisational routines are now necessary to examine the interrelationships among projects, and operating within a matrix requires additional individual, group and organisational level competencies.

In the *integrated* stage, organisational competencies will begin to dominate. Since the firm has enough experience with projects and portfolio management, senior management focuses on organisational competency to imprint capabilities in the organisation, including links to Human Resource Management and Knowledge Management.

In the *value-focused* stage, the attention is placed, in addition, on strategic competencies. Economic reasoning is now well embedded in the organisational decision-making, and concepts such as real options are not merely well understood, but practiced with the support of requisite tools, organisational routines and data.

Firms typically have three options for accessing these new PM capabilities: acquisitions, partnerships, or internal development. Acquisitions of businesses

Table 1.2 Competencies and maturity of PM system

	Levels of Competences			
	Individual Project members	**Project Leader**	**Senior Management**	**Organisational**
Ad hoc: *Substantive and relationship logic dominates discourse*	Technical skills for project tasks and interpersonal skills for team work	Technical and interpersonal skills for leading team; Political skill in cultivating project sponsors within senior management	Substantive knowledge of technical domains of projects and interpersonal knowledge of project leaders.	
Allocative: *Calculative logic dominates discourse*	Technical and interpersonal skills plus data access and data entry skills for PM cost-benefit reporting systems	PM tools for generating project cost-benefit analyses and cost-benefit forecasts	Consistent application of agreed upon Cost Benefit calculative logic and metrics for project approval and project reviews.	
Portfolio: *Financial investment portfolio logic dominates discourse*	Technical, interpersonal, data entry and conceptual understanding of role/value of project within current project portfolio	Skills in arguing and justifying time deadlines, resource requirements and deliverables appropriate to project type and role in portfolio	Portfolio management and risk return analysis of portfolio balance and composition of projects	Organisational routines for portfolio management

Integrative: *Strategic logic emerges*	Project management; Portfolio management; Career management	Knowledge of operating well in a matrix	Portfolio management; Sponsorship	Conflict Management in matrix; Resolution mechanisms for different strategic visions of desired composition of project portfolio; Formal KM Linkage to HRM
Value Focused: *Strategic and value logics dominate*	Project management; Portfolio management; Economic logic; Career management	Knowledge of operating well in a matrix; Economic logic; Strategic linkages	Portfolio management; Sponsorship; Options modelling	Conflict Management in matrix; Resolution mechanisms for different strategic visions of desired composition of project portfolio; Formal KM Linkage to HRM

or sub-units with PM capabilities already adapted to new business and market opportunities have the advantage of speed. However such acquisitions create new challenges of post merger or post acquisition integration of these PM capabilities. To what extent can the overall project management office integrate project work based on dissimilar project management processes? Some firms maintain independent and separate project management systems for distinctive sets of business and market opportunities. However, the determination of the business scope of each project management office is a key strategic decision.

A second option is to partner with an organisation whose project capabilities are complementary to one's own, and thus may be integrated to varying degrees with the partner through inter-organisational collaboration. Many outsourcing agreements or supplier-customer partnership agreements take this form. However, as these projects involve increasingly complex project services, it becomes necessary for project participants from both organisations to integrate their knowledge, skills and business practices. These types of partnership hence pose complex innovation and knowledge integration challenges that often require the creation of inter-organisational project management structures and systems focused upon integrating knowledge, skills and processes across the collaborating supplier and customer organisation (Jones and Lichtenstein, 2008).

The third option for accessing new PM capabilities is internal development. Brady and Davies (2004) describe a model for the internal development of new project management capability building, consisting of two interacting levels of learning. First, there is the bottom-up, 'project-led' phase of learning that occurs when a firm moves into a new technology/market base and engages in exploring new opportunities and learning new project management skills and practices. This phase is followed by 'business-led' learning, that occurs when 'top-down' strategic decisions are taken to create and exploit the company-wide resources and capabilities required to perform increasingly predictable and routine project activities in support of the new business arena served by the project management system created. A critical challenge in such internal development scenarios is whether the initial projects and project management systems created to explore the new business opportunity learn fast enough how to meet the project requirements of their new clients, and whether these initial exploratory new business projects can create a viable project business platform for subsequent business growth and corporate resource support.

1.7 Future research directions

In this chapter, we have articulated the importance of the role of senior management in project management, and with the articulation of the concept of

PM system, highlighted the many concrete ways in which senior management influences project execution. As we have summarised in the beginning of the chapter, the thought leadership in project management literature has begun to recognise this, and influential PM scholars are beginning to open up the literature to the intellectual currents in strategy and organisation theory. We believe that a corresponding research thrust which examines the role of senior leadership on the conduct and performance of projects is a much-needed complement to the emerging direction.

At the surface level, the maturity model of PM system we have sketched is a hypothesis, and is thus amenable to testing and refutation. But beyond this, we see three major avenues for research: (1) theoretical, (2) empirical, and (3) towards an enlarged view of PM.

Theoretical

A focus on senior management provides PM researchers an opportunity to connect to the strategy and organisation theory literatures, both rich in insights and both speaking to the senior management of an organisation. Additionally, this connection enables PM to speak to the concerns of senior management, thus elevating the visibility and status of PM in many organisations. Both connections will enable PM researchers to add organisational and industry levels of analysis to their current preoccupations.

The strategy literature may offer several theoretical lenses for the study of PM at the organisational level. Internal markets, options theory, transaction costs, value chains and portfolio theory are illustrative of the concepts that can be imported to the study of PM in organisations. Internal markets are discussed by Halla, Geranmayeh and Pourdehnad (1993); real options by McGrath, Gunther and MacMillan (2000); transaction costs by Williamson (1981); value chains by Porter (1980); and portfolio theory by Markowitz (1991). Resource-based, capability-based and knowledge-based views of the firm, by now well established in the strategy literature, and the emerging theory of dynamic capabilities may provide the theoretical platforms needed to link PM to SM literature, and ultimately to competitive advantage (Teece, 2009).

Similarly, organisation theory allows several prominent sociological perspectives to be utilised in the examination of senior management and their influence on PM. We will mention three to illustrate this point. First, institutional theory may enable one to examine the broader influences – intra-organisational and environmental – on both PM system (as we have conceptualised) and the conduct of projects (in the narrower sense expressed in the PM literature). Second, system structural approaches may enable researchers to assess the degree of congruency between PM system and the strategic context faced by the firm. Finally, the social network perspective may offer valuable insights into the operation of projects or design of intra organisational interactions.

Empirical

Our agenda calls for *macro level* studies, where organisation or firm is the unit of analysis. We will identify at least two different approaches that are necessary for this purpose: case studies, and large-scale comparative analyses.

Case study methods are not new, and are necessary to shed light on hitherto under-examined phenomena, summarised in this chapter, and to anchor large-scale studies in the real world. However, in this case, we will need multi-level case studies. That is, although the organisation is the unit of analysis, since we are focused on the role of senior management in projects, case studies will necessarily include individual (senior managers), project, and organisational levels of data and analysis. Industry-specific case studies, those involving multiple firms in an industry, are a necessary first step. These grounded theory case studies will help situate the theory development works that will enable PM to link into strategy and organisation theory literatures.

In summary, we have argued that conceptualisation of project management from the perspective of senior management is urgently needed to complement the current scholarly preoccupations in PM. We have offered the concept of the project management system as a way of moving the scholarly conversation and practice forward. The perspective of senior management offers interesting challenges, but is also likely to yield rich dividends for the PM community. Thus, we call on Project Management researchers to incorporate a macro strategic perspective into their ongoing preoccupations.

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Notes

1. Although drastic events (e.g., political revolutions such as the Arab Spring) or crises (e.g., the Japanese earthquake of 2011) may trigger significant shifts in PM, instead of these unpredictable events, we focus on continual influences, because in our judgement this is more useful to managers.
2. We have benefited from Chapter 5 in our discussion; however, we use the term ‘governance’ in a much narrower sense than O’Leary, focusing on monitoring of the projects, as they are implemented, but exclusive of project portfolio decisions. We view portfolio decisions as driven by strategic considerations.

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2
The Proposal

Knut Samset and Gro Holst Volden

2.1 Different views and perspectives on success

Measuring success in projects is not a simple and straightforward undertaking. This is because the term 'success', used as an indicator, is a highly complex and aggregated measure. First of all, it may be interpreted differently by different individuals and institutions. Secondly, it tends to be measured differently in different types of projects, depending on the nature of their immediate outputs and long-term outcome. Thirdly, different individuals tend to assess the success of the same project differently, depending on their preferences, values and to what degree they are affected by the project. Finally, the degree of success is time-dependent.

To illustrate how success is affected by time, the track record of the Empire State Building in New York can be used as an example. It was commissioned in 1929 by General Motors, who wanted to exceed the height of rival car manufacturer, Chrysler's, building. It was completed one year ahead of schedule, almost 50per cent below budget (helped by the depression), and to the specifications designed. From an immediate perspective, the project should therefore have been a complete success. However, only 20per cent of the building space was rented at the building's opening, so it was nicknamed the Empty State Building. It took 17 years for the building to have enough tenants to turn a profit. It has been a success ever since, and is the tallest building in New York with almost 100per cent tenancy. The project went from success, to failure and then success again.

Success is measured differently in different types of projects, depending on the nature of their immediate output, and long-term outcome. A hospital is assessed in terms of its health benefits, an industrial project might be judged in essentially financial terms, and an infrastructure project in terms of its utility.

The assessment of success can be in absolute or in relative terms, that is, in relation to what was agreed versus what was realistically achievable. *Ambition* is expressed in terms of the project's stipulated objectives. Its *outcome* is a direct measure of what has been actually achieved. Clearly, success measured in absolute terms may give a misleading conclusion if objectives are unrealistically ambitious. By measuring in relative terms, in relation to what could reasonably be expected, as compared with experiences in similar projects, the same project might possibly be considered a success.

Williams (2009) suggests that the archetypical 'man in the street' would be likely to think of projects as generally unsuccessful. A key word often associated with them in the public's mind is the English colloquialism 'white elephant' (something whose cost and subsequent upkeep is much greater to the owner than its value, deriving from the reputed practice of monarchs giving sacred white elephants as gifts). Morris and Hough (1987), concluded that 'the track record of projects is fundamentally poor, particularly for the larger and more difficult ones. … Projects are often completed late or over budget, do not perform in the way expected, involve severe strain on participating institutions or are cancelled prior to their completion after the expenditure of considerable sums of money'.

More than two decades ago Pinto and Slevin (1988), concluded that

> the concept of project success has remained ambiguously defined, both in the project management literature and, indeed, often within the psyche of project managers. Projects are often rated as successful because they have come in, on, or near budget and schedule, and achieved an acceptable level of performance. Other project organisations have begun to include the client satisfaction variable in their assessment of project success. Until project management can arrive at a generally agreed upon determinant of success, our attempts to accurately monitor and anticipate project outcomes will be severely restricted.

Success as a generic term means to gain advantage, superiority, accomplishment, achievement, or added value. One interpretation of project success is that the stakeholders who are part of, or affected by, a project are satisfied. Being such a compound measure, success will have to be translated into a hierarchy of indicators to enable its measurement. Wideman (2005, pp. 3–4) describes a sequential set of four success measures, all of them time dependent: (1) 'internal project objectives (efficiency during the project), (2) benefit to customer (effectiveness in the short term), (3) direct contribution (in the medium term) and (4) future opportunity (in the long term)'. Three of these measures go beyond the project's immediate outputs. There are many examples of projects that score highly on efficiency, but subsequently prove to be disastrous in terms of their effect and benefit. There are also numerous projects that failed to pass the efficiency test, but still prove to be tremendously successful in both the short and long run.

Clearly, a successful project is one that delivers its outputs and significantly contributes to the fulfilment of agreed objectives. Moreover, it should

Table 2.1 Five widely applied success measures

1. EFFICIENCY	Delivery of outputs in terms of scope, timing and cost in relation to what was agreed
2. EFFECTIVENESS	The extent to which the objective has been achieved
3. IMPACT	All other positive and negative changes and effects caused by the project
4. RELEVANCE	Whether the objectives are aligned with valid priorities and users' needs
5. SUSTAINABILITY	Whether the positive effects of the project will be sustained after the project has been concluded

have only minor negative effects, its objectives should be consistent with needs and priorities in society, and it should be viable, in the sense that the intended long-term benefits resulting from the project are realised. These requirements were first formulated for US-funded international development projects by the United States Agency for International Development (USAID) in the 1960s, and subsequently endorsed by the United Nations (UN), the Organisation for Economic Co-operation and Development (OECD) and the European Commission (EC). They advocate five requirements or success factors that have to be fulfilled: the project's efficiency, effectiveness, relevance, impact and sustainability. These are tough requirements that go far beyond the issues usually covered by the media, or, indeed, many planners and decision-makers.

2.2 Tactical and strategic performance

In applying the success criteria above, we distinguish between the project's *tactical* and *strategic* performance. Success in tactical terms typically means meeting short-term performance targets, such as producing agreed outputs within budget and on time. These are essentially project management issues. Strategic performance, however, includes the broader and longer-term considerations of whether the project would have a sustainable impact and remain relevant and effective over its lifespan. This is essentially a question of getting the business case right, or, in short, of choosing the most viable project concept.

This is illustrated in Figure 2.1. Tactical performance is a question of how the project is implemented, that is, how inputs are converted into outputs. These are measures of its *efficiency*, in terms of the cost, timing and quality of deliverables. Strategic performance is a question of how the project performs after the outputs have been delivered. This will have to be monitored with the more compound measures mentioned above, which would cover the broader and long-term perspectives. It would, to a lesser degree, involve

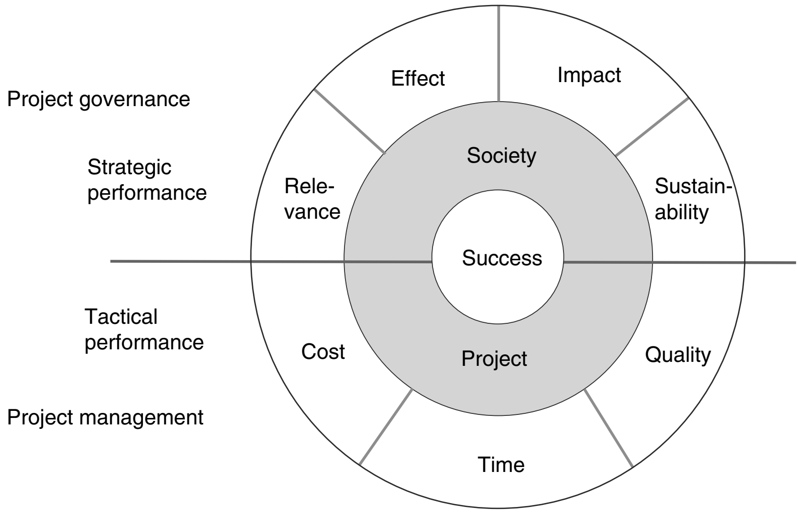

Figure 2.1 Successful projects

focusing on technology and management issues, but more on the societal and economic aspects.

The Empire State Building was a success in tactical terms from the very start. The economic depression, with low costs and abundance of cheap labour, offered a golden opportunity for this type of investment, and affected the tactical performance favourably. However, for 17 years it was considered a failure in strategic terms, until it had found enough tenants to turn a profit.

In times of depression the market for expensive offices in the centre of New York had collapsed, and the project was therefore not *relevant*. The building was under-utilised, running at a loss, and was therefore not *effective* or *sustainable*. With time, things changed radically and the project became a huge success, not only in terms of its relevance, effectiveness and sustainability, but also its *impact*, since it rapidly became a major tourist attraction and national symbol.

Generally speaking, tactical considerations are typically restricted in time and perspective, with a presumed ability to meet short-term performance targets and trade-offs to keep stakeholders on board. They are likely to prove ephemeral when matched against the lifespan of most projects. This includes the often proclaimed success of a project simply because it has come in 'on cost and on time'. Strategic performance is the key issue, but strategic success will only emerge over time, in the context of the project having sustainable impact and remaining relevant and effective over its lifespan.

Projects which score highly on all the five success criteria mentioned above are those that perform successfully both tactically and strategically.

Such projects may be rare. The tactical performance of projects is of less concern at the early project proposal stage. Strategic performance is the main issue here. But to what extent is it possible to make a meaningful assessment of the proposal in relation to the above success measures? Would the amount and type of information available early on be sufficient?

In order to assess its *efficiency*, the costs of a project and the nature of its delivery should be reasonably well understood at an early stage. But there may be doubt as to whether cost estimates are realistic, and that conditions of implementation will allow outputs to be produced as anticipated. Consequently, attempting to gauge efficiency may not be worthwhile in the front-end phase. At the very least, the complications facing planners and decision-makers in estimating realistic costs clearly indicate that the basis for rigorously evaluating efficiency is usually poor.

The same is true of *effectiveness*. Undoubtedly, the anticipated first-order effects are usually clearly known, their realisation is time-dependent and relies on the fulfillment of other events outside the scope of the project. Realistic forecasting may therefore be notoriously flawed.

Early estimates of *impacts* are even more difficult. Undoubtedly, experiential knowledge may be acquired by studying similar projects. But we face conditions that are difficult to forecast, which arguably requires imagination and guesswork beyond our capabilities.

However, the situation for *relevance* differs. Common sense and user surveys, as well as knowledge of markets, laws and regulations, permit us to form an early, accurate picture of whether an initiative is relevant. That we are notoriously poor at this sort of early evaluation is not due to it being impossible, but rather to it not being done to a sufficient extent.

Forecasting future *sustainability* is also difficult. However, the question is closely related to whether the proposed project is relevant. Moreover, from early on, we have been able to realistically analyse cash flows.

Consequently, the answer to the question above is that with modest effort, we can gain a good picture of whether a project is relevant and sustainable. Extensive analyses of the other three criteria may not be worthwhile at an early stage. The good news is that relevance and sustainability are precisely the attributes that determine whether a project will be successful or not in the long term. Therefore, this may be a minimalistic answer to the question raised, or a 'quick-and-dirty' approach to ex ante evaluation of project proposals, in which the benefits are great compared to the cost.

2.3 Quality at entry

One of the prime goals of strategic planning is to attain structured and effective continuous management. The strategy should encourage decision-makers at various levels to pull in the same direction, by providing a common long-term goal. Research has shown that this is essential to attain good results (Heijden, 1996). A study of 1125 projects compared the extent and quality of pre-project studies, appraisals and design prior to project inception, with whether or not they were successful. The conclusion was that 80 per cent of the projects that scored highly in terms of their quality at entry (QaE) were successful, compared with just 35 per cent of those that were started without proper preparation (World Bank, 1996).

A survey conducted in the USA of approximately 600 project managers helped to identify which critical factors influence the level of achievement in projects. The conclusion was that planning the project was by far the most important factor. Problems that could have been avoided with a better project plan arose repeatedly during the entire project cycle (Pinto and Slevin, 1988).

An international study that drew on the experience of 60 large infrastructure programmes concluded that projects with great strategic depth, and an appreciable level of underlying strategic assessment, were more likely to be successful. A clear pattern showed that the projects which attained the best results had allocated greater portions of their overall costs to their front-end phases. These cost allocations varied from 3 per cent for simple projects to as much as 35 per cent for complex projects. The costs in the front-end phase, before the decision was made to start, varied from 15 to 500 million US Dollars. The conclusion was that such costs were often justified and resulted in considerable cost reductions in the implementation phase, more socially acceptable projects and better risk management (IMEC, 1999). The study also found that three aspects in particular characterised the most successful projects: (1) the front-end phase had been long, that is, several years, (2) the concept had been revised several times, and (3) problem-solving was systematic and inclusive. Moreover, it was found that the use of risk analysis was vital, and that there was a decided advantage in holding open debate during project planning.

Typically, the less successful projects resulted from authoritative choices made by investors, public agencies, or strong interest groups, and were often carried out under time pressure. Little time was allocated to pre-project studies, or to the evaluation or appraisal of concepts. The original concept was maintained to save time, with insufficient emphasis on acquiring relevant information. Consequently, in many cases, projects had conflicting goals and were based on assumptions imposed by interest groups or the authorities.

Paradoxically, the greater portion of resources expended to ensure project success is not used up front, but during the implementation phase. Moreover, the greater amount of resources expended up front is used to work out a relatively detailed strategic plan, while only a relatively small part is used in concept development, to identify and test alternatives, and delineate a strategic framework for the final project.

This is perhaps one of the principal problems with project activities in general. Early on, before the project or process is initiated, there is often too little attention given to fundamental questions concerning the concept itself. There are plenty of fine-tuned, resource-intensive precision instruments for controlling processes that do not detect whether the concept is sensible or not. In many cases, the methods are used to marginally improve and uphold concepts that should have been discarded. Projects with budgets in the billions may be precisely controlled in time spent, costs incurred and quality delivered, while the choice of concept itself is insufficiently considered.

This is due in part to the complexity of assessments, as they depend not only on knowing, but also on foreseeing. In the initial phase, uncertainty is greatest and the amount of reliable factual information smallest. At this stage, there is no great diversity of methods to apply, because information is scarce, qualitative and often judgemental. Consequently, it makes little sense to use precision instruments.

2.4 Tactical flexibility

Strategic planning is only part of the solution. *Tactical flexibility* is equally important, to allow for manoeuvring within the delineated strategic framework, as the project is implemented. Additionally, there should be latitude for changing the strategic perspective if this becomes necessary. Strategic planning is built on judgement and assumptions which do not necessarily identify the most suitable choices in situations that may arise. Requiring that a strategic plan be followed strictly can make it a straitjacket. In practice, this means that there is little sense in formulating a detailed strategic plan early on.

This line of thought is underscored by Napoleon Bonaparte's remark on planning: *Plans are nothing, but planning is everything*. The creative, initial planning process affords decision-makers the opportunity to identify and assess the key alternatives, and to find the way to a sensible, realistic concept. Planning helps decision-makers think through alternatives and thereby become better equipped when they are later faced with situations in which they must make tactically vital choices. In some cases, these tactical choices will influence and change the strategy. It is rare that a precise strategy will be implemented in detail strictly as laid out.

A plan presupposes a degree of determinism, a quality of information and a clear cause-effect relationship that, at best, exists only in the implementation phase. It allows only cursory consideration early on of the inconceivability of foreseeing the interplay between various involved or affected parties over time, of the incompleteness of information, and of the cause-effect relationship being influenced by uncertainty, which can change the analytic context that comprises the base of the goals and strategic choices undertaken.

A story often cited in the project literature concerns a Swiss military troop which returned exhausted to base camp after three days in a blizzard high in the Alps. According to the troop leader's account, the men had lost their way and thought that they were doomed, until one of them found an old map in his pocket. Courage renewed, the men found shelter, waited until the storm subsided and then used the map to find their way out of the area. Afterwards, they were astonished to find that the map was of the Pyrenees, not the Alps.

The story is used to show that in a situation with high uncertainty, it is not necessarily the quality of the strategic instrument that counts, but rather the tactical response chosen. Strategy can be useful even when it is completely wrong. It is principally an aid to point out a main direction. A detailed strategy strictly followed can be the worst strategy.

There are differing perceptions of what a strategy is. The ideal would be a rational, designated plan, based on thorough preparation and designed to serve a specific purpose. In many cases however it is merely a pattern, that is, a standardised scheme which is applied over and over again in different projects. Finally, and quite commonly, it is merely a ploy which is designed to serve a different purpose, for instance to stir up interest in a scheme or attract funding (Mintzberg, 2005).

Consequently, the question of which concept is best concerns more than the systematic, rational identification and assessment of various alternatives. In the front-end phase, the interests and prioritisations of various parties become evident, intervene and lead to decisions that are often far from that which appeared logical and rational at the outset. Hence, understanding this process is as vital as questions regarding the information base and the rational analysis choice of method.

Major public projects are typically conceived as the result of politically expressed needs in dialogue between various stakeholders. This is followed by a lengthy process of developing the project and making the necessary decisions, typically involving the government at various administrative levels, but also political institutions, the public, the media, and consultants and contractors in the private sector. Such processes are often complex and unpredictable. They can also be deceptive and irresponsible, affected by hidden agendas rather than openness and social responsibility (Flyvbjerg, Bruzelius and Rothengatter, 2003). This is discussed further in Chapters 5–7 of this book.

2.5 The project proposal

As discussed, it is a long way from analytic results to decisions and actual project realisation. The merit of the decision basis is central. Clearly, its quality cannot be assessed solely on the grounds of the methods used or the quality of the input data, but must be viewed in connection with what happens later in the process. All too often the decision basis is restricted to a detailed assessment of just one alternative concept. The basis for decision-making could, for example, essentially be a probabilistic analysis, which results in expected values of costs and time expenditure that are considered favourable. Such a decision basis is too narrow in most projects. The assessments must embrace more than the narrow implementation perspective. They should also consider the long-term consequences of the project. Moreover, they need to build on real assessments of alternative conceptual solutions. Studies of the scope and quality of project decision bases in general show that this is not often the case.

Decisions may be made on a very simple basis. One might toss heads or tails, or, if reliable information is available, undertake a simple assessment of foreseen rewards relative to costs. But the decision basis may also be comprehensive. Large projects usually have a thorough, detailed pre-project study. In some cases, this may take years, and include complex analyses, simulations, pilot studies, and so on. Studies of managerial use of decision information have shown that many managers decide on the basis of their own experience and intuition, perhaps after having conferred with persons they trust. Thereafter, available information is used to support the decision, not as the basis for making it.

However, in many cases, the type and extent of studies in the *initial phase* may be severely limited. The terms of the final project are often shaped more by the events of the initial phase than by the pre-project study. It is at this point in time that the terms of the pre-project study are determined. With a prior, top-down assessment of the concept itself, strategic guidance could be included in an initial phase that also puts the pre-project study on a sensible track. This may be extremely useful, both in the short term and the long term, not least because the costs of the initial, broad and often qualitative concept studies are relatively small.

The extent of effort in the initial phase of a project appears to be either fairly limited, or relatively comprehensive. This may be ascribed to formal requirements, for example, for impact assessments and quality assurance, first being imposed when the project exceeds a certain size. Hence, there is no accepted tradition for systematic front-end phase appraisal of smaller projects. The same is true of the systematic use of risk analyses in project activities. Today, there are no widely used method tools or standards for such analyses.

A project proposal should ideally include the following steps and elements:

1. A needs analysis mapping all stakeholders and affected parties and assessing the project's relevance in relation to needs and priorities in society.
2. A specification of all requirements that need to be fulfilled when the project is implemented (for example, functional, aesthetic, physical, operational and economic).
3. An overall strategy defining the project's goal and purpose (first order and long-term effects) with emphasis on consistency, realism and verifiability.

4. Specification of concepts that might be considered as alternative solutions to realise the identified strategy.
5. An alternatives analysis, including a full economic analysis and risk analysis, involving at least two alternative main concepts and the zero-option (doing nothing). The analysis should evaluate the proposed alternatives with emphasis on:
   - **Relevance** in relation to
     - Needs
     - Societal priorities
     - Existing portfolio of projects under the responsible ministry/agency
   - **Feasibility** in relation to
     - Proposed budget
     - Time frame
     - Quality of outputs
     - Composition and timing of elements in the total project
   - **Sustainability** in the operational phase with emphasis on
     - Long-term economic benefit
     - Financial sustainability
     - Uncertainties.
6. Rank the proposed alternatives and provide recommendations regarding decision strategy and implementation strategy for the project.

The project proposal should be prepared by the end of the pre-study phase at a time when the choice between alternative concepts is still open. It should guide decision-makers by providing a sound basis for the decision whether or not to initiate a pre-project with further investigation of alternatives.

After the pre-project phase, the project proposal should be followed up by an overall project management document, with the aim to ensure the quality of the decision basis, including cost estimates and uncertainties associated with the chosen project alternative before it is submitted for final approval and funding. The document would typically include information on the following:

1. Outline of the strategy for the project (what, when, where, how and by whom, and so on).
2. Scope of activities and assumptions.
3. Financial analysis including cost estimates.
4. Assessment of return on investment and effort.
5. Risk assessment with identification and classification of possible threats or risks during implementation and subsequent operational phase.
6. Technological assessment of feasibility, technological risk, trends and outlook for relevant technologies.
7. Environmental impact assessment (EPA).
8. Project management structure and administration.
9. Contract strategies and associated risks.

The relationship between strategic management and project management is not one-way. Morris (2009) describes how strategy implementation is accomplished with project management, but project management can also contribute to strategic management. He points out that project management's contribution 'can add value to the emerging strategy and ensure that benefits are reaped from its realisation'. The strategy is, or ought to be, a major concern to both parties, because it lays out the direction and justification for the project in a long-term perspective. Alignment of needs and objectives is a key issue.

2.6 Alignment of needs, objectives and anticipated effects

Projects in a typical management environment, public or private, can often be said to be in a 'wicked mess'. 'Projects are complex, ambiguous, confusing phenomena wherein the idea of a single, clear goal is at odds with the reality' (Linehan and Kavanagh, 2004). Engwall (2002) describes the establishment of the perfectly correct goal as a 'futile dream'. For projects to be aligned with organisational strategy – *and stay aligned* – it is important to recognise the turbulence of the environment, and build in the capability to cope with this turbulence at the start of the project. Miller and Hobbs (2005) suggest that this is equally important when the project is being undertaken by a heterogeneous consortium or group of organisations, where processes and structures need to be developed to deal with turbulence.

Therefore, flexibility needs to be built into the project strategy, both in the front-end concept stage, and at later stages. Olsson (2006) shows the need for tactical flexibility within a defined strategy, and Samset (2010) points out the danger in seeking predictability. He warns that 'prediction [can] become a prescription … it shifts the decision-maker's focus from finding the best solution to … [making] his own idea or prescription come true'. Premature lock-in to an inappropriate concept can be a major danger to project success.

At the earliest phase however, despite the remonstrances mentioned above, it is important to ensure alignment of *needs*, *objectives* and anticipated *effects*. Strategies are designed in response to certain needs. The phenomena of needs, goals and effects are closely related, and they should be compatible, in the sense that the causality or logic between them is right.

- The goal specifies the need formally in terms of scope, time and quality.
- The effect should correspond at least to the anticipated results specified by the goal.
- The gross effect should be such that the needs are satisfied.

For example, a hydroelectric power project is initiated and planned to meet a need for electric power in the market. The project is to build a facility with a stated capacity. The goal is to attain stable delivery to the grid at that level. Need and effect are often expressed indirectly in derived units. For example, the triggering need and effect can both be expressed in economic terms, in this case in production and consumption respectively. As mentioned, the design of the project should include the basic requirement of a connection between needs and effect. The goal should be derived from the needs, and the effect should at least correspond to the goal set for the enterprise. The needs must be real, to attain the anticipated effect. Basic user and market research may be used to ascertain whether this is the case. The lack of user or market adaptation lowers the chances of success.

Alignment in this context would imply the following requirements:

- Needs are expressions of a future desired situation, and should not be expressed as a specific solution to the problem at hand. Needs should be expressed in a way that allows for alternative solutions or concepts to be considered.
- The goal should specify what is to be achieved as the result of the project and expressed in terms that can be measured. An intention becomes a goal if, and only if, measures are made to fulfill it. The goal should be realistically achievable compared with the time and resources available, and the uncertainties that might affect project implementation.
- The effect expresses the degree to which the goal was achieved. The effect can only be established in retrospect. The combined or gross effect should also include any side effects that might be attributed to the project.

As they are formulated and agreed upon, objectives are a project's prime success criteria. Formally viewed, success is ensured when a project is implemented as efficiently as possible, and causes effects that concur with its objectives and correspond to the needs that triggered it. Formulating, furthering and following up objectives are a management function.

Large investment projects are complex and usually have several objectives that are more or less mutually dependent. Customarily, a hierarchy of objectives is defined to clarify how the various objectives relate to and support each other. The location of an objective in the hierarchy indicates how general or concrete it may be, but does not necessarily indicate its importance. The hierarchy displays cause-effect relationships. So, to a degree, it indicates realisability, in other words, the ambitiousness of the individual objectives.

Studies of projects have shown that ambitious objectives produce better performance, but also that performance drops when objectives are overly ambitious or completely unrealistic. Næss (2004) contends that in American literature, this is used to argue that objectives should be formulated so that they are realistic, that is, they can be achieved with the means available. In Scandinavian literature, it is asserted that entirely realistic objectives (that we are certain we can achieve) are insufficiently challenging in a continually changing world. Visionary objectives are needed to bring out the best performance. This means that overall objectives should be sufficiently ambitious to motivate, yet be realistically attainable in time. Of course, impossible objectives are purposeless.

The formulation of an objective should indicate what is needed to attain it. This is what strategy sets forth. An objective may be expressed at the project or process level, such as building and furnishing a new opera, at the organisational level, such as attaining a target market share or membership, or it may be at a national level, such as keeping inflation to a specific level.

The purpose of formulating an objective is principally to clarify the direction for that which is sought. The scope of that which is sought also needs to be stated, so one may know when an objective is attained. Multiple objectives may confuse this if they point in different directions. This is particularly evident if the objectives also conflict with each other. The development of a new oil field can hardly be justified with an environmental objective, as the investment will undeniably result in increased emission of atmospheric pollutants. Here there is a conflict of objectives. Using an environmental objective for a hydroelectric project will not give rise to such conflict, disregarding other environmental aspects, such as those associated with the damming of watercourses.

Objectives should give rise to common understanding and motivation of all parties involved in, or affected by, a project. On the one hand, this means that objectives should be unambiguous and realistic. On the other hand, to motivate, they also have to be well-founded, to the degree that they are accepted. Often, this is not possible, simply because there are differing prioritisations and needs, and because some parties may simply be opponents of the project.

Moreover, the objectives should limit the enterprise or the strategy. This means that the resources allocated and the results anticipated should correspond. Inadequate allocation of resources leads to insufficient conditions for realising an output. If the objective is overly ambitious, the anticipated effect is not achieved. Finally, objectives should be expressed in ways that permit the assessing of performance and results. This means that objectives are verifiable and measurable. Such requirements are often expressed in terms of SMART, a mnemonic for Specific, Measurable, Attainable, Realistic and Time-bound.

Practice often differs considerably from this ideal. A study of major Norwegian governmental investment projects conducted by the Ministry of Finance in 1999 found that the formulations of objectives were vague and overly ambitious, unrealistic and hardly suited to overriding management. The objectives stated were mostly activities or tasks, while there was no hierarchy of objectives between these extremes (Berg et al., 1999). The finding was hardly unique. Rather, it seems to be commonplace practice, as corroborated by several studies, including Samset (1998).

2.7 Defining project concepts, and systemic borders to guide the selection of alternatives

The generic notion of a concept designates an abstract idea or model that corresponds to something concrete in reality or in language. As used in the context of project definition, a concept is a construct of thought that is meant to solve a problem or satisfy specific needs. It should be of such a nature that several different concepts might be identified as solutions to the same problem. Further, in each specific case, all concepts ought to be real alternatives, in the sense that they are mutually exclusive. This would imply that they should have certain common features that make them suitable as solutions to the same problem. Finally, the quality of being principled means that the concepts are not just variations of a particular solution. This is illustrated in Figure 2.2, in which the investment case is distinguished from the project. The investment case is an abstract construction, or an instrument used by the financer or commissioner as a basis for appropriating funds, subsequently to be implemented in a project.

As mentioned above, the needs, goals and effects are expressions of the same phenomenon which appears at three subsequent stages: up front, during implementation and in the operational phase. The point of departure is an undesirable condition in society, here called the problem, which is the cause that gives rise to a need. To satisfy the need, there must be a positive change, here called the goal. If the goal is realised, an effect is

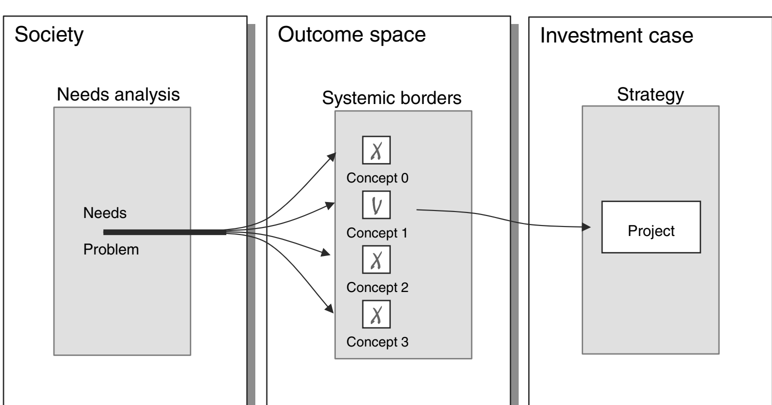

Figure 2.2 An investment case is implemented as a project after prior assessment of alternative concepts

achieved, so that the undesirable condition ceases. The original problem is thus solved.

Needs

Intervention is necessary to enable the cause-effect chain process to work. This is called the concept. It comprises the actions that enable realisation of the goal. The choice of concept is hence guided by the original problem and the expected effect. Needs, goals and effects may be defined at various levels. The less general the definition of needs, the more it will provide guidance in the direction of specific types of solutions. This introduces the risk of the project not being suitable to attain the overriding goals. There are numerous examples of needs analyses identifying one particular technical solution as a need, with goals and impact assessments being constrained to concern the implementation of a given main concept.

What this means in practice is illustrated by the following example of the planning of a transport project in an urban area suffering congestion in its main streets (Næss, 2004). At the concept level, the needs may concern reducing travel time between sectors of the urban area, prompting a more environmentally-friendly transport mode distribution and furthering of less travel-generating, car-dependent urban development patterns. The goals at this level must reflect these needs, and the effects of various solution concepts and their relevant combinations must be assessed.

When a main concept, such as an urban tramway system, is chosen, demand analyses, goal setting and impact assessment will focus on ensuring that it is designed and implemented in the most socially acceptable manner. Needs and goals at this level may, for example, be concerned with attaining high passenger volumes, financially favourable and environmentally-friendly routing, and with contributing (through the locations of stations) to urban development in targeted areas.

Whenever demand analyses, goal setting and impact assessment at the strategic level are skipped over, and, instead, the project level is initiated within the framework of a given solution, the initiators' needs can easily be confused with those of society. Hence, the wishes of special interest groups for financial gain, prestige or ideologically preferable solutions may take precedence over top-down political goals and the needs of broader social groups. Such constraints on planning at a premature stage are a commonplace weakness in the formulation of large, public investment projects.

Problems

The assumed effect is decisive to the choice of concept. But often the starting point is an undesired condition or a problem that initiates a search for a solution. In such cases, different aspects need to be considered in determining a concept.

First, it is essential to focus on existing problems, rather than assumed, probable or future ones. Secondly, problems should not be expressed as the absence of a particular solution. For example, the farmer's problem is not that he does not use pesticides, but that his crops are infested by pests. So there are considerable differences in the way the problem can be approached. There are many alternatives in addition to spraying the crops. The problem therefore ought to express an existing undesirable condition, and it needs to be concrete. If the problem concerns traffic congestion, stating it in terms of too few traffic lanes points to just one solution.

Expressing the problem in more general terms allows latitude for several alternative solutions. Instead of directly dealing with the problem of too few traffic lanes, one may seek other indirect solutions, such as the routing of some traffic to other streets, or the use of other means of transport. All are solutions to the overriding problem, which in this case deals with traffic flow.

This example underscores another aspect, namely that the concepts chosen should be dissimilar. Nonetheless, they would have to share common characteristics suited to solving the same problem. If that is not the case, they are merely variants of one set solution. Of course, the final choice of solution also needs to be assessed. But that should happen not at the concept level, but at the project level, after the concept has been chosen.

The alternatives also have to be genuine, in the sense that they exclude each other. An over-simplified example is that if you want to start a family and have found two potential spouses, you are faced with two mutually exclusive alternatives, unless you wish to be a bigamist. If at the same time, you have three job offers, each in a different city, you have $2 \times 3 = 6$ mutually exclusive alternatives (Løwendahl and Wenstøp, 2002).

We have no solid tradition for identifying truly alternative concepts as bases for designing projects. Most often, the choice is made at the starting point, and assessment is mainly at the project level. For example, in a study of a new national museum of art, architecture and design in Oslo, the choice was between alternatives that all featured co-location of the museums on the same site. The alternatives differed in distribution of space above and below ground, remote or central storage, and the like. So, obviously the concepts were merely variations on the same solution. Genuine alternatives would, for instance, look more closely at which museums should be co-located, and where, in the city or in the country, they should be located. These aspects could then be weighed against the increased benefit envisioned. In this case, the problem, the anticipated effect and the benefit were all vague and gave no clear guide for choice of alternatives. Consequently, there was no substantive discussion of the reality of the proposal put forth.

The reason for the requirement of genuine alternatives is that it would stimulate creative thinking and thereby increase the chances of a good choice. Experience suggests that this is worthwhile. At the same time, we know that innovative thinking is no guarantee that it will happen. So there is a need to assess several alternatives. Moreover, these alternatives ought to be assessed against the zero option, to avoid ending up with something that turns out to be worse than what already existed.

There are no commonly agreed guidelines for best practice for the systematic identification and selection of unique and different solutions to a problem, here termed concepts. Also, there are not many studies that offer a systematic inquiry into how this is done in practice, the range of alternative concepts identified, and which ones are chosen. One such study, which is not conclusive, but which might offer some clues on the state of affairs in the Norwegian setting (Minken et al., 2009) concluded:

- The alternatives being considered were merely different technical solutions to the same problem, rather than mutually exclusive concepts.
- The tendency was that the preferred technical solutions were used to guide the choice of concept rather than vice versa.
- The link between the choice of concept and the underlying societal need or problem was often not made explicit.
- The project-triggering need or problem would frequently be confused with other perceived needs or problems.
- The anticipated, desired effect of the project was often confused with various positive or negative anticipated side effects.
- The zero-option, or the low-investment alternative solution, was often not identified, formulated or considered in relation to the alternative concepts being analysed.

In other words, there is a strong tendency to choose the initial concept and stick to it. Experience also suggests that we tend to prefer incremental improvements of an inferior solution rather than fundamental change. Also that there is an overwhelming inertia: once set in motion, a project, having been implemented, is almost impossible to stop. On the positive side there is much to suggest that the window of opportunities is usually larger than envisioned, and mainly unexplored.

The window of opportunities is exactly the same as that which is termed the outcome space in Figure 2.2. It is delineated by the systemic borders that will define what can be identified as possible concepts. These borders would, to a considerable degree, translate into what would subsequently be the investment case strategy or the strategic frame for the project. Laying out the systemic borders at an early stage is therefore much more essential than formulating objectives according to the SMART requirement, which would eventually have to be done later, when the project is implemented.

One challenge would be to apply different perspectives in the quest for sensible conceptual solutions, such as (1) the retrospective, looking at trends in the past, (2) the normative, identifying the desirable and useful,

(3) the explorative, using projections to identify what is possible, (4) the interdisciplinary, to identify opportunities, uncertainty and risk, and (5) the conterfactual, that is, to take a second look at the zero option, which would usually also represent the lowest cost alternative.

2.8 Front end analyses with limited information – strengths and weaknesses

When projects fail strategically, it is likely that the problem can be traced back to decisions in the earliest phases, when the initial idea was conceived and developed. What happens during the front-end phase is therefore essential for a project's success. There are different ways to improve quality-at-entry, for example by challenging initial ideas, extracting and making use of previous experience from similar undertakings, and consulting with stakeholders.

In most cases, the key issue at the earliest stage is to shed sufficient light on the underlying problem that would provide the justification for the project, and the needs that the project is meant to satisfy. Detailed information about possible alternative solutions is less relevant. This illustrates what seems to be a major dilemma, since most projects originate as one specific solution to a problem, while the problem itself may not be analysed sufficiently, and alternative solutions may not have been considered at all. Typically, the preferred concept originates in the mind of one individual, based on intuition and experience, rather than systematic analysis of problems, needs, requirements, and so on. Most of the information generated is associated only with the initially identified solution. A second dilemma is that this information, which may be very detailed and specific, tends to lock decisions into the initially preferred concept – to the extent that this will inevitably be the one that is finally chosen. It is all too rare that alternative concepts are identified and analysed to the extent that they get a fair trial in the subsequent decision process.

The gravity of this is obvious, because this is exactly the stage when the fundamental choices are made, when uncertainty is at its highest, freedom to choose is at its optimum, and also when available information is most restricted. Adding information, therefore, makes sense – but only to a certain degree. However, some available information might not be relevant in the decision-making process, and information that would seem necessary will not be available until later.

The crucial issue is not the volume, but what type of information is needed. In the initial phase of a project the priority is to establish an overall perspective, and to analyse the problem in its context, considering the needs and priorities of stakeholders, users and affected parties, in order to come up with a sensible strategy. Opportunities and risks should also be considered. Experience suggests that creativity, imagination and intuition can be more valuable at this stage than large amounts of data. Therefore, lack of information in the earliest phase may not necessarily be a problem: it can even be to our advantage. Many planners have learnt that in the early phase of a project, it can be of considerable help to operate primarily with qualitative expressions, and only to a very limited degree with quantitative data.

Scheibehenne and von Helversen (2009) conclude that 'less can be more', and that having less information can actually help decision-makers. A restricted, but carefully selected, sample of relevant facts and judgemental information may be an advantage in the effort to establish a broad overall perspective, and identify and test alternative strategies. Omitting details and less relevant information helps avoid 'analysis paralysis', when decision-makers are presented with large amounts of detailed information too early in the decision-making process. Furthermore, accurate quantitative information tends to quickly become out of date. This is a problem, since the front-end phase in major projects may last for years, even decades. The phenomenon can be coined the 'half-life of information' (Samset, 2009). For instance, exact information about the demand in a fast developing market will have limited value after months, or even weeks. We cannot make a valid prediction of the actual demand three years into the future, but might be pretty certain that it will remain for a long time, and therefore rely on it in strategic planning up front. In other words, carefully extracted qualitative information about a well thought-out project concept could provide reliable and valid input to the decision for the whole of the front-end phase.

What is of interest here is the principle that decisions need to be based on a foundation of assessment. The solidity of assessment depends on the selection of decision criteria, and the underlying information used to substantiate these. Each decision criterion needs to be substantiated with a number of parameters or indicators, producing an information hierarchy. The principle is valid, however, regardless of the type of information used. It can be factual or judgemental, quantitative or qualitative. For the assessment to be useful and trustworthy, the selected decision criteria need to both capture the essential aspects that ought to be considered, and be sufficiently comprehensive. Underlying supporting information needs to be valid and reliable. Reliability is a question of whether you can trust the information, this being determined by the quality of sources and the way it is collected. Validity is a term used to express the extent to which an indicator provides information that corresponds with what is to be measured. The type of indicators chosen will determine the validity of the assessment. Using several indicators at the disaggregate level helps improve validity at the aggregate level, providing that each indicator is valid. In most projects the five success criteria mentioned at the beginning of this chapter could be applied.

Clearly, upfront decision-making is not simply an issue of adding masses of information. As is illustrated in Figure 2.3, the cost of collecting information

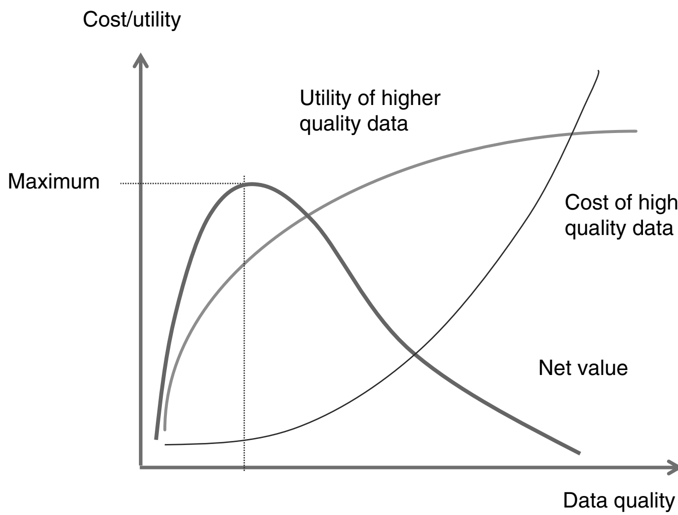

Figure 2.3 Trade-off between the amount/quality of information and the acquisition cost

on a specific topic usually increases progressively with the amount of information collected. This is because more information requires more in-depth studies, or more wide-ranging information searches. On the other hand, the gain in utility of additional information tends to decrease. This is because there is usually a critical amount of information that is needed to obtain the necessary insight in a situation. Additional information will be of limited use. Maximising the utility/cost ratio will therefore set a limit to the amount of information that is useful. The maximum would typically be quite a bit to the left in the diagram, which would come as a surprise to many planners and decision-makers alike.

Adding to this, it is useful to point out that decisions may be affected in different ways:

- More by subjective or political priorities than by rational analysis.
- By priorities that may change over time.
- By changing alliances and pressure from stakeholders.
- By how information is interpreted and used by different parties.
- By the existence of disinformation, and so on.

Nevertheless, when taking the above reservations into account, the fact remains that the soundness of the documentation that constitutes the basis for decisions, or the quality-at-entry, has proved beyond doubt to be of vital importance for the outcome of investments.

2.9 Front-end estimation of cost and benefit

In project management, cost is the management parameter that attracts the most attention during the front-end phase and implementation. Some would argue that other parameters, such as project relevance, deserve more attention. In many projects, even large cost overruns have little effect on long-term profitability. Yet in other cases, cost overruns may comprise a death blow.

Cost is eminently suitable as a management parameter, because it is expressed quantitatively with great precision, and is continuously updated as a part of all transactions in a society. Costs are suited to making participants accountable, to gauging progress and result attainment and to comparing expenses with income to assess economic viability over time.

The prime focus is on cost overruns related to budgets. Major cost overruns can be serious, not least because they may trigger prolonged conflicts between the responsible parties over who shall pay the bills or how costs shall be divided. But the type of costs involved in budget overruns is often only the tip of the iceberg. In innumerable cases, the budget increase in the front-end phase, from the first cost estimate to the adopted budget, is much greater. An interesting observation is that, for projects in general, the initial cost estimate, almost without exception, is lower, not higher than what is eventually decided for the final budget.

In principle, there are four causes of cost overrun. They occur successively in the course of the front-end phase and the implementation of a project:

- Initially, planners and decision-makers wilfully estimate low costs to increase the chances of a project being considered.
- The information base and the cost estimation methods are unsatisfactory.
- Unforeseen situations necessitate changes, for instance regulations imposed by the public will increase costs.
- Inadequate cost management when the project is implemented.

Of the four, the first often has the greatest effect in terms of increased estimates. In many cases, the reason is deliberate underestimation to gain consideration. The principal point is obvious: get on with the agenda, because the longer a project has been in the budget process and the further it has been studied, the greater the chances that it will be approved and implemented. Hence, under-bidding price in the first round can be decisive. Moreover, even very large budget increases in the front-end phase seldom have consequences for the responsible parties. Of course, it is the final cost estimate that is most relevant. So, what is the problem? – Evidence pretexts including "we only wanted to start the discussion" or "a better estimate wasn't possible because we lacked information". Decision-makers are surprisingly tolerant of what gets by early on, in spite of it arguably being the most decisive part of the entire project process. The same is true of the cost estimates of projects that have passed the first enquiry and are on the agenda. It has become so commonplace that one no longer speaks of systematic underestimation, but rather of normalisation of deviation (Pinto, 2006). In other words, a culture has evolved with lax views of honesty and compliance, to the extent that decision-makers no longer see a reason to trust the figures put forth in the front-end phase. Hence, the possibilities of controlling and influencing go down the drain.

This is serious. It means that poor projects slip through, when they should have been rejected, had a realistic estimate been put forward up front. Needless to say, this is a far greater problem than marginal budget overruns in the implementation phases of projects.

Systematic underestimation appears to be greatest in public projects, particularly so in local projects proposed for national financing. Hence, the phenomenon has become known as *strategic underestimation*. The principle of it is shown in Figure 2.4. The dots indicate cost estimates in the front-end phase. The plot often ends up in some sort of S shape. Cost estimates are low in the initial period before the first systematic estimates are undertaken. With time, the information basis improves, and the first surprises come to light. This in turn triggers greater focus on the effort, demands for greater

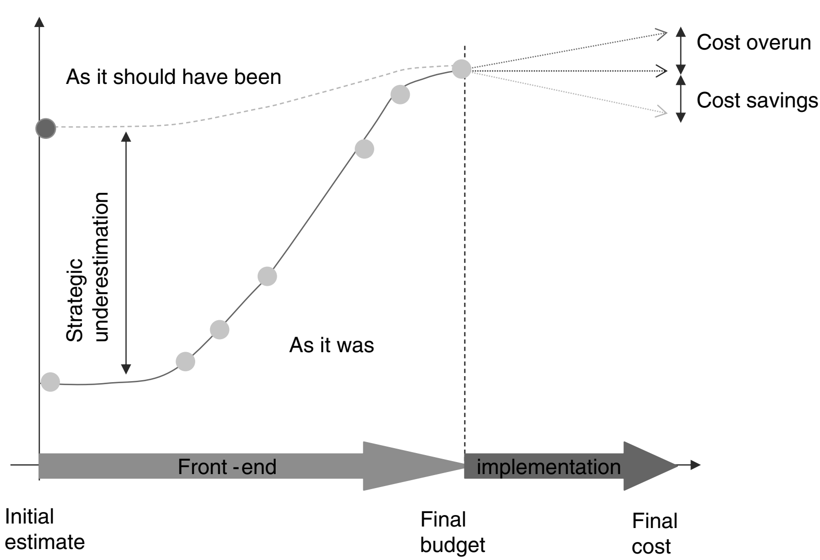

Figure 2.4 Early underestimation relative to what is the finally approved budget is often far greater than the cost overrun

openness and realistic estimates, often by independent appraisals, and the cost estimate rises rapidly to the level at which it should have been at the outset. Thereafter, there are minor modifications, until the final budget is approved.

The dashed line uppermost illustrates the development of cost in the front-end phase as it should have been, had the process started with an estimate at a realistic level. The difference between the dashed and solid lines is called strategic underestimation. In many cases, this is called tactical budgeting, which is a misunderstanding, since what is at stake here is the choice of the project concept, which is a strategic choice.

The development of cost in the implementation phase is indicated by two dots at the upper right, designating cost overrun or cost savings. Strategic underestimation, as it is used here, is often large and many times the cost overrun. Cost overrun in relation to budget is typically in the range 10–100 per cent. The final budget is often several times as high as the first estimate, in some cases 10–20 times higher.

A disproportionate amount of research has focused on the problem of cost overruns in projects. The difference between budget and final cost is erroneously designated by some as strategic misrepresentation (Flyvbjerg et al., 2003). In light of the discussion above, this might be called tactical cost estimation. Here we may distinguish between two phenomena. Strategic underestimation in the front-end phase influences the actual choice of project. Improving cost estimation in the front-end phase is conceivably far more important than gaining control of cost overruns in implementation, as it may lead to fewer poor projects being chosen, thereby increasing the overall benefit of investments.

Adding to this picture, much the same problem that can be seen in cost estimation also applies to estimation of the anticipated utility or benefits of projects, as illustrated in Figure 2.5. Strategic overestimation of utility is common, for much the same reasons as mentioned earlier.

It is reasonable to assume that project utility is often more difficult to foresee than cost. The final effect of a project may be assessed only some time after it has been handed over, and many aspects difficult to predict affect user and market responses. In the front-end phase, utility is estimated on the bases of parameters such as traffic volume, turnover, market response and the like. In some cases, the estimates are revised in the front-end phase as more information is acquired. The moment of truth arrives when the project has been implemented and user response is evident. Initial response is often much lower than forecasted. Thereafter, response goes up and perhaps flattens out during the first few years, indicating an S-curve. The gap between the actual response curve and the prognosis amounts to what is here called strategic overestimation of utility.

The combined result of overestimated benefits and underestimated costs, when expressed in terms of a benefit/cost ratio, could obviously be exceedingly

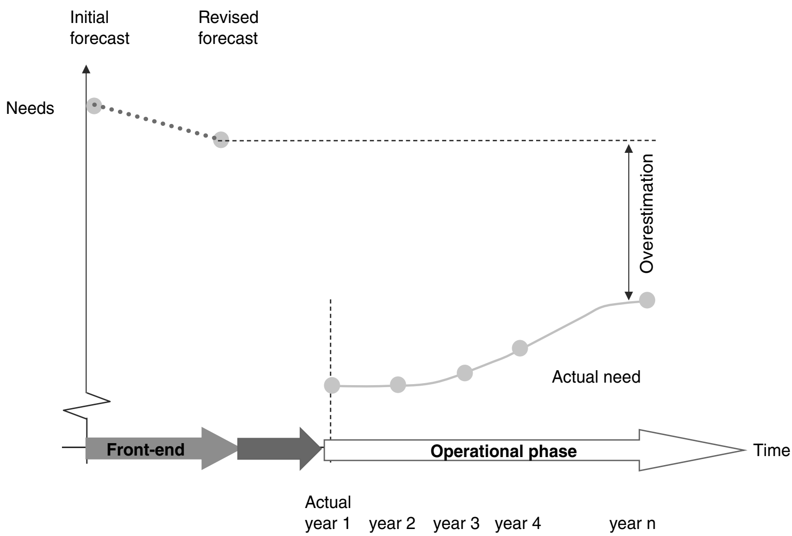

Figure 2.5 Strategic overestimation of benefits

misguiding for decision-makers and their ability to decide on a sound choice of project concept. In numerous infrastructure projects in the USA and Great Britain, the actual benefit/cost ratio turned out to be 15– 25 per cent of that assumed at the time funding was approved (Flyvbjerg et al., 2003). This implies that the benefit/cost ratio was prospectively overestimated by a factor of four to seven. That said, it is worth giving heed to the possibility that going backwards in time in each of these projects, to the earliest cost estimates and the earliest prognoses on which utility assessments were based, would reveal far greater exaggerations of benefit/cost ratio and economic viability.

2.10 Financing mechanisms for projects

A necessary part of every project proposal is a plan for how to meet the project's financial obligations during each period of its life cycle. Firstly, the project needs capital as an input for production and to finance the high and negative cash flow during the construction phase. Secondly, the subsequent payback throughout the operational phase is not necessarily in financial terms. For example, a public road is expected to generate benefits in terms of time savings and improved safety conditions, which are benefits that are not easily sold in a market. This is illustrated in Figure 2.6, in which the dashed line is the *private* (financial) benefit and the solid line is the *social* benefit of the investment.

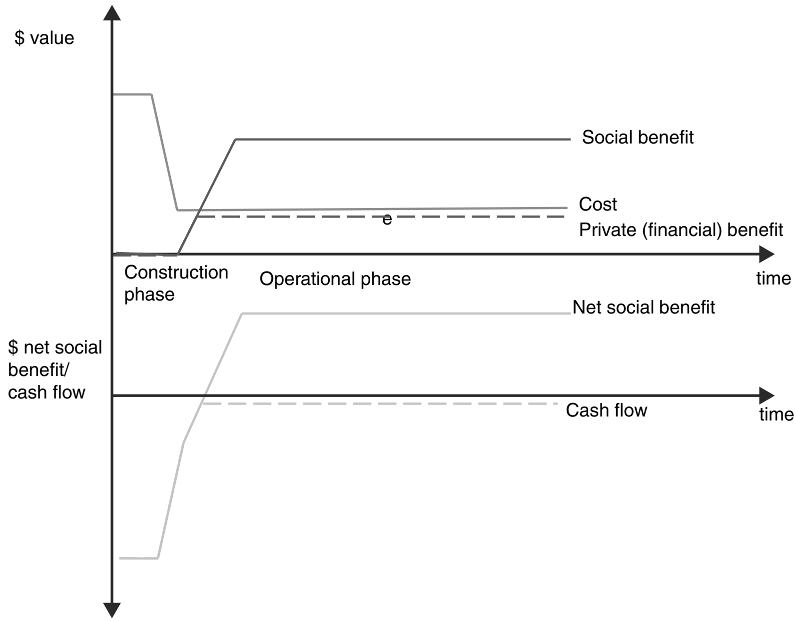

Figure 2.6 Costs and benefits over the project's life cycle

The Asian Development Bank (1997) suggests that the financial analysis should focus on three questions:

1. Are adequate funds available to finance the project's expenditure?
2. Is it possible and desirable to seek recovery of some of the project's costs from the beneficiaries?
3. Is there an incentive to ensure a continued participation from the central stakeholders in the project?

In this chapter, the focus is primarily on public projects, particularly infrastructure projects. State government funding is often the principal source of funds to meet investment and operating expenditures. Assuming that these funds mainly come from *extra taxes*, the marginal cost of taxation should be estimated. Moreover, a choice must be made as to whether it is possible and desirable to let users bear some of the financial burden in the form of *user fees*. If the local community as a whole is the beneficiary, one option is to seek *co-funding from local government* (which in turn will be paid by local taxes). Another funding option for public projects is to bring in some form of *private capital*. Arguments for the latter are that public budgets are tight, and that private capital may be considered more cost-efficient.

These alternatives will be discussed in more detail below, and we will argue that they may have an impact on the project's overall performance, both in strategic and tactical terms.

2.11 General taxes versus user fees

The cost of public funds

The collection of taxes, whether by central or local government, creates an efficiency loss in the economy through its impact on relative prices, and on people's behaviour. In addition, there are administrative costs associated with tax collection systems, termed 'the cost of public funds' or 'the shadow price of taxation' (Grønn, 2003; NOU 1997: 27).

Some taxes are more distortionary than others. For example, personal income tax normally induces a high efficiency loss because it leads to a decrease in production. Sales taxes are somewhat less distortionary, whereas property tax is as close as we can get to a 'lump sum tax', which exhibits virtually no effect on people's behaviour. Some taxes even *increase* economic efficiency. For instance, 'green taxes' are introduced to correct a market failure. It is possible to estimate the efficiency loss from the mix of all taxes in an economy, thereby estimating the marginal cost of increased taxation for financing new projects. In Norway, for instance, which is a country known for a rather high income tax level, a 'conservative' estimate of the cost of public funds is approximately 20 per cent (Finansdepartementet, 2005; NOU, 1997:27).

The deterring effect of user fees

The main alternative to general taxes is a 'tax' linked directly to the use of goods, that is, a user fee. However, for this to be a realistic option it must be possible to identify and charge users, and to reject those who do not pay. Most infrastructure projects have some elements of a 'public good'.[1] Public goods are characterised as being: (1) *non-rival in consumption*, implying that once provided, the marginal cost of giving another consumer access to it is zero, and (2) *non-excludable in consumption*, implying that it is impossible, or very expensive, to prevent anyone from consuming it. Examples of pure public goods are defence infrastructure, lighthouses and to some degree, transport infrastructure.[2] It follows that public goods are associated with a 'free-rider problem'. Potential investors will not be able to obtain the necessary return on their investment, which is why free and uncoordinated markets are not able to provide public goods. This is a paradox for cases in which the project is highly socially desirable. In such cases, public funding through general taxes is therefore normally the only viable option.

When goods are excludable, user charging schemes may be established. The basic principle from welfare economics is that users should pay the marginal cost of providing the good or service to them. In the case of 'private

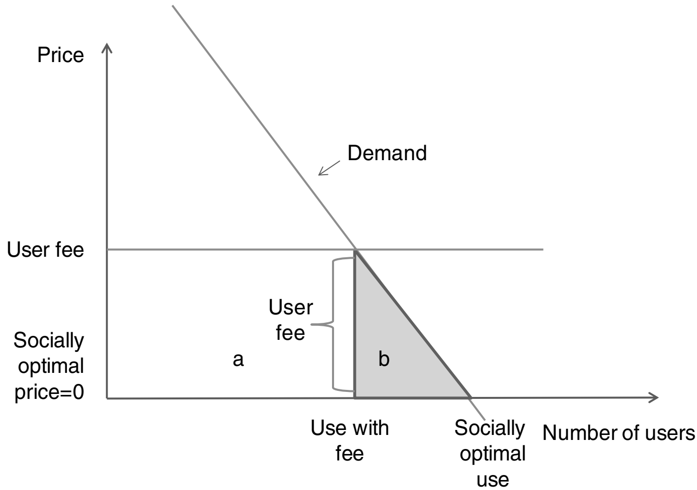

Figure 2.7 Deterring effects of user fees

goods' such as health care and education in which marginal costs are substantial,[3] user fees may provide an efficient way to prevent overconsumption. A public infrastructure is typically characterised by high costs up front and negligible marginal costs, which implies that the optimal fee is close to zero. Any attempt to set a fee that exceeds the marginal cost will have a distortionary effect similar to those of other taxes (NOU, 1997:27). This is illustrated in Figure 2.7 below; the socially optimal allocation is one where the price is zero and all users are being served. The impact of a tax is twofold: (1) area 'a' illustrates the tax revenue, that is, a transfer from users to the infrastructure owner, while (2) area 'b' represents the social loss in terms of foregone benefits for users who exit the market.[4]

Which are less inefficient, user fees or general taxes?

Based on the above discussion, it seems that neither taxation nor user fees is a perfect choice as long as the marginal cost is zero. Below, we briefly discuss two situations in which user fees could be preferable (and vice versa):

- *Inelastic demand:* The size of the efficiency loss of a user fee depends on demand elasticity with respect to the fee. If demand elasticity is low (illustrated by a demand curve with a steep slope), users have few alternative options except to pay the fee and continue to use the infrastructure. In such cases, the efficiency loss will be low, as shown in Figure 2.8.
- *Negative external effects*: In some cases, using the infrastructure entails negative external effects not considered by users that can lead to overconsumption. For example, transport may have negative impacts on

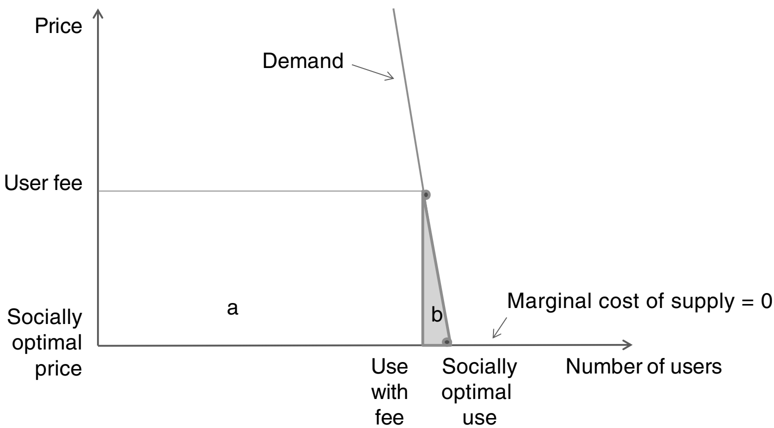

Figure 2.8 Inelastic demand

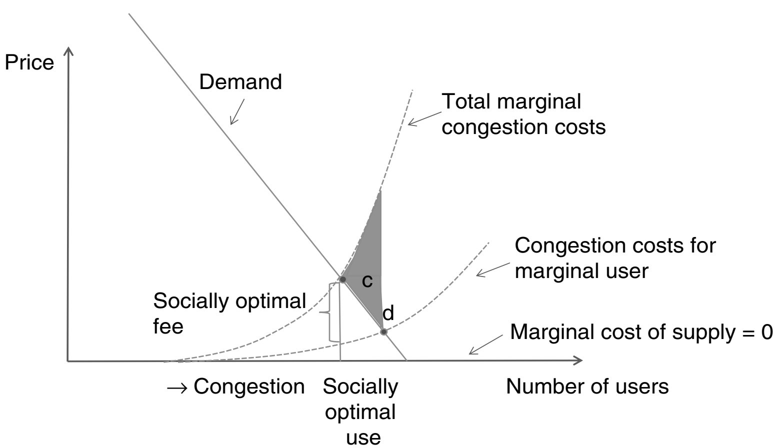

Figure 2.9 Pricing of congestion

health, safety and the environment. Not least, transport systems impose substantial costs on society, due to congestion (see for example Goodwin, 2004). The marginal congestion cost typically increases with the total number of users in the system, which is illustrated in Figure 2.9 below (based on Grønn, 2003). Area ‘c’ shows the social loss without pricing. Introducing a user fee during peak periods may yield a considerable social surplus, and according to NOU (1997: 27), congestion taxes should *always* be implemented even before the need for increased capacity is considered.[5]

Administrative costs

User fee collection requires a collection system. Amdal et al. (2007) studied the operational costs of toll road companies in Norway, and concluded that some projects are unsuited for private finance, as the operational costs comprise too high a proportion of revenues, up to 40 per cent. Welde (2011) found that operational costs are difficult to predict ex ante, and often turn out to be higher than estimated. On the other hand, general taxes are collected through existing collection systems and the marginal increase in their costs is negligible. While this has been an argument against toll roads hitherto, toll collection costs are expected to decrease when electronic collection systems are adopted.

The benchmark for user fees should be the general costs of taxation, which, as explained above, have been estimated to be up to 20 per cent of revenues in Norway. This means that if the costs of user fees (i.e., the sum of the efficiency loss and administrative costs) could be kept below 20per cent, then these could be a good solution.

2.12 What is 'fair' funding?

Society cares not only about efficiency, but also about how resources are distributed. This explains why governments often provide not only public goods, but also education and health care, and why tax systems are used for redistribution purposes.

Different financing mechanisms have different distributional effects. Conventional theory has suggested that user fees have a tendency to be regressive, that is, to comprise a larger proportion of the income of the poor compared to the rich. Recent research on congestion charging in the transport sector has indicated that the opposite could also be true. In general, equity effects depend on the choice of charging scheme, including revenue recycling (Levinson, 2010).

Furthermore, there are different views on what is 'fair' or 'reasonable' with regard to cost sharing. Is it reasonable that users pay? Or are infrastructure goods to be considered 'necessities' that everyone should have a right to consume regardless of their income? We will leave this discussion to the politicians. Nevertheless, we realise that it is important to consider these issues before making a choice of financing mechanism. A project's relevance and sustainability depends on it being accepted throughout society, and this includes the sharing of the financial burden.

2.13 Local beneficiaries and perverse incentives

Infrastructure projects are often 'local public goods', initiated by stakeholder groups in a local community. There could be many reasons why local infrastructure projects should be funded in part by state government budgets, such as free rider problems, optimal risk sharing, distributional concerns and so forth. Different types of subsidies are available, for example, central/local government cost sharing, 'soft loans' (an interest rate below the market rate), government guarantees, and so on.

However, this induces a risk of a market failure known as the principal-agent problem in economics and contract theory.[6] This situation is characterised by: (1) a *conflict of interest* between the state government (the principal) and local agents, and (2) *asymmetric information*, in which the local agents know better about their real needs and ambitions. The state government is assumed to act on behalf of the entire nation, seeking the best projects within a national perspective. By contrast, local promoters only consider the benefits and costs accruing to them. A region with a low share of total taxes (for example, due to a small workforce) will regard a nationally funded project as being practically free of charge (Helland and Sorensen, 2007). Privileged *individuals* are particularly eager, for example, a landowner who will benefit from increased land prices, a local politician who will increase his popularity among local voters and so on. Their arguments are typically formulated in terms of 'societal needs', although privileged groups have incentives to overestimate benefits, while underestimating costs and risk. It is not only local agents, but also planners in public organisations who may have a personal interest in the result. This leads to the 'survival of the unfittest', in which it is not the best projects that are built, but the most misrepresented ones (Flyvbjerg, 2007).

Moreover, a project's success ex post often depends to a certain degree on local agents' efforts, although the state government cannot know whether these agents will make an effort once the funding is raised. These challenges are well known from development aid, and often increase within the layers of a hierarchy (Ostrom et al., 2001).[7]

This problem arises because state government does not have enough information to separate good project proposals from bad ones, and because agents are protected from the consequences of their own actions. One obvious solution is to demand co-financing from local communities, the thinking behind this being that agents will not promote bad projects if they have to bear the costs. Additionally, transparency and broad involvement in the pre-study phase is essential to ensure that local agents really do represent their entire community.

An alternative explanation for the disproportionate distribution of national funding of local projects is the political parties' desire to maximise their numbers of seats in the national assembly (Helland and Sorensen, 2007). Parties will allocate more funds to districts with high voter mobility, and with many voters on the ideological cusp. Furthermore, districts with a high ratio of parliamentary seats to voters will be favoured. Even so, local (co-)financing here may be an appropriate measure. Local communities will not accept a useless 'gift' if it comes with an invoice.

2.14 'Project-based funding' – with private capital?

The discussion thus far has primarily been in relation to the potential of a project in terms of a social surplus ('strategic potential'). However public projects involve another, special challenge, related to tactical performance. The lifetime of most infrastructure projects is several decades, with an implementation phase that alone amounts to five years or more. For an infrastructure administrator to develop and operate major projects in a time and cost-efficient way, a high degree of predictability and flexibility is essential.

In the real 'public budgeting' world, however, there are impediments to the optimal planning of major projects. In particular, government budgets are tight, and grants are only available on a year-to-year basis. The result of this is often a prolonged construction phase, less returns to scale and a later realisation of benefits. According to Vista Analyse (2010), the economic cost to society of this year-to-year principle amounts to 22–25per cent of construction costs.

Mechanisms exist to overcome the problem by providing all the necessary funding at start-up, to be spent by the project administrator in a time-optimal way. These mechanisms are categorised as 'project-based funding', and normally involve the use of private capital (Vista Analyse, 2010 and Econ Pöyry, 2008). Some examples of this are:

- Multi-year budgeting (politically, but normally not legally, binding).
- State government loans to public agencies, or allowing them a right to enter into loan agreements in the financial market (normally requires a change in organisation, for example to a state-owned enterprise).
- Separating out the projects as a legal unit, with a right to take up loans.
- Leaving the development and operation of the infrastructure entirely in private hands (privatisation).
- Creating a partnership with a private contractor who takes a major share of the responsibility for finance, development, and often maintenance and operation as well.

All of these models have been tested, and the results are mostly positive. Britain was a pioneer with public-private partnerships for infrastructure projects, such as roads and rail. One important experience is that such contracts work best when the entire project life cycle is taken into account in the contract (so-called life cycle models) and when the transfer of risk to the private party is 'real'.

As pointed out by the OECD (2008), there is an increasing gap between the demand for infrastructure and the available public finances in most OECD countries, due to ageing populations, increasing health expenditure, and so on. Hence, most countries have no choice other than to make more intensive use of private capital to help ensure the provision of infrastructure in the future. However, private investors will only consider their own payback and not the total social benefit, so in the end we are left with taxation and user fees as the ultimate (amortisation) alternatives.

2.15 Conclusions

It all starts with the project proposal, and challenges in developing the proposal are abundant and complex. One is to avoid problems such as tactical budgeting, whereby responsible parties tend to underestimate costs in order to increase the chance of obtaining funding for a project. Another challenge is to increase the chance that the most relevant project concept is identified. It is also crucial to ensure a transparent and democratic process, and to avoid adverse effects of stakeholder involvement and political bargaining. A major challenge is to make the process predictable, when the front-end phase may last for years. Many of the strategic performance problems facing investment projects can be interpreted in terms of deficiencies in the interaction between analysts and decision-makers in the front-end process.

Although we can appreciate the rational decision model as an ideal, we are fully aware of the limitations facing planners and decision-makers in real life: time is limited, information is sparse and stakeholder preferences vary and often conflict. But above all, we live in a political reality that is not rational, or even reasonable, and is only to a limited degree predictable. What can be achieved by rational analysis and planning is accordingly limited.

The bounded rationality model (Simon, 1979) holds that problems and decisions should be reduced to a level at which they will be understood. In other words, the model suggests that we should interpret information and extract essential features, and then make rational decisions within these boundaries. We can hope, not for a perfect solution, but for one that is 'good enough', based on the limited abilities of the analysts to handle the complexity of the situation, the ambiguity and the limited information.

We must then take into account whether or not the analysts' advice is applied by decision-makers. In the ideal model for decision-making, decision and analysis follow in a logical, chronological sequence that eventually leads to the selection and go-ahead of the preferred project without unforeseen interventions or conflicts. In reality, the process is complex, less structured, and affected by chance. Analysis may be biased or inadequate. Decisions may be affected more by stakeholder priorities than by rational analysis. Priorities may change over time. Alliances and pressures from individuals or groups of stakeholders may change. Information may be interpreted and used differently by different parties. The possibility for disinformation is considerable, and so on.

Under any circumstances, starting with a well-formulated strategy may be an advantage, but is no guarantee of the best choice when the final decision is made. In some cases, the result may be entirely different from the initial choice. In other cases, the lengthy and unpredictable decision process may result in an optimal decision, even though the initial choice was entirely wrong.

A financial analysis is a crucial part of every project proposal, not least in public infrastructure projects. Different financing mechanisms can be applied under different circumstances, and their features, strengths and weaknesses vary.

Private capital is often expected to improve project flexibility and tactical performance. Ultimately however, a public project must be financed either by taxes or by user fees. Both create an efficiency loss in the economy, as well as administrative costs. User fees will normally reduce demand ex post and thereby benefit realisation. This option should therefore be considered only in cases of inelastic demand, negative external effects and/or highly efficient (electronic) collection systems.

Cost sharing between government and users/beneficiaries is also an issue. The risk of local agents' 'perverse incentives' could be an argument for local co-funding. The local share will ultimately be paid by local taxes or user fees.

A project's relevance and sustainability depends heavily on it being accepted throughout society. This includes the sharing of the financial burden. Therefore, the distributional impacts of different financing mechanisms should always be considered.

Notes

1. See any textbook on the subject of economics, particular in relation to public finance, for example, Rosen (1995).
2. Classification of a good as excludable or not is not absolute, as it depends on the state of technology, on costs and on legal arrangements.
3. The use of the labels 'public' and 'private' does not necessarily mean that it must be provided by those sectors, respectively.
4. We have assumed a uniform user fee. If price discrimination is possible, less distortionary solutions may in theory be found (Rosen, 1995).
5. However, as pointed out by, for example, Parry and Bento (2001), this conclusion may be questioned in the presence of pre-existing distortions *outside* the transport sector.
6. See, for example, Rosen (1995).
7. A related challenge is the Samaritan's Dilemma, which was first identified by Buchanan (1975).

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3
Assessing the Proposal

Chris Chapman

3.1 Introduction

Assessing a project proposal from a governance perspective should address *all* key assumptions made when developing the proposal. Key assumptions include both working assumptions and framing assumptions, be they explicit or implicit. Working assumptions are assumptions of convenience, which can and should be tested for robustness. Framing assumptions can only be tested using more general framing assumptions. The effectiveness of governance is limited by the framing assumptions it employs. The framework used by this chapter to address all key assumptions is an approach to project uncertainty management as outlined in Chapman and Ward (2011).

Uncertainty and associated opportunity and risk are central to effective project shaping and execution, so the quality of uncertainty management is a central concern. However, it is the quality of the overall evaluation, direction and monitoring of activities, to ensure enterprise objectives and constraints are met, which governance has to address using uncertainty management concepts and tools.

The opportunities and risks involved in projects require an uncertainty management framework to interpret conventional risk management framing assumptions and all related project management assumptions. The basis of a suitable framework will be explored, and the implications of some alternatives. However, first we need to consider project lifecycle frameworks which capture all stages of project evolution and relate that lifecycle to corporate operations and strategy, to address the timing of project governance and associated learning loops.

Building on this, multiple criteria require a clear framework which embraces relatively straightforward trade-offs, like capital cost and construction duration trade-offs, non-measurable criteria, such as trust, and difficult criteria to address in terms of trade-offs, for instance environmental damage and loss of life. Operational frameworks for understanding the implications of alternative choices will be addressed. They are needed for the assessment of basic organisational objectives, environmental issues, economic issues, and linked ethical and political issues. Whole lifecycle concerns involve discounting frameworks, which will be linked to the multiple criteria framework. A set of practical examples will be used, some simple, some more complex.

Trade-offs will be considered early on, but difficult, and very difficult trade-offs will be addressed towards the end. Early attention will be given to some competence and trust concerns. However, the overall role of trust in governance will be left until later. A concluding summary section will provide an outline of what needs doing for those who want to apply the concepts developed earlier.

The rationale for the ordering of material throughout this chapter is to build an overall understanding in the easiest sequence to explain. For example, all trade-offs are a central concern for governance – in terms of both the full implications of the specific choices made and the quality of the processes used to make them, but very difficult trade-offs are addressed towards the end, because the shadow price concept used can be linked to earlier treatment of multiple criteria, discounting and constraints.

3.2 Basic framing assumptions and concepts

Projects in a corporate context

Project governance has to view project management as an integral part of three related perspectives on management: corporate management, operations management and project management. Project management is the change management component. Projects in this broad sense include programmes, and portfolios of projects are part of the concern. The way projects and project management relate to operations management and corporate management is a central concern.

Governance aspects of a lifecycle framework

Table 3.1 portrays the relationship between the corporate, operations and project perspectives on management just noted, and a generic lifecycle for the asset created by a project characterised as four traditional basic stages: conceptualisation, planning, execution and delivery, and utilisation.

The conceptualisation, or concept stage, encapsulates concept development and development of a business case for investing in the asset produced by the project – be it a physical asset, like a building, or a less tangible asset, like a new process or corporate culture. It may be initiated bottom-up to meet operations needs, or top-down to meet corporate level strategic needs, but corporate management considerations usually dominate the end of the conceptualisation stage and the beginning of the planning stage.

The planning stage encapsulates a complex and potentially lengthy process that begins at a strategic level and progressively refines the design of the asset, an understanding of intended benefits from the asset, how it will be

Table 3.1 A traditional four-stage view of the asset lifecycle and dominant management aspects

Basic lifecycle stages	**Dominant management aspect**
Conceptualisation	Operations or corporate management initially, then corporate management
Planning	Corporate management initially, then project management
Execution and delivery	Project management
Utilisation	Operations management

used, how it will be created, what resources will be needed, and when and how it is to be delivered. The execution and delivery stage encapsulates the implementation of plans for creation and delivery of the asset, with project management preparing for this during much of the planning stage.

The utilisation stage encapsulates the operation of the asset throughout its operating life to eventual termination of use, with operations staff building on their earlier contribution to the concept and planning stages, assuming they were involved earlier on. The way the traditional dominant management aspect pattern portrayed in Table 3.1 changes over time, and the lack of real separability between these management aspects, encourages a wide range of different, more detailed project lifecycle structures in different project contexts, to ensure clear definition of who does what, when and how in an orderly manner. For example, the UK rail industry has developed an eight-stage investment life cycle as part of its GRIP (Guide to Railway Investment Projects) process (Network Rail, 2007) which is widely cited.

Looking at Table 3.1 from an uncertainty management perspective, who carries out which stages in the lifecycle is clearly important, but the dominant issue is ensuring that *all* uncertainty associated with different stages of the lifecycle receives appropriate and timely attention. Maximising the opportunities presented by the creation of proposed assets warrants careful attention to all stages of the asset lifecycle, taken together as a whole, as well as attention to what role the asset will play in the context of the asset owner's other investments and operations.

Characterisation of the asset lifecycle as four sequential stages starts to indicate the scope of the basic tasks involved from corporate, operations and project management perspectives and the associated scope of uncertainty that warrants attention. However, the more detailed consideration of these four basic stages of (Chapman and Ward, 2011, Chapter 1) provides a deeper insight into the scope of decisions involved in different parts of the lifecycle, the goals being addressed, who are the main players, and the extent and nature of the uncertainty involved. There are three areas of concern here.

First, it is important to distinguish between strategic planning for project execution, operations and corporate purposes. They are related, but address different concerns, and sometimes involve different people.

Second, it is important to distinguish between strategic and tactical planning for all purposes, and to ensure that all strategic planning precedes most tactical planning. Strategic and tactical planning should serve different purposes, and they often involve different people.

Third, it is important to have separate sequential gateway processes concerned with governance after each of four 'nominal' stages ('nominal' acknowledging most organisations will use some variant of any basic framework):

1. A concept strategy-shaping stage which has a business case focus from a corporate strategy perspective;
2. A design, operations and termination strategy-shaping stage which has an operations planning focus from an operations management perspective;
3. An execution and delivery strategy-shaping stage which has an execution and delivery planning focus from a project management perspective;
4. A tactics-shaping stage which provides all the detail necessary to start to implement the strategy.

In effect, the first gateway process involves testing the concept in business case terms, using what common practice project management might refer to as initial 'best guesses' of the operations and execution strategies to be shaped by the later stages, as well as the tactics to be shaped prior to implementing the strategy. If the project does not pass this concept governance test, it is not worth the expenditure involved in later stages, and if it passes this test when it should fail, then serious corporate inefficiencies are involved. The following gateways have to test the validity of the initial 'best guesses', and the first gateway has to allow for *all* the inherent uncertainty in *all* the 'best guesses'. The initial focus of this chapter is this first-stage governance process. The next three governance processes and variants on this pattern will be considered later.

Lack of well-defined plans and lack of objective data in this first-stage governance process are inherent difficulties implied by the common practice 'best guess' terminology. In practice, systematically derived subjective estimates using the best available judgement is what is needed, and initial 'best guesses' in common practice terms are better viewed as 'initial best estimates' based on the uncertainty management approach outlined shortly.

Composite uncertainty and four component types

A common practice view of risk management and associated probability-based estimates of cost, revenue, duration and other key parameters is focused on 'risks', which are best seen as 'sources of uncertainty' which have an 'event uncertainty' form – possible outcomes or scenarios which might, or might not happen, because of specific events or conditions. 'Uncertainty' is best viewed as just 'lack of certainty'.

A common practice view of quantifying this event uncertainty suggests a need for detailed specification of the events and estimation of event probability and impact using objective data or a 'qualitative' probability-impact grid approach. Long lists of low level 'risks' in this sense are often truncated to a 'top ten', and sometimes quantitative treatment is used to estimate a 'risk adjustment factor' to add to a point estimate of base cost, revenue or duration. Point estimates of base values are a common practice feature of general project management approaches, whether or not risk management is employed.

A best practice uncertainty management process has to recognise three other types of uncertainty. In order of increasing importance they are:

1. 'Inherent variability' associated with inflation rates, weather and other factors that always happen – it is just a matter of degree;
2. 'Systemic uncertainty' associated with relationships between sources of uncertainty, sometimes simple correlation dependence, sometimes complex feed-back and feed-forward relationships;
3. 'Ambiguity uncertainty' associated with lack of knowledge, lack of understanding, or lack of agreed 'plans', including designs and contractual structures.

Generally speaking, we have to work with sources of uncertainty defined as composites of all four types, although we may choose to decompose high level composites to focus on specific types of component. Any common practice approach which uses point value base estimates plus a risk adjustment factor based on 'risks' which are limited to event uncertainty at the concept stage, is usually overlooking at least 80 per cent of the relevant uncertainty. Governance must deal with this. More generally, good governance requires a sound judgement about the quality of the treatment of *all* uncertainty associated with estimates. This includes judgements about what to quantify and what needs to be treated as 'conditions' (assumptions).

A minimum clarity view of estimates

Point estimates of any important parameter involve inherent framing assumptions which require governance attention. A 'minimum clarity' approach to estimation is based on the simplest viable general set of working assumptions in an interval estimate framework.

To illustrate what is involved, say overall project cost is estimated directly using the simple interval estimate model illustrated by Figure 3.1.

Figure 3.1 is a deliberately simple, 'minimum clarity' model, involving a working assumption that the uncertainty of interest has a uniform probability density function, a linear cumulative probability distribution. In general, it is

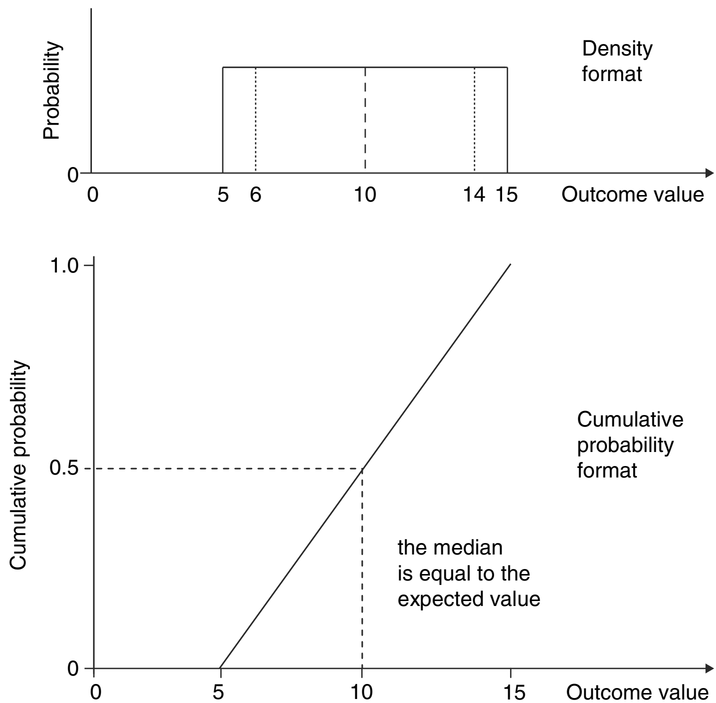

Figure 3.1 Simple interval estimate example

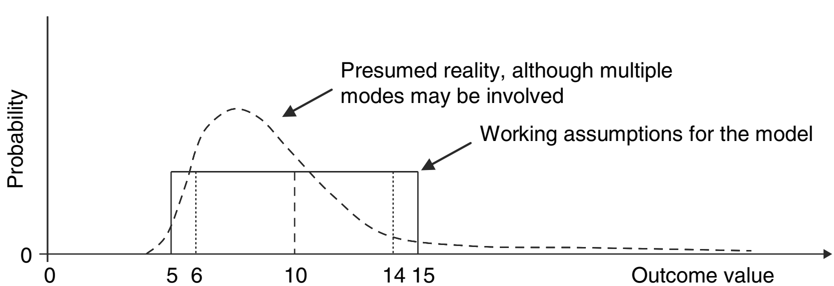

Figure 3.2 An illustration of the approximation involved

important to avoid estimating range estimates in terms of absolute maximum or minimum values, and a P10 (10 percentile value) plausible minimum plus a P90 (90 percentile value) plausible maximum is the assumed approach to estimating the Figure 3.1 model. Figure 3.2 illustrates the assumed relationship between the working assumptions involved in using Figure 3.1 and the underlying reality.

Chapman and Ward (2011) explore in some detail the key working assumptions underlying the use of a Figures 3.1 and 3.2 approach, how best to add complexity, which pays if more clarity is worthwhile, and the implications of alternatives. To indicate the nature of what is involved, consider some example issues.

In general it is important to be clear about ambitious stretch targets, to manage good luck. The P10 value can serve as a stretch target as well as a plausible lower bound for cost estimation purposes. In general, it is important to be clear about commitment values – what is promised as distinct from what is aimed for – to manage possible bad luck. The P90 value can serve as a commitment as well as a plausible upper bound for cost estimation purposes. In general, it is important to be clear about expected values – our best estimate of what should happen on average. The P50 value in Figure 3.1 is a simple expected value estimate. The gap between the P10 and the P50 is a simple measure of 'provision' – it will be needed on average. The gap between the P50 and the P90 is 'contingency' – not needed on average. Who owns 'provision' and 'contingency' in financial and managerial terms matters – usually a great deal. This complete set of simple default assumptions defines a minimum acceptable level of clarity for an important project parameter such as overall cost.

If an overall project cost estimate using Figure 3.1 is too crude, we can add more clarity in a rich variety of ways. Choosing a 'clarity efficient' way, providing the maximum level of insight, which can be communicated for any given level of effort/cost, is always the goal. A decomposition of overall cost uncertainty in Figure 3.1 terms is usually important. But clarity efficiency will be lost if the approach adopted loses sight of the default assumptions for the minimum clarity model. They can be usefully refined, but they should not be left ambiguous. For example, extensive decomposition using point estimates raises the basic question 'what does this point value mean – is it a P10, a P90, something within this range, or something outside this range?' Lack of a clear answer implies the extensive decomposition exercise was grounded on inappropriate assumptions, and a good governance process should clarify what the estimate means, or reject the project proposal.

The Highways Agency re-estimation example

As an illustrative case-based practical example, consider the initial estimation of the capital cost of a major road programme when it is first considered.

Prior to 2007, the UK Highways Agency used traditional point estimates of cost and common practice 'risk adjustments' to prepare estimates. Persistent optimistic estimation bias led to a House of Lords enquiry, followed by a report commissioned by the responsible minister, *Review of Highways Agency's Major Roads Programme: Report to the Secretary of State for Transport* (Nichols, 2007). This was a personal report by Mike Nichols, Chief Executive of the Nichols Group, with support from a small group of Nichols Group staff, including the author of this chapter. It was accepted by the Highways Agency (HA), and initial implementation involving a Nichols team, as outlined in Hopkinson, et al. (2008) and Chapman and Ward (2011), was deemed a success by all concerned, including HM Treasury.

Of immediate interest, when considering the capital cost of a proposed new major road programme at the beginning of the concept-shaping stage, the report made it clear that *all* uncertainty had to be addressed, starting top-down. Three component composites were worth identifying:

1. Uncertainty best owned and managed by the government (not the HA);
2. Uncertainty best owned and managed by the HA at a portfolio of projects level;
3. Uncertainty best owned and managed by the HA at an individual project level.

Uncertainty Composite 1 included inflation, escalation of construction costs over and above general inflation because of economic cycles, and the impact of delays for government funding reasons with systemic uncertainty connections to inflation and escalation. Complete (100%) qualitative treatment was advised for Component 1, complete (100%) quantitative treatment for Component 3 and a mix of the two for Component 2. This meant all concept strategy-shaping stage projects were estimated in 'present £' terms, 'money of the day', subject to timing and funding assumptions involving government decisions. Transfer of this uncertainty to contractors via the Highways Agency only made sense *after* contracts between the HA and contractors were signed *if such contracts transferred responsibility for inflation, escalation and delay to the contractor*. To the extent that government funding delays impacted costs after the start of construction, responsibility had to stay with the government. There was no acceptable rational argument for the Department for Transport (DfT) not accepting this uncertainty on behalf of the government.

Uncertainty Composite 2 included changes in cost, linked to changes in road 'quality' driven by European Union (EU) regulations or HA decisions to improve 'quality' beyond EU minimums – for example, changes in design regulations about crash barriers. The HA needed to manage some uncertainty at a portfolio level because this was managerially efficient and effective.

Uncertainty Composite 3 was *by definition* everything else, a residual of all uncertainty not explicitly part of 1 and 2. Before a project had a designated manager, all that involved managers and project cost estimators needed clarity about was what was explicitly excluded and their responsibility for the ambiguities – for example, crash barrier costs, which go beyond EU minimums and standard additional HA provisions.

The initial implementation involved a re-estimation exercise. The HA wanted to re-estimate the cost of a portfolio of major road projects worth about £20 billion in about six weeks. A stratified sample of projects was taken, scaled up to size portfolio cost. To estimate Uncertainty Composite 3 for each project, a simple decomposition was used: construction cost, cost of land and cost of traffic management are good examples of the half dozen components involved.

When considering a proposed new project at the beginning of the concept-shaping stage, most of the uncertainty involved is ambiguity uncertainty, involving incomplete knowledge. This uncertainty in respect of construction cost might have been estimated directly, by asking the estimator originally involved for a direct estimate of P10 and P90 values in Figure 3.1 terms. It is always important to use the simplest robust model which will do what needs to be done, being clear about the approximations involved in working assumptions. However, given the history and context, a three-part approach was adopted.

Construction cost was decomposed into three components: cost uncertainty which the estimator had in mind when the original point value construction cost estimate was prepared, risk provisions calculated via common practice project risk management approaches, and everything else – a residual so that *all relevant uncertainty* was addressed in quantitative terms.

After a careful briefing to ensure that the estimator involved knew what was required, the estimator and a facilitator constructed a 'sensitivity diagram' illustrated by Figure 3.3, using the diagram as a framework for the inbuilt integration of the three component probability distribution estimation processes.

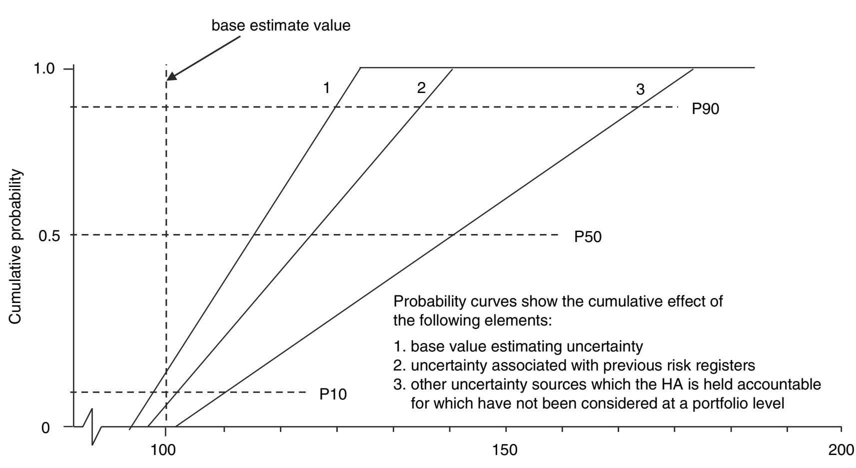

Figure 3.3 Sensitivity diagram: Highways Agency (HA) example

Figure 3.3 uses a 'normalised' scale, with 100 per cent as a base estimate value, to avoid project specific information and portray the 'typical' outcome of interest here. The relative positions of lines 1–3 are typical for major road projects assessed at an early stage in their lifecycle, but it is not an accurate portrayal of particular projects.

The vertical dashed line is a 'line zero' – the original base estimate value produced earlier by the estimators, a point value estimate.

Four sources of uncertainty were identified and explained to the estimators responsible for the line zero estimates:

1. Source 1 was 'base value estimating uncertainty' – all the uncertainty about working assumptions normally considered in qualitative terms by the estimator when producing the base estimate. This included ambiguities like no design as yet, no surveys as yet, no definitive route as yet and no agreed contracting approach as yet – a list of major sources of ambiguity uncertainty which would be resolved before a contract was signed, unless early contractor involvement forced HA commitment to build before these issues were resolved.
2. Source 2 was 'uncertainty associated with previous risk registers'– the joint effect of all sources of uncertainty in the risk registers used previously.
3. Source 3 was 'other uncertainty sources which the HA is held accountable for which have not been addressed at a portfolio level' – the joint effect of all other sources of uncertainty which a minister could reasonably hold the HA accountable for, such as the impact of reasonably foreseeable changes in EU safety rules involving crash barriers with project specific impacts not accounted for separately at a portfolio level.
4. Source 4 was 'portfolio level sources' plus 'government level sources', separated out for collective treatment at portfolio and government communication levels, as noted earlier, treated as non-quantified conditions defined by scope assumptions for construction cost estimation purposes.

Line 1 was defined by Source 1, 'base value estimation uncertainty'. Line 1 would have passed through the line zero P50 if appropriate provision and zero contingency for estimating error had been built into the original estimate. Line 1 was estimated by asking the estimators to provide P10 and P90 values of uncertainty associated with their base estimate excluding sources 2, 3 and 4. This involved asking for a Figure 3.1 and 3.2 estimate with predefined conditions using the format of Figure 3.3 for estimation purposes.

Line 2 was Line 1 plus Source 2, 'uncertainty associated with previous risk registers'. The P50 for Line 2 shifted to the right by an amount equal to the previous risk allowance point estimate if contingency and provision for risk register events was fully embodied.

Line 3 was Line 2 plus Source 3, 'other uncertainty sources which the HA is held accountable for which have not been addressed at a portfolio or government level' – the joint effect of all other sources of uncertainty which a minister could reasonably hold the HA accountable for.

In this case the sources of uncertainty involved were ordered to clarify thinking during the estimation process, and each additional estimate was conditional, incorporating dependence directly. The composite source of uncertainty addressed by Component 2, sized by the gap between Lines 1 and 2, was the total of all common practice event risks considered previously, plus the implications of dependence between them. The implications of alternative working assumptions are discussed in Chapter 11 of Chapman and Ward (2011).

In most individual projects, the composite sources of uncertainty addressed by Component 2 proved to be much less important than Components 1 and 3, as indicated by Figure 3.3. Because Lines 1 and 3 were previously unmeasured, persistent under-estimation bias was inevitable, of the order indicated by Figure 3.3. Previously this had been addressed unsuccessfully using 'optimism bias' adjustment processes mandated by HM Treasury (2003a and b). There are fundamental problems with most optimism bias adjustment processes, which Chapter 11 of Chapman and Ward (2011) addresses.

One key message here is that more refined and restructured treatment of Source 2 is a waste of time compared to more refined and restructured treatment of Sources 1 and 3. Another key message is frameworks that omit consideration of Sources 1 and 3 are failing to address what really matters in any comparable context. Conventional project management approaches using point estimates and common practice project management do not address Sources 1 and 3 directly – some skilled users will introduce aspects of Sources 1 and 3 partially, but the conventional process framing assumptions do not cater for these components of uncertainty – predominantly inherent variability, systemic and ambiguity uncertainty. A further key message is that optimism bias needs to be addressed in an uncertainty management framework addressing all components of uncertainty. Good governance needs to address any failures to deal with all of these issues.

In the HA study, a separate estimate in Figure 3.3 form was then used for each sampled project's 'cost of land', 'cost of traffic management' and several other cost items of this kind. When these components were added, the resulting sample project cost estimates were then scaled to provide a re-estimate for the project portfolio as a whole excluding portfolio level uncertainty.

Separate estimates of portfolio level sources of uncertainty could have been quantified and then combined in the same way using the same diagram format. However, the treatment here becomes more complex. For example, much of the need for changes to HA projects is driven by government actions and HA responses to changes in world conditions, which are portfolio level changes – an illustration of corporate strategy level changes driving related project changes. This needs systematic treatment in portfolio terms, with project level provisions for minor changes, plus clear qualitative treatment of relevant condition sets in scenario terms, plus clear ownership of all related issues – both financial and managerial.

A key assumption underlying an uncertainty management approach is that all sources of uncertainty relevant to any assessment of uncertainty should be considered in an optimal decomposition structure, using an optimal approach to portraying what matters, and other optimised working assumptions, even if a simple unbiased estimate is the only concern. Good governance has to test how this assumption compares with the comparable working assumption for the projects being assessed. More generally, good governance has to ask 'how good is the estimation process?' as part of assessing 'is the project outcome going to be appropriate?'

The motives for uncertainty management served by the Figure 3.3 sensitivity diagram tool plus their linked nesting structures (and more sophisticated forms) include achieving clarity of understanding of uncertainty in terms of where it comes from and how it combines. Those responsible for estimating key parameters for projects, such as their cost, need the understanding provided by sensitivity diagrams to drive their uncertainty management process, building the structure in a bottom-up manner as the process proceeds. They also need to use sensitivity diagrams selectively in a top-down manner to explain their conclusions to all other relevant parties, including those responsible for governance.

A key point of immediate relevance is that the HA example as discussed so far is about clarifying *uncertainty* with a view to eliminating bias. The wide variability depicted in Figure 3.3 should not be associated with *risk*, because during the concept-shaping stage there is no commitment to build, and much of the uncertainty associated with Components 1 and 3 would be reduced before a commitment to build – by completing surveys, designs and contractual arrangements. That said, there are important sources of risk which the HA needs to manage.

In particular, bias is important to the HA because persistent underestimation of costs damages the credibility of HA staff. Any organisation which persists with estimating approaches that are significantly biased is likely to incur a reputation for not understanding what it is doing. This will include all those responsible for governance, and, arguably, they are directly responsible for both detecting the reasons and directing the elimination of those reasons. Immediately obvious implications of such unaddressed bias include too many projects that get beyond the concept gateway and have too much money spent on them too early – money that may be wasted completely. But it is also a symptom of a much deeper problem, addressed shortly – the failure to understand the 'opportunity efficiency' implications of uncertainty in more general terms.

Bias is a major risk with wide-ranging implications. Addressing bias is an important aspect of a best practice uncertainty management approach.

It is not an integral part of most common practice project *risk* management processes, which cannot deliver unbiased estimates because they do not explicitly address *all* sources of uncertainty, quantified or non-quantified, in an integrated manner.

The role of two lenses to visualise uncertainty

'Uncertainty' was defined as 'lack of certainty' earlier, a simple nominal definition to avoid restrictions or limitations. A similarly simple and unrestrictive nominal definition of 'risk' is 'possible unfavourable outcomes', with a complementary definition of 'opportunity' as 'possible favourable outcomes'.

The focus of governance is performance management, so in the first instance we need to focus our attention on the performance lens view of uncertainty in Figure 3.4. A knowledge lens perspective helps to integrate performance management and other aspects of project management involving uncertainty.

This performance lens perspective means that uncertainty about the achievement of objectives is the basis of opportunity and risk, a starting point for managing opportunity and risk via uncertainty management, consistent with most current leading edge thinking about the nature of risk and uncertainty, but relatively free of restrictive assumptions.

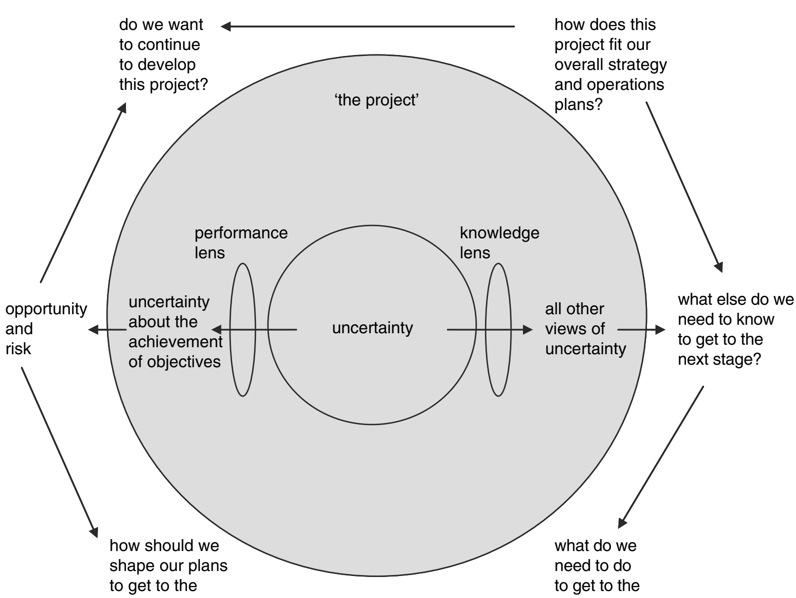

Figure 3.4 The role of the performance lens and the knowledge lens to visualise uncertainty

If we assume that capital cost, duration and all other relevant project attributes addressed by project objectives are measured, or at least envisaged, in Figure 3.1 and 3.2 terms, or a higher clarity variant, and we assume the expected value is the 'opportunity/risk datum', then opportunity and risk are portrayed by Figure 3.1 and 3.2. Note that neither risk nor opportunity is measured directly – they are portrayed in two dimensions, even if the complex presumed reality of Figure 3.2 is modelled via a complex asymmetric distribution function or a multiple class rectangular histogram portrayal, or built up via an extensive decomposition of uncertainty using such assumptions.

A risk efficiency perspective

A relatively unrestricted generalisation of a Markowitz (1959) mean-variance view of 'risk efficiency' has been used to make effective project decisions by a number of companies which the author has worked with since the mid 1970s. Consider a variant of a much used example involving a barge choice decision by BP for a North Sea project in the execution and delivery strategy shaping stage of its lifecycle.

The first BP project to use a prototype of the 'performance uncertainty management process' (PUMP), described in Chapman and Ward (2011) on a 'live' basis, the Magnus project, was about to seek board approval and release of funds to begin construction. Analysis was undertaken to give the board confidence in the plan and its associated cost estimates. One activity involved a 'hook-up' operation – connecting a pipeline to a production platform. It had a target date in August. In the base plan a 1.6 m barge was specified, equipment which could work in waves up to a nominal 1.6 m height. Analysis demonstrated that August was an appropriate target date, and that use of a 1.6 m barge was appropriate in August. However, this analysis also demonstrated that there was a significant chance that the hook-up would have to be attempted later, in November or December, because the hook-up operation was late in the overall project sequence, and there was considerable scope for delays to preceding activities. Using a 1.6 m barge at this time of year would be time-consuming and might mean hook-up could not be completed until the following spring, with severe opportunity cost implications.

An alternative option was available in the form of a 3 m wave height capability barge, costing more than twice as much per day as the 1.6 m barge. A revised analysis assuming use of the more capable 3 m barge virtually eliminated the risk of going into the next season, and an associated risk of a significant cost overrun. Employing the 3 m barge also reduced the expected cost of hook-up. Figure 3.5 illustrates the nature of the 'decision diagram' used to make this decision.

The cumulative probability distribution curves for the two barges cross above the P50 (50 percentile line), indicating that the 1.6 m choice will be

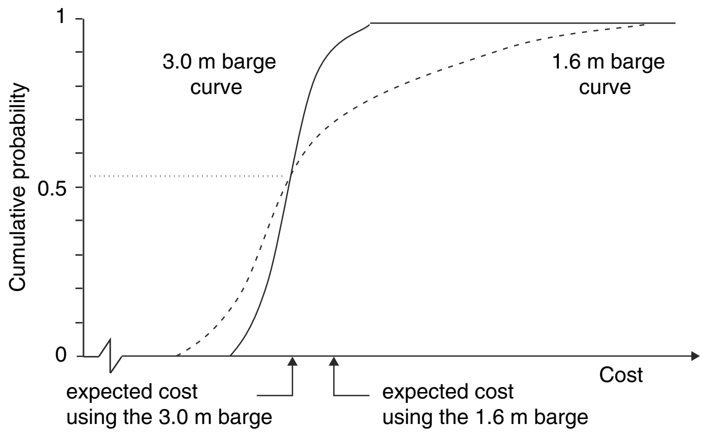

Figure 3.5 Decision diagram: One risk efficient choice example

cheaper most of the time. However, the 3.0 m barge distribution curve is much steeper, because the outcome is less uncertain. The 1.6 m barge distribution has a much longer tail to the right, because of the relatively low probability, but high cost, of a lost season. It is the long tail to the right that drags the expected cost of the 1.6 m barge option to the right of the expected cost for the 3 m barge option. Analysis indicated that the 1.6 m barge had a better than 50:50 chance of being cheaper, but the expected cost of using the 3 m barge was less than the expected cost of using the 1.6m barge, by about £5 million.

Based on a discussion of Figure 3.5, the base plan was changed, and it was recognised at board level that this one change paid for the uncertainty management analysis study many times over. The board approved the plan – successful despite some surprises – and the board also mandated the underlying process world-wide for all large or sensitive projects, because the board was convinced that the anticipated increases in project risk efficiency would more than pay for the process.

In the event, hook-up was actually completed in October in good weather conditions, and it was evident after-the-fact that the company could have got away with using a 1.6 m barge. The use of Figure 3.5 demonstrated the project manager had done a good job as well as making the right barge choice, and BP had been lucky with the weather. Making the right barge choice had involved 'enlightened caution'.

'Enlightened caution' is a willingness to commit resources which may not be needed, because in expected value terms (on average) it will be cost effective to commit them.

Had problems in the earlier parts of the Magnus project caused the hook-up to take place in November or December, with seasonably bad weather, the change to a 3 m barge would have been clearly justified. The wisdom of enlightened caution associated with the choice of barge would have been verified empirically. However, given that the hook-up actually took place in October in good weather, it was very important to be able to explain why the more expensive 3 m barge was deployed.

If an effective PUMP had not been followed, with the result that Figure 3.5 was not used to decide on a 3 m barge, and the decision was instead made on intuitive grounds by the project manager, his career might have looked much less promising when it became clear he could have got away with a 1.6 m barge. That is, the PUMP analysis made it clear that the project manager had done well to achieve hook-up by October, and BP had been lucky with the weather. Without the Figure 3.5 analysis output, the project manager would have been accused of wasting money on the more expensive barge, overlooking completely his good management of the project (getting to the hook-up by October), and blighting his career. A worldly-wise project manager would explicitly recognise this possibility, and might opt for the 1.6 m barge in the absence of a PUMP with these features, deliberately making a bad management decision from a corporate perspective, because good luck with the weather would subsequently be confused with good management, and bad luck with the weather would subsequently just be interpreted as plain bad luck. If an organisation cannot distinguish between good luck and good management, or between bad luck and bad management, individuals will manage risk and opportunity accordingly. Without PUMP support to demonstrate the rationale for their decisions, astute managers, who are naturally and reasonably cautious with respect to their own careers, will see risk efficient decisions comparable to choosing the 3 m barge in Figure 3.5 as unwise, potentially dangerous to their careers because such decisions might be seen to demonstrate a 'wimpish' uncalled-for caution whenever they actually manage the preceding work effectively. Very astute managers will avoid even looking for opportunities to increase risk efficiency in this way, to avoid the moral hazard of the obvious conflict of interests. More generally, if bad luck and bad management cannot be distinguished, such opportunities will not be looked for, and for the most part they will be passed over if they are stumbled upon.

An effectively supported PUMP can facilitate and demonstrate enlightened caution in particular instances, and by doing so encourage a more general culture change associated with circumstances which are not amenable to quantitative analysis.

If everyone involved understands the lesson of examples like that illustrated by Figure 3.5, the organisational culture can change, as a consequence of everyone looking for and making changes which increase risk efficiency and linked opportunity capture through enlightened caution. This means that many people will spend money on 'insurance options' that are not subsequently needed. However, any organisation which never spends unnecessary money on 'insurance' which is not needed is habitually 'under-insured'. Enlightened caution needs to be facilitated and demonstrated to overcome this widespread cultural phenomenon, the documentation of instances when the wisdom of enlightened caution was not empirically verified, being of particular importance.

While promoting enlightened caution, formal PUMPs can, and should, also encourage 'enlightened gambles', defined here as 'the selection of a high return option from a set of risk efficient options when relatively significant risk that comes with the high return is considered bearable'.

To illustrate what this involves, consider a fabricated alternative to Figure 3.5, developed for use in a culture change programme for IBM UK in the 1990s. Figure 3.6 is similar to Figure 3.5, but with the cumulative probability distribution for the 3 m barge shifted to the right, so the £5 million expected cost advantage for the 3 m barge of Figure 3.5 becomes a £5 million disadvantage in Figure 3.6. This is a fabricated example, but if the numbers in the real example had been different, this result might have been obtained.

The point where the curves cross now suggests the 1.6 m barge has about an 80 per cent chance of being cheaper, but crucially the ordering of the expected outcomes has been reversed – the expected cost of the 3 m barge is now about £5 million more than the expected cost of the 1.6 m barge. However, the long tail for the 1.6 m barge still implies much more risk, associated with a lost season, assumed for illustrative purposes to be comparable to a 10 per cent chance of an extra £100 million in costs. The key question is should this extra risk be taken?

A basic Markowitz approach implies both options are risk efficient – the 3 m barge option involves less risk, but a higher expected cost; the 1.6 m barge involves more risk, but at a lower expected cost. The choice of barge is

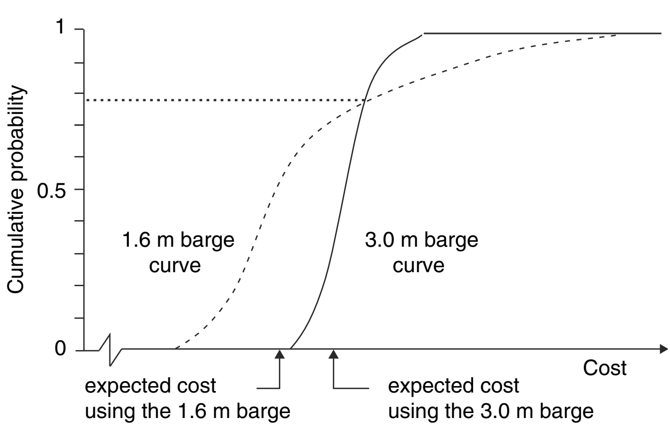

Figure 3.6 Decision diagram: Two risk efficient choices example

therefore a matter of decision-maker preference – the board needs to make a decision based on corporate 'risk appetite' and corporate risk-taking capability, determined via a corporate view of risk efficiency for all projects and other corporate operations.

For oil majors involved in £1000 million projects in the 1970s and 1980s, potential losses much greater than £100–200 million were part of the territory. To enable them to live with these risks, joint ventures were common. Over ten such projects, taking the 1.6 m barge risk described by Figure 3.6 equates to an expected cost saving of £5 million times ten, or £50 million. Oil companies could not afford to pass up expected cost savings on this level in order to reduce risk which did not need to be reduced. Enlightened gambles were a key part of the culture. Organisations which do not take enlightened gambles and spend too much on reducing gambles, reduce their average profitability, and may eventually go out of business. Formal PUMPs can facilitate, demonstrate and encourage enlightened gambles as a basis for engineering associated organisation culture changes.

In the context of a choice like that portrayed in Figure 3.6, if the gamble paid off, the wisdom of the enlightened gamble would have been verified empirically. However, the occasional visible failure of such gambles is extremely important, because it demonstrates that good managers who take risk efficient gambles are sometimes unlucky. If no quantified uncertainty analysis were undertaken to demonstrate an expected cost saving associated with an enlightened gamble like that of Figure 3.6, this message would be lost, whatever the outcome. In the absence of a demonstrated expected cost benefit, and of an organisational culture which promotes enlightened gambles, astute managers do not take such gambles, and very astute managers do not even look for them.

Option choice curves portrayed by decision diagrams like Figures 3.5 and 3.6 and simpler linear versions are key tools for all PUMPs, at a suitable level of clarity. They are the basis for risk efficient choices for all applications.

The Gulf of Mexico oil spill disaster, caused by the Macondo well 'blowout' accident while Deepwater Horizon was drilling under contract to BP on 20 April 2010, caused major strategic damage to BP, because of the fatalities involved, the environmental damage and linked knock-on impacts. The reasons why it happened will not be explored in this chapter, but it is important to note that mainstream press reports and more extensive studies, such as Freudenburg and Gramling (2010) suggest that 'an enlightened gamble' was not involved (the choices made were not risk efficient, nor was the level of risk taken appropriate), and an effective variant of the prototype PUMP developed for BP's North Sea projects was not being used.

Since April 2010, the author has been very aware of the risks associated with using BP as an example of good practice. However, a well-earned reputation for best practice developed in the 1970s and 80s can be lost. Explicitly pointing out that an organisation which has a well-earned reputation for best practice can lose both its best practice and its reputation seems a sounder strategy than hiding the BP use of early PUMPs and its role as part of the basis of the PUMP and associated ideas. Some implications of the transitory nature of best practice and reputations will be developed later. The key messages here are that good governance should test whether:

1. There is clear evidence of effective use of 'risk efficiency' to choose between options, including 'do this project or not' and all key embedded strategic choice assumptions, driven by a PUMP which can deliver effective decisions in an efficient manner;
2. There is clear evidence that 'enlightened caution' and 'enlightened gambles' are being sought, with no 'unenlightened' gambles or caution.

An opportunity efficiency perspective

A common situation is a presumed 'good practice' or even 'best practice' approach to project planning and execution, which is, in fact, 'poor practice'. From an uncertainty management perspective, we need to seek a form of 'best practice' or 'overall optimality' usefully viewed in terms of three components:

1. 'Risk efficiency' in the sense just discussed is one component – minimising risk for any given level of expected performance for all relevant attributes, measurable or not;
2. 'Clarity efficiency' – minimising management decision-making effort and cost for any given level of clarity, where 'clarity' is corporate insight which can be communicated;
3. 'Opportunity efficiency' – making the most appropriate trade-offs between risk and reward for all attributes, and making the most appropriate trade-offs between all attributes, including the trade-offs between management decision-making effort and cost versus clarity.

To build on the risk efficiency discussion in the last section with a simple fabricated example to demonstrate the two additional aspects, consider a variant of an illustration from Chapman and Harwood (2011), as used in Chapman and Ward (2011).

The single photocopier in a busy office failed terminally. The office manager had to replace it quickly, and justify the choice of replacement later. The office manager could obtain the same machine from the same supplier on a comparable contract. The contract cost for a minimum of five years was a rental charge per month plus a maintenance charge per copy. The only source of uncertainty associated with contract cost over the five years was the number of copies needed. This meant the office manager did not need to decompose uncertainty along the lines used in Figure 3.3 – it was reasonably simple to think in Figure 3.1and 3.2 terms directly. The office

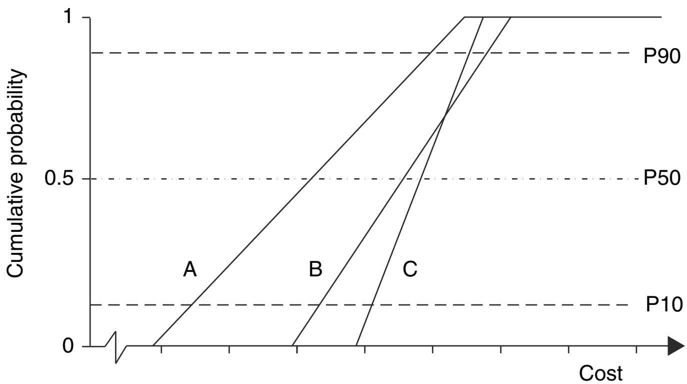

Figure 3.7 Decision diagram: Comparison of approaches A, B and C

manager used a direct Figure 3.1 approach to estimate uncertainty for three possible choices, putting all three on a single 'decision diagram' illustrated by Figure 3.7.

Figure 3.7 was used to make and demonstrate the rationale for choosing option A. The option A line in Figure 3.7 portrayed the office manager's estimate of the average contract cost per year, if the same machine from the same supplier on a comparable contract was chosen. It assumed a linear cumulative probability distribution, corresponding to a uniform probability density function, and a direct approach to Figure 3.1 estimation, using P10 and P90 estimates of the average number of copies per year scaled by the cost per copy, plus the cost per year. Figure 3.7 shows P10 and P90 dashed lines which were used for direct estimation purposes. The office manager recognised that the true option A curve would be non-linear and asymmetric, as illustrated by Figure 3.2, and pointed this out when explaining the option A line on Figure 3.7.

Alternative suppliers offering comparable machines on the same contractual basis were evaluated, using P10 and P90 estimates based on the same estimates of the average number of copies per year. They are portrayed as lines B and C on Figure 3.7.

The P50 dotted line indicates expected outcomes for all three options, reflecting the linear approximations involved. In expected value terms A is the cheapest, followed by B, then C, if the lines or curve generalisations are in approximately the right places. The expected value of option A is usefully seen as the opportunity/risk datum in this example *for all three options shown*, and it is worth remembering that maximising expected pay-off is always the long-term optimal strategy, *provided* we can afford to take any associated risk.

The slopes of the option lines of Figure 3.7 indicated variability. The line for A had the lowest slope, indicating the highest variability, because the cost per copy was the highest, with a lower cost per month than B or C. The line for C had the steepest slope, indicating the least variability, because the cost per copy was the lowest, with a higher cost per month than A or B. However, variability on its own does not measure or indicate risk – risk also depends on the expected value. In this case if the opportunity/risk datum is defined by the expected value of option A, option C is riskier than A, as is B.

Assuming minimising contract cost was the primary objective, and, making this assumption clear, the office manager argued that A was the only 'risk efficient' choice in cost risk terms. 'Risk efficiency' means the lowest level of risk for any given level of expected cost. Option A clearly has the lowest expected cost. Option A also has the lowest level of risk, because its cumulative probability distribution is entirely to the left of B and C, by a margin which is big enough to suggest more precise estimation producing non-linear cumulative distributions would lead to the same conclusion. There was no obvious need for more precision, and any 'overall optimality' concept which includes the cost of decision-taking will keep it simple unless more effort pays.

As the option A machine was marginally faster than B or C, option A dominated when considering this secondary objective too. Had this not been the case, employee time lost waiting for copies might have been estimated and converted to an opportunity cost, followed by aggregation to a single cost attribute. Alternatively, any important secondary objectives might have been considered, using separate graphs in Figure 3.7 form, or a simple judgement made about whether the gap between Figure 3.7 primary objective lines was large enough to more than counterbalance secondary considerations.

As the office manager knew that the colour and design style of the current supplier's products was consistent with the corporate consensus of an optimal house style, this third order objective was not an issue either. Had this not been the case, the gap between the curves would have to be evaluated by the relevant person or group, in terms of trade-offs between non-measurable objectives, as well as measurable objectives. Any 'overall optimality' approach which addresses all relevant objectives uses simple dominance tests for additional objectives, unless more sophisticated approaches look useful.

Had the option A machine been unavailable in a feasible time-frame, a choice between B and C might have been forced – assume for the moment this is the case. Unlike option A, option B would not dominate C in cost terms, or vice versa. Both B and C are risk efficient, given A is not available. B has a lower expected cost, but more risk, indicated by the way the lines cross. However, the lower expected cost of B justifies the marginal increase in rental cost risk – at a corporate level this kind of additional variation should be regarded as just 'noise'. This alternative starting position would also have to be tested in terms of additional objectives, measurable or non-measurable.

Had B or C seemed preferred choices, because A was not available in a feasible time-frame, reliability risk and risk associated with a new supplier, who might not deal effectively with reliability or other issues, would need care. Risk to the company and risk to the office manager might need separate consideration by the office manager, whose reputation might suffer from a highly visible mistake, perhaps costing their job if times were tough. Optimal mitigation of this risk might involve exploring more general working assumptions, like borrowing a copier from the existing supplier until A is available, a simple example of a reformulation of the choices available to deal with emerging concerns in a general framework.

More complex problem formulation and reformulation issues could be considered, but this example illustrates a flexible general framework which can address multiple attributes, some not measurable, risk and opportunity which is not limited to variability of measured attributes, and risk and opportunity perceived differently by different parties. This approach assumes a multiple criteria approach to each attribute, involving expected outcome and risk. Risk is not measured by a single criterion like variance – it is depicted graphically by cumulative probability distributions. Comparing the B and C options graphically, and choosing one, implies an underlying decision function approximation to preference functions, which addresses trade-offs between expected outcome and associated risk exists, but it does not require specification of the decision function, or agreements between different relevant parties. Similarly, choices involving more than one attribute imply the existence of appropriate decision function approximations to preference functions which address trade-offs between attributes, but they do not require their specification or agreement between relevant parties.

Non-measurable performance attributes, such as optimal house style and the office manager's reputation, may require consideration too, as may attributes not worth measuring, like the reliability of other machines and suppliers. Distinguishing between risk to the organisation and risk to the office manager is important. Links, like the effect on the office manager's reputation of a commitment to a poor machine and supplier, are also important. Effective consideration of these trade-offs involves utilising the concept of risk efficient trade-offs and generalisation of this concept to the search for 'opportunity efficiency'.

Judgements about value, value trade-offs and associated uncertainty, including process as well as option issues, are core concerns explicitly illustrated by this example, via a flexible approach to working assumptions suitable for the context. Specifically, working assumptions in this analysis include no need to look beyond the minimum rental contract period of five years, or decompose average variability per annum within this period, or estimate Figure 3.7 using more sophisticated probability distributions. This kind of concern is central to an efficient and effective PUMP pack – a set of PUMPs which can be tailored to any decision context to suit the context. No concerns of potential importance should be overlooked, even if they cannot be measured (for example, optimal house style or office manager reputation), or if measurement is not practical (for example, the reliability of a new supplier).

The key messages this example illustrates in a governance context are:

1. Are the trade-offs between risk and reward for all relevant attributes appropriate?
2. Are the trade-offs between all relevant attributes appropriate?
3. Do the management decision processes being used generate an appropriate level of clarity?

Good governance has to address all these concerns, with a clear idea about what is involved, how to detect the presence of opportunity efficiency, how to detect associated shortfalls, how to compensate for tolerable shortfalls, and when rejection of a proposal is in order.

An efficient frontier perspective

Figure 3.8 is a variant of the 'efficient frontier' diagram Markowitz (1959) used to discuss risk efficiency in mean-variance framework, and economists use routinely to discuss trade-offs between any two criteria.

Using a risk efficiency interpretation and our earlier examples, when BP adopted a 3 m barge in the Figure 3.5 context, they moved from a point like e_1 to a point like b_2, involving less risk and more reward. They were in a 'competent management area' usefully treated as an 'opportunity management area', looking for better ways to shape their strategic plans for execution and delivery. A choice like that portrayed by Figure 3.6 is like a choice between b_2 and b_1.

Using a clarity efficiency interpretation and our earlier examples, a minimum clarity Figure 3.1 and 3.2 approach to overall project cost is comparable to point c, while the Highways Agency re-estimation approach is comparable to a point very close to c but moving towards b_3.

From a governance perspective, what is critical at the concept stage is being satisfied that those preparing the project proposal understand risk efficiency, clarity efficiency, and their generalisation to opportunity efficiency, and that they work in the competent management area. If they do not understand efficiency and appropriate trade-offs in these terms, they are probably working in the incompetent management area, and their proposal will involve more risk than it should for less reward. From a governance perspective, testing for opportunity efficiency is testing for competent management, a basic and fundamental concern.

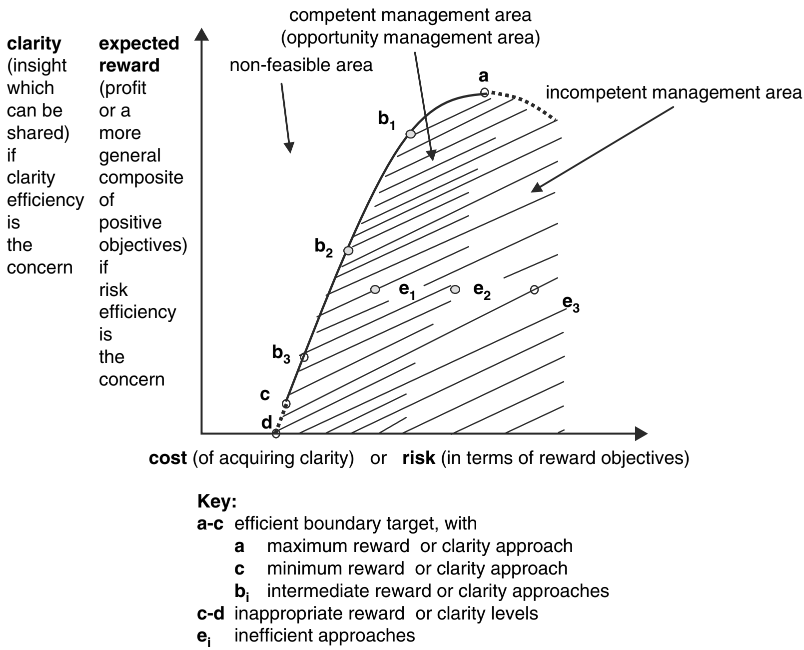

Figure 3.8 Efficient options in an 'efficient frontier' portrayal

3.3 Performance uncertainty management processes

Performance uncertainty management processes (PUMPs) are the direct replacements for risk management processes if the Chapman and Ward (2011) uncertainty management framework is adopted. The same basic PUMP is suitable for all strategy-shaping stages of a project lifecycle. The gateway process following strategy-shaping stages, including appropriate governance, should also take a common form. Both shaping and gateway processes serve as suitable templates for somewhat different processes once strategy implementation begins. The 'PUMP pack' – the complete set of PUMPs for all lifecycle stages – is an integrated set which can be applied to all lifecycle stages of all projects, fully integrating project management, operations management and corporate management. The details of these PUMPs are beyond the scope of this chapter, but the nature of the seven phase strategy-shaping PUMPs is worth exploring briefly, after first considering the seven Ws view of a project it works with, as shown in Figure 3.9.

In the concept-shaping stage, the focus is the plans for business case purposes, drawing on a very preliminary view of all other plans, but the 'who'

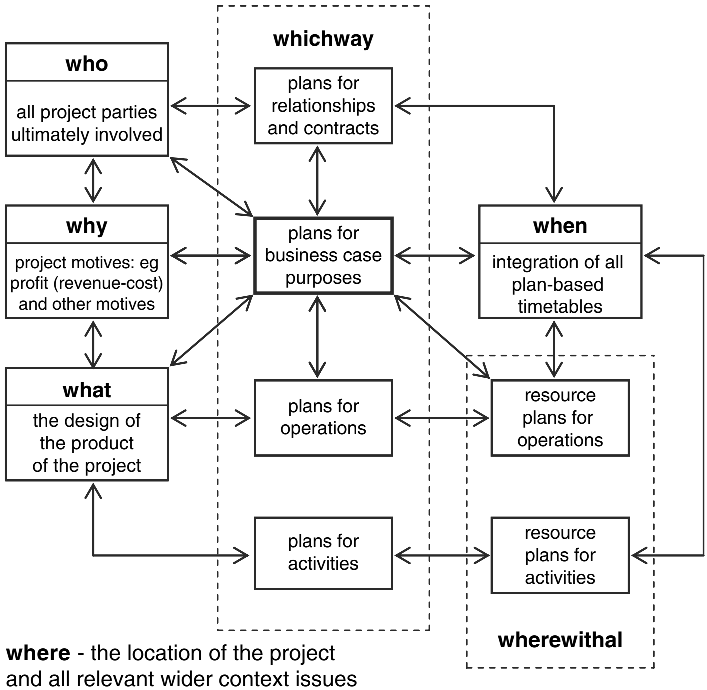

Figure 3.9 The basic project definition process – the seven Ws

and 'why' and plans for relationships and contracts need special attention from the outset. In the next strategy-shaping stage, the focus should move on to refining the design of the product of the project, plus related plans for operations. Plans for activities to execute and deliver should follow.

Define the project for analysis purposes – the 'define phase'

To initiate each full pass of each iteration in each lifecycle stage, a 'define phase' is implicit in any uncertainty or risk management process. Governance has to address whether or not all relevant aspects are explicitly considered in an effective and efficient manner, and the implications of any significant shortcomings.

The basis should be a clear view of the seven Ws framework of Figure 3.9 and the lifecycle stages still to come. In the concept-shaping stage, the focus is generally the plans for business case purposes, the core of which is usually a discounted cash flow model. However, a preliminary view of all aspects of the seven Ws is essential, with clearly identified and suitably robust working assumptions about all key decisions which will not be made until later in the lifecycle.

For instance, the Highways Agency example discussed earlier was concerned with a light touch re-estimation process, which could be applied to a £20 billion portfolio of major road projects in about six weeks, to eliminate obvious bias based on reinterpreting information already available. The intention was a much more detailed process for subsequent first time estimates, equivalent to moving from a point very close to 'c' on Figure 3.8, much closer to b_3.

A key aspect of using the seven Ws structure effectively is developing an appropriate set of 'criteria-plan relationship structures', understanding how the objectives of interest relate to the plans of interest, even if these plans are not yet defined. For example, plans for activities and associated resource plans for activities are implicit in any project duration and cost estimate, and adequate identification of associated sources of uncertainty will need an appropriate reference framework. Good governance requires understanding what has been assumed here.

Focus the generic PUMP – the 'focus phase'

A rich set of possible objectives for PUMPs has to be focused on those of immediate relevance, and a variant of the generic process designed to achieve those objectives in a clarity efficient manner.

The basis should be the process objectives relevant to this stage in the project lifecycle. Clarity efficient unbiased estimates at an appropriate level of clarity should always be relevant. Good governance should not tolerate inherent bias, be it deliberate or unconscious. A well-developed full set of plans in the seven Ws sense will not be feasible in the concept-shaping stage, but full provision for associated uncertainty is essential.

Boards or their equivalent which demand +/− 10 per cent cost estimates at a concept stage, when −50 per cent to +500 is a credible P10 to P90 range estimate, are demonstrating incompetence. They are forcing a seriously dysfunctional 'conspiracy of optimism' on the organisation preparing proposals. Revenue estimates can be even more of an issue in this context. Those responsible for governance of boards of directors or their equivalent should understand this, and take appropriate action. What Flyvbjerg et al. (2003) refer to as 'strategic misrepresentation' has wider sources with some similar implications, and those with governance responsibilities at all levels need to understand what is involved and how to identify it.

Robustness of analysis by people who can be trusted is an important objective from the perspective of those responsible for the ultimate level of governance. Those at lower levels of governance, and those doing the analysis, need clear sticks and carrots to ensure this concern is met.

Further, a 'one size suits all' process approach to risk analysis tested in governance terms via compliance is clearly negligent from an uncertainty management perspective.

The 'identify phase'

The identify phase is about using the earlier phases to identify all relevant sources of uncertainty, including both proactive and reactive responses if they are relevant at this stage, and sources of uncertainty which involve working assumptions assumed to be best treated as conditions. The basic framework provided by the define phase is the starting point.

For example, if project duration is an issue, and a one activity network represents project duration in the define phase on the first pass of the concept-shaping stage, project duration can be treated as a single composite. Its duration can be estimated directly via a Figure 3.1 minimum clarity approach, or on Figure 3.8 a point 'c' approach. The same approach could be used for cost, treating total capital cost as a single composite, with variability 100 per cent correlated with duration.

The Highways Agency examples used earlier demonstrate a need for greater clarity, with the basic structure and the three sources of uncertainty quantified at a project level for construction cost. Responses to uncertainty were not considered, but by the execution and delivery stage of complex projects they should be, and provision for uncertainty to be reduced later is essential at the concept-shaping stage.

Good governance should look for a clarity efficient treatment of all relevant uncertainty at a suitable level of decomposition in terms of sources of uncertainty, including the identification of responses, secondary sources of uncertainty and responses if key responses may not work and key relevant conditions. A traditional risk log given a 'top ten' focus is inadequate.

The 'structure phase'

The structure phase is, in part, about testing the robustness of all earlier structuring assumptions, and completing the qualitative structuring involved in earlier phases. For example, some responses to particular sources of uncertainty are particular to that source of uncertainty – if a piece of equipment fails during project execution or delivery, or later, in the operation stage, we can repair or replace it. Other responses are general, in the sense that they can cope with a range of sources – if a number of earlier project execution activities are delayed for any combination of reasons, we might arrange contracts for follow-up work so that multiple shifts can make up for lost time. This builds in robustness to cope with sources of uncertainty we have not even thought about – the 'unknown unknowns'.

Good governance should look for robustness in this sense, and a clear understanding that robust and insightful qualitative analysis is the basis of all good quantitatively based judgements.

The 'ownership phase'

Which party to a project owns uncertainty in managerial and financial terms is an aspect of qualitative structuring worth separate treatment, because it matters a great deal and it raises some special issues, such as the most appropriate contract structure for a project.

Good governance needs to be sensitive to a wide range of issues which this can give rise to, especially if non-conventional, or risky forms of contract are involved – outsourcing and private-public partnerships providing some common examples. Good governance involves testing the working and framing assumptions contractual strategies are based on.

Estimate *some* of the uncertainty – the 'estimate phase'

Good governance requires a sound judgement about the appropriateness of the quantitative estimation processes employed, including assumptions like statistical or causal dependence, and the related treatment of conditions.

Evaluate *all* the relevant implications

Good governance should be particularly sensitive as to whether or not the analysis underlying a project proposal is effective, but 'opportunity efficiency' is the test of both effectiveness and efficiency, which is needed. Iteration management in the evaluate phase is central to opportunity efficiency – looping back to seek further clarity when this looks a cost effective investment of additional effort, choosing when to loop back via a nested structure of sensitivity diagrams like Figure 3.3, as well as making provisional decisions at all levels in the nested structure via decision diagrams like Figures 3.5–3.7.

3.4 Governance as part of a set of separate gateway PUMPs

Governance should be part of a set of gateway processes that follow the completion of an iterative shaping process suitable for the lifecycle stages involved. Each gateway process is a separate process from the preceding shaping process, and the governance aspects should be undertaken by different people, with direct testing of all relevant plans in relation to overall corporate objectives in mind, or higher level objectives if regulatory governance is involved.

The first gateway process should be after a concept strategy-shaping process which is focused on the overall concept and its relationship with corporate and operations strategy. Subsequent gateway processes should address: design and operations strategy-shaping issues, associated with the corporate asset or change which is the product of the project; execution and delivery strategy-shaping issues which are about how to deliver the asset or change; detailed planning issues associated with all these strategic issues.

By way of a summary, those responsible for governance at the end of the concept-shaping stage need to test the robustness of all assumptions underlying a project proposal, those considered thus far including assumptions underlying such questions as:

1. Have all sources of uncertainty been considered, using residuals appropriately?
2. Are all cost and revenue estimates free of unconscious and conscious bias?
3. Have all objectives involving measurable or non-measurable attributes been considered appropriately?
4. Has clarity efficiency been addressed appropriately?
5. Has risk efficiency been addressed appropriately?
6. Have all the trade-offs aspects of opportunity efficiency been addressed appropriately?
7. Has an appropriate set of concepts and processes been adopted which will adapt to accommodate all following stages of the lifecycle appropriately?

These concepts and processes may, of course, use very different terms and language to that adopted here, but their robustness needs testing in terms of a general framework, with comparable power to test robustness. Most standards fail this test. For example, the proposed approach to performance uncertainty is consistent with the International Standard (2009) approach to risk, but richer in its approach to opportunity. Most guides also fail this test. For example, the PMI (2008 and 2009) process and underlying concepts are consistent with most common practice, but not the approach proposed here. While APM (2004) can be interpreted as consistent with that proposed here, it can also be interpreted as consistent with PMI (2008) – it is ambiguous to a significant and unhelpful extent. Most other guides lie on a spectrum between the PMI and APM approach, as explored briefly in Chapman and Ward (2011, Chapter 4). In the author's view, professional bodies responsible for standards and guides need to address these issues as a matter of growing urgency, and this position is being argued on an ongoing basis. However, the reader should not anticipate rapid responses to this concern.

3.5 Clarity about discounted cash flows

Most projects involve a business case which has to deal with a time horizon that is long enough to make a discounted cash flow framework essential. Uncertainty about cost and revenue estimates obviously has to be dealt with. Uncertainty about important issues not easily treated in terms of measurable objectives can raise new issues. Of immediate concern here, the appropriate discount rate raises new issues, which involve working assumptions, which many people approach as framing assumptions and make inappropriate choices. Good governance has to address these assumptions, rejecting project proposals which have been prepared using inappropriate assumptions.

The author's uncertainty management perspective to seeking clarity about discounting has evolved in several stages, involving three examples usefully explored here. Consider the most complex example first, also one of the more recent, and still highly controversial and important.

Permanent disposal of UK nuclear waste example

In the mid 1990s the author was engaged by UK Nirex to provide advice on an execution and delivery strategy-shaping PUMP for the construction of a 'rock characterisation facility' – a deep mine to be instrumented for testing the suitability of an enlarged mine complex to store UK intermediate level nuclear waste. This rock characterisation facility project was a component of the one large project UK Nirex was set up to execute – long term 'permanent' storage of nuclear waste on behalf of all UK waste producers, with ongoing operations implications over a virtually infinite operations and support stage.

A year or so into the assignment, the Department of Energy (DoE) undertook a review of the overall permanent storage project, with a view to deferring the whole permanent nuclear waste disposal project for 50 years. The author's remit was then changed to supporting UK Nirex contributions to the DoE review.

The execution and delivery strategy-shaping PUMP for the rock characterisation facility was given a simple form to consider the duration and capital cost of the initial construction phase of the project as a whole, building on earlier cost estimates. This framework was then used to consider a version deferred for 50 years. Operations issues after 50 years were assumed to be the same, but operations issues during the deferral period were studied to assess the cost of ongoing 'temporary' storage of nuclear waste on the surface in simple design and operation-shaping PUMP terms – termination was at an infinite horizon, but the difference between proceeding now and proceeding in 50 years time was at a 50 year horizon. These results fed into a DoE discounted cash flow model, as did an HM Treasury mandated 6 per cent real discount rate (HMSO, 1991). The result suggested a £100 million advantage for deferral, and consequently the DoE recommended deferral (DoE, 1994).

At the time the author and Nirex argued that the 6 per cent real discount rate assumption was not appropriate and that the basis for such a figure was highly uncertain (Chapman and Howden, 1997; Chapman and Ward, 2002, Ch.8). A lower rate of about 3 per cent seemed more defensible. The Treasury has since revised its discounting recommendations to a rate which starts at 3.5 and reduces over time to 1 per cent in a multiple test framework (HM Treasury, 2003a). A somewhat different multiple test approach is recommended by Chapman, Ward and Klein (2006), using a real discount rate of the order of 3 per cent based on different basic economics. Whichever framework is used, a 3 per cent real discount rate suggests that a multi-billion pound decision error was made by the DoE, other things being equal. There is, of course, considerable room for argument that 'other things' are not equal. In the event, the rock characterisation facility failed to get local planning approval, but a decade later this issue was back on the UK central government agenda, with proposed changes in planning procedures. It is a major problem which is not going to go away, even if all new nuclear power facilities are banned permanently.

The need for a multiple test gateway framework arises because deciding to proceed with a project or not almost always involves a number of considerations and objectives which can only be collapsed into a single discount rate test if unrealistic working or framing assumptions are made. In the nuclear waste disposal case, the cost of capital, government energy policy, intergenerational transfer of welfare issues, and risk associated with either choice, makes a decision rule based on a single discount hurdle rate basis defective in obvious ways. Once the basic problem is understood, PUMPs which accommodate it in simpler contexts can be designed. Simpler examples will help to clarify what is involved.

Alaska Power Authority hydroelectric power project example

Before we explore what was learned from the nuclear waste case, consider another, somewhat simpler case, which underlay Chapman and Howden (1997).

In the late 1970s the Alaska Power Authority had to choose between a major hydroelectric power project and incremental development of coal-fired power units. Acres Consulting Services were providing support on a range of issues, and possible adaptation of the BP methodology ideas developed by the author was explored. An impediment to choosing the hydro option was the very long payback period and the 'risk' which seemed to be implied by a long payback period. A very simple PUMP was developed to assist with this decision (Chapman and Cooper, 1983). At the time it seemed to set aside what had been learned about strategy-shaping PUMPs from the BP applications, to start in a very different place. It avoided direct probabilistic modelling of any of the parameters of the standard Net Present Value (NPV) decision framework, because the key parameter uncertainties involved issues such as the rate of inflation of fuel prices relative to general inflation and the terminal value of a hydroelectric power unit. These issues are, by nature, highly correlated and only amenable to highly subjective probability distribution estimates.

The approach developed was 'parametric', in that it systematically identified how far parameters had to move from their expected values to change ('flip') the decision, comparing that movement with plausible ranges of values, to identify the relative importance of uncertainty associated with all key parameters, a generalisation of Internal Rate of Return (IRR) approaches. It facilitated identifying the key parameter, followed by exploration of a simple qualitative understanding of associated uncertainty in a framework most suited to the key parameter.

The parametric analysis suggested that the key parameter was the value of the hydro facility at the end of a planning horizon of 40 years, when a coal fired power station alternative conventionally has a terminal value of zero. The Ontario Hydro facilities at Niagara Falls developed by the founder of Acres early in the last century are still an appreciating asset. There was a plausible case for arguing that the value of the proposed Alaska Power authority hydroelectric facility 40 years on, in money of the day before discounting, was greater than the cost of construction. It was clearly likely to be much more than zero. About 90 per cent of the capital cost was roads, dams and other civil works that might be much more valuable in 40 years if properly maintained, given inflation in construction costs and further relative escalation in fuel costs. The 10 per cent of total capital cost associated with turbines and generators might be worth zero after a conventional 50 planning horizon, but some residual is likely.

It was useful to determine what minimum value for the hydroelectric facility in 40 years time would indicate that hydro was the preferred choice under various expected value assumptions for other parameters. It was also useful to recognise both the likely modest losses in NPV terms if hydro was selected and energy prices fell, and the likely massive losses if hydro was not selected and energy prices rose, with implications linked to the rest of the Alaska economy, and the cold climate. The decision addressed in this example is complex, but it involves a moderate level of complexity relative to the nuclear waste disposal example, and the qualitative 'parametric' approach provided a useful complementary methodology which underlay the nuclear waste approach.

Insulating the walls of a house in the UK in the 1980s

Before confronting the complexities of the UK Nirex or the Alaska Power Authority examples, a simpler, third example is useful.

A house owner-occupier in the UK in the 1980s is considering insulating the walls of his or her home. Current and anticipated fuel price rises is the big concern. To give this example a governance flavour, assume the householder is your favourite aunt, who does not understand economics and relies on your financial advice.

The define phase of the appropriate PUMP for all three examples

To consider an appropriate PUMP for all three examples, we can start by considering the simplest example, with a view to generalising what this tells us. A key parameter is the discounted payback period, the number of years the householder lives in the house before selling it to recoup the insulation cost in discounted NPV terms. Insulation is likely to prove an appreciating asset, as fuel costs escalate at a rate higher than general inflation. However, in this case the biggest source of uncertainty is how long the owner will keep the house. Moving soon after insulating would involve a small loss. Staying a long time without insulating would involve a very large loss.

The most basic parameter structure starting point involves a planning horizon of n years, a time period index t = 0, 1, 2, … n, with t = 0 serving for the capital investment starting point, and a 'current value' or 'money of the day' differential cash flow (for the 'nominally preferred' 'option A' 'insulate' less the fall-back 'option B' 'do not insulate') measuring net cash flow in at the end of time period t, X_t.

The most effective initial calculation involves three parameters:

1. C – differential capital cost at t = 0 (the full installed cost of the insulation);
2. F – differential operating cost for t = 1 … n (the fuel cost saving per annum);
3. S – differential 'scrap' value (the value of the installed insulation = the value of the house with insulation less the value of the house without insulation) tomorrow if insulation is installed today (t = 0).

This initial simplification can then be linked to three 'rate of change' parameters and a discount rate:

1. I – a general inflation rate factor;
2. E – a real escalation rate factor for F (fuel inflation above the general rate);
3. A – a real appreciation rate factor for S (the installed insulation appreciation rate above general inflation);
4. D – a real discount rate factor defined as:

$$D = 1(1 + r/100)$$

where a real discount r = 5% means D = 1.05 for example, with comparable interpretations for I, E and A.

In these terms a basic NPV formulation means the differential NPV of insulating over not insulating is given by:

$$V = -C + \sum_{t=1}^{n} (\, F\, I^t\, E^t \,/\, I^t\, D^t \,) + S\, I^n\, A^n \,/\, I^n\, D^n.$$

The general inflation terms cancel out, so we can work in 'real' terms to assess 'economic desirability' in terms of values for V greater than zero.

In the hydro/coal example, C becomes the capital cost of the hydro approach less the capital cost of a coal fired equivalent; F becomes an operating cost differential driven by coal prices; and S is the value of the hydroelectric facility less the value of the coal fired station, assuming a zero value for the coal station at the standard 40 year planning horizon for coal fired power stations. In this case S is in effect the 'value' of the hydro facility 'tomorrow' if it is built 'today' (ignoring construction duration issues as a working assumption), perhaps equated to C, with A defining the way that value changes over time. In this context there was no point in separate S and A parameters, the two being combined in a parameter defining the value of the hydro facility in money of today after 40 years. A potentially useful alternative interpretation involves the way the value of the Alaska Power Authority as a whole changes over time, given selection of the coal or hydro routes.

In the nuclear waste 'defer/proceed now' example, C becomes C_0, the capital cost of the disposal facility if proceeding now, and F becomes the operating cost differential driven by surface storage costs, if deferral is selected. S is no longer a relevant concept, but there is a new parameter C_{50}, the capital cost of the disposal facility if building it is deferred for 50 years. In this case S and A are replaced by C_{50} for estimation purposes, the capital cost of the disposal facility in 50 years time.

In practice, notation changes may be convenient for any particular context, in some cases 'appreciation' may become 'depreciation', and in some cases short term inflation or escalation cycles thought to be predictable and multi-year construction periods might need calculated adjustments to simple model results.

For any example context it pays to simplify this basic model even further, by composition of the earlier parameters into a simpler basic parameter set. We can define

$$R = \sum_{t=1}^{n} E^t / D^t \qquad \text{(a composite discount parameter)},$$

$T = S\,A^n / D^n$ (the terminal value of the insulation in present value terms),
$N = C - T$ (depreciation of the insulation asset over the horizon in present value terms),

so that

$$V = F\,R - N.$$

This gives us a constructively simple top-down perspective for the decision rule: 'if V is greater than zero, then select the nominally preferred option A, otherwise use the fallback option B'. This simplicity has a number of benefits.

First, $V = 0$ defines a 'flip point' as parameters change, which we can rewrite as the condition

$$N = F\,R.$$

We can then use a range of tests equivalent to 'V greater than zero?' which include:

1. Is D greater than the 'correct' D? (an internal rate of return (IRR) approach);
2. Is n greater than the 'correct' planning horizon? (a discounted payback period approach);
3. Is N greater than F R? (a planning horizon cost and benefit view);
4. Is F less than N / R? (an annualised benefit and cost view);
5. A terminal value version of S equivalent as used for the hydro/coal decision.

This means we can select whichever approach best suits our particular context – a discounted payback period for the insulation decision for example – once we understand which parameter uncertainty is most important.

Secondly, it becomes obvious that unless we want to model presumed 'knowledge' about the immediate future, it is long term averages that we need, and short term fluctuations generally cancel out, in addition to general inflation.

Thirdly, less obvious but also important, escalation rate (E) and real discount rate factor (D) positively correlated variations cancel out, as do F and R negatively correlated variations, with an amplified effect if the opposite correlations apply.

In brief, we can use a simple top-down focus to identify sources of uncertainty which really matter at a composite level, decomposing only where it clearly matters, to avoid getting lost in the detail of an impenetrably complex NPV calculation.

Given this very simple but general starting point structure, the define phase of the concept-shaping PUMP can use simple versions of the later phase PUMPs to develop an early view of all the relevant parameters. Most importantly, it can start to consider other relevant objectives for all the relevant parties. For example, the householder considering insulation may be interested in a warmer house, or the kudos of 'green credentials', in addition to cash savings. If the householder is your favourite aunt and she is inclined to be parsimonious with her heating, you may take the view that you need to look after her interests in terms of ensuring she is warm. The electric power authority may be thinking about Alaska's future in a very cold climate when the coal and other fossil fuels run out. If they are not, the Alaska government oversight should reflect such concerns. Moreover, a government contemplating nuclear disposal needs to think about the environmental consequences of a nuclear waste disposal strategy, 'low carbon' concerns, energy policy implications, linked economic policies and security implications. Governance of the government by the press needs to address such issues if the government itself does not, including the competence of

HM Treasury. This multiplicity of relevant objectives and the implications of constraints is the basis of multiple tests, implemented during the evaluate phase addressed below.

In effect, the criteria-plan relationship structure in the concept-shaping PUMP requires reference to the integrated lifecycle and seven Ws structure. Simplification is feasible, but it requires great care, and how it is approached matters a great deal.

The focus phase

The focus phase addresses different concerns with different outcomes, depending upon the context, and which stage of the project lifecycle is involved is a very important aspect of the context. In the concept-shaping stage, there is a particularly obvious need for a simple top-down view of all relevant uncertainty in relation to all objectives for all relevant parties, with a clear view of what is sensibly quantified, and what has to be addressed in qualitative terms.

The identification phase

Uncertainty identification in the concept-shaping stage requires a top-down perspective that is dominated by variability uncertainty composites which include inherent variability, event uncertainty, ambiguity uncertainty and systemic uncertainty. However, specific event-based sources of uncertainty may need identification and appropriate responses.

For example, in the house insulation case, two basic options were considered: a lower cost option, involving injecting expanded polystyrene into brick cavity walls, and a higher cost option, using rock wool. The lower cost option was rejected, because of the risk of rising damp if building subsidence subsequently took place. Analysis focused on the decrease in the differential scrap value S and an increase in associated risk, which more than offset the increase in C, all other parameters remaining unchanged. In effect, an event uncertainty source was usefully identified and part of the overall model was used to make a choice.

In the hydro case, the dam silting up or failing due to earthquakes was addressed. In the nuclear waste case, the preferred site becoming non-feasible for political reasons, if 50 year deferral took place, was addressed. However, most other uncertainty was not linked to specific identified events. The value of a very simple top-down perspective as a starting point is particularly obvious at the concept-shaping stage – involving just one composite source for each parameter discussed above, as per C, F and S. As in other lifecycle stages, identification in the concept-shaping stage also needs to recognise response options which may be preventative or reactive, plus some relevant secondary sources and responses.

An important aspect of response recognition in the concept stage is the formulation of a project management strategy that offers a suitably robust and generic response to uncertainty associated with the project. All projects involving speculative product development, the application of novel technology, or high levels of complexity, warrant careful, early attention to project management strategy, starting with design of an appropriate lifecycle structure. Rather than simple sequential progression through the 12 stage nominal lifecycle used to generalise this chapter's Table 3.1 in Chapman and Ward (2011), more complex parallel trials and iterative cycles of activity may be appropriate. In particular, highly uncertain elements of a project raise questions about knowledge gaps, assumptions, or what is feasible. The project management process, then, needs to contain activities designed to answer those questions, recognising that answers may well force significant modifications to designs, plans and performance objectives (Lenfle and Loch, 2010). This is an illustration of the knowledge lens perspective of Figure 3.4.

Considering uncertainty in general terms suggests general responses in the form of 'resilience' and 'agility' should be built into the project management process. In broad terms, this might involve balancing control and flexibility, a focus on learning processes, parallel working, intensive communications, adaptability, trial and error, frequent testing, fast feedback, and decoupled dependencies (Laufer, Denker and Shenhar, 1996; Augustine, 2005; Loch, DeMeyer and Pich, 2006; Fernandez and Fernandez, 2008; Cleden, 2009). In principle, consideration of all such project management strategies are within the scope of a PUMP pack, highlighting the desirability of integrating PUMPs into project management processes, particularly in the concept stage. Governance needs to ask whether these issues have been effectively addressed.

The structure phase

As with all PUMPs in all lifecycle stages, there is a need for a carefully structured sequence for building up composites of all the relevant sources of uncertainty to the top level. However, a striking difference, based on experience to date, is the lack of use of sensitivity diagrams like Figure 3.4 and more sophisticated variants, showing the relative importance of uncertainty components for the basic parameters discussed above. The reasons for this will be explored shortly.

The ownership phase

Ownership was not an issue for the home insulation case, apart from its role in terms of a planning horizon defined by selling the house, but ownership was an issue in both the Nirex and Alaska Power Authority examples. In the nuclear waste case, one important issue was benefits enjoyed by one generation of UK citizens (low cost energy and defence), that are paid for by later generations (left to cope with the waste). This inter-generational transfer issue was equally important in the Alaska Power Authority case, but for somewhat different reasons. Conventional funding approaches coupled to US regulation of electricity utilities meant that new financing approaches were necessary to avoid overcharging current generation electricity consumers and undercharging future consumers. 'Financial feasibility' had to be distinguished from 'economic desirability' (Chapman and Cooper, 1985).

The quantify phase

As noted already, the insulation and hydro/coal cases limited themselves to parametric analysis using expected value starting points for all parameters and related plausible ranges without an explicit minimum clarity basis. The nuclear waste example caused a rethink of this position, moving to a more general position that makes use of quantification when it is useful. With hindsight, the author now recommends fully adopting the minimum clarity basis outlined in Chapman and Ward (2011, Chapters 2 and 10), plus a modest increase in minimum clarity when significant asymmetry is involved, even if probability distributions are not needed in an explicit form. For example, the insulation case might start by estimating the expected value of n – the planning period duration – by estimating a P10 value for n of 2 years and a P90 value of 20 years, and then assuming the expected period before moving house is about 5 years, clearly implying significant asymmetric uncertainty without bothering to quantify the probability distribution formally. This approach to all the parameters, as a mandated minimum acceptable clarity, would provide a clear and simple basis for sizing uncertainty associated with all expected values, and help to control bias in estimates from the outset.

The nuclear waste case involved a number of parameters where full quantification was useful. For example, C_0 uncertainty had already been quantified, and it was useful to use this as a basis for quantifying C_{50} uncertainty, observing that strong positive correlation was probable. Further, a semi-Markov process model of costs over consecutive time periods gave those estimating an expected value for the cost of temporary surface storage of nuclear waste a lot more confidence in the average cost per annum of surface storage. They could only approach this task in a way they were comfortable with by defining the condition of the waste at a starting point, thinking about what measures would have to be taken given that state, and then thinking about what this would imply for the following year. A semi-Markov process was part of their planning and costing perspective, with good reason, and it made sense to accommodate this perspective directly. Further, the DoE accepted an 80 per cent probability (expected value) that another site would have to be found if deferral took place, effectively doubling the current money expected value of C_{50} relative to C_0.

The evaluate phase from a project perspective

As noted earlier, the use of Figure 3.3 sensitivity diagrams in a hierarchical structure was not part of the nuclear waste case at the top level, and this way

Table 3.2 V (£) as a function of n for the insulation example

n	0	1	2	3	4	5	6	7	8	9	10
V	−150	−100	−45	15	80	152	230	315	408	510	621

of portraying uncertainty was not considered for the hydro/coal or insulation cases. Moreover, the use of Figure 3.5–3.7 decision diagrams was not part of the top level DoE approach. This is worth exploring briefly here.

In the house insulation example, expected value NPV analysis using example parameter estimates indicated a positive V for insulation of £152, assuming five years before moving house. Parametric analysis of all the parameters discussed earlier indicated that the only associated risk of significance was a possible move before the five year expected duration. Table 3.2 shows V values for n = 1 to 10.

This table shows modest losses if moving within a year of installing insulation proved to be the outcome (n = 1 and V = −100). The example assumes C = £400 and S = £250, an overnight depreciation of £150 when insulation is installed (n = 0 and V = −150). However, this table also clearly shows losses turn into gains between n = 2 and n = 3, with a non-linear increase in NPV resulting in a substantial payoff by year ten. Put into simple story terms, in a 1980s UK home context, if your aunt insulates, there is a low probability of low losses if she moves unexpectedly early, but the opportunity for savings if she stays a long time is much more important. Put the other way around: if she does not insulate, she runs a massive risk of losing this opportunity. Plus she can be more comfortable and greener if she insulates, with no risk of unintended consequences like rising damp. Simple stories which do not need complicated graphs to communicate the key insights should be kept simple.

That said, if what is at stake was much more important, and the relative advantage differential much smaller, so that more clarity becomes desirable, might it help if we drew further on sensitivity and decision diagrams and their use, as discussed in Chapman and Ward (2011)? The answer is a tentative 'yes', with reasons worth understanding, although this chapter will not attempt full illustration.

Still with the insulation case, if uncertainty about n was assumed to be the only source of uncertainty about the NPV of insulation, and we formally quantified this uncertainty using a P10 = 1, a P90 = 9, and a P50 = 5 assumed to be the expected value with an associated uniform probability density function assumption, we could use the results in Table 3.2 to plot a cumulative probability curve for V representing the NPV of option A over option B.

We need to recognise that Table 3.2 (or its graph equivalent) allows users to implicitly use their own probability curve for n to interpret the same

Table 3.3 V (£ millions) as a function of r = the real discount rate (% per annum)

r	0	2	4	6	8
V	−9250	−3600	−1100	100	740

information, which can be useful. If different people may have different views of the appropriate probability distributions, or less effort is involved using a parametric presentation, it can be better to give users the basic parametric relationships without the probabilities, to avoid possible discussions about difficulties in assessing probabilities or differences in views which may not matter.

However, *if* uncertainty about other basic parameters is treated in the same way by people with special expertise in each area, *and if* they collectively think about and agree suitable dependence assumptions, and *if* results are combined using Figure 3.3 format sensitivity diagrams with a summary Figure 3.5–3.7 format decision diagram, *then* there is a good case for arguing that more clarity has been provided in an efficient manner. At the very least, it is worth understanding that use of Table 3.2 format parametric analysis is a shortcut version of a higher clarity quantitative approach. Put a bit differently, Figure 3.3 and 3.5–3.7 curves can be key tools in PUMP evaluation in all lifecycle stages, but in the concept-shaping stage, parametric approaches may be more clarity efficient.

In the nuclear waste example as addressed by Chapman and Howden (1997), the Table 3.2 equivalent was Table 3.3.

This table shows a £100 million advantage for deferral if a real discount rate of 6 per cent per annum is assumed, as was required by HM Treasury at that time, dropping to zero just below 6 per cent, becoming a disadvantage of £1100 million with a real discount rate of 4 per cent, £3600 million with a discount rate of 2 per cent, and £9250 million at 0 per cent. The significance of the real discount rate assumption and the 2003 HM Treasury move to annual discount rates ranging from 3.5 per cent to 1 per cent prompted Chapman, Ward and Klein (2006) to propose a 'traffic light' decision process for public sector projects.

The evaluate phase from an overall corporate strategy perspective

Full development of the details of the Chapman, Ward and Klein (2006) 'traffic light' process is not appropriate here, but the approach as a whole has a number of features worth understanding by anyone interested in project governance. What is central is a concern for projects from an overall corporate strategy perspective, integrating project, operations and corporate concerns.

Consider in outline how the 'traffic light process' operates. Start by considering the concerns of those who are interested in public sector (government funded) projects. As will become clear, those who are interested in private sector projects, or intermediate public/private sector partnerships, and even personal domestic projects, can apply the same ideas to achieve clarity efficiency not available from common practice discounting approaches.

The overall process starts with a corporate portfolio review, and it takes a corporate strategy perspective throughout, while facilitating quick independent decisions for all clearly desirable projects.

1. The process for each individual project starts with a 'bond test' focus in the evaluate phase, which asks the question 'does a proposed project have a positive NPV, using an estimated actual cost of money discount rate linked to any bond funding which would be necessary?' This involves the only use of discounting, employing an assumed actual cost of the money needed.
2. If this bond test is passed, the evaluate phase focus shifts to a 'return test'. A government must constrain how much it invests in all sectors, with priorities for different sectors, which change with circumstances and political priorities – defence, education, health, and so on. The return test facilitates this balancing of priorities, without using the discounting process. Capital rationing and trade-offs between different sectors are treated in constraint terms, with revealed shadow prices which are not embedded in the discounting process. Embedding any opportunity costs in discount rates induces bias – in favour of 'quick buck' projects, against long payback projects. Different opportunity costs for different investment areas will simply vary the bias.
3. If this return test is passed, the evaluate phase focus might shift to a 'risk test' next – the ordering of tests can be altered to suit the context. There is always a risk we will make the wrong decision in NPV terms, because we got the NPV parameters wrong or we were unlucky in terms of anticipated NPV uncertainty. For example, our favourite aunt insulated the walls of a house and then moved immediately because of an unexpected job offer without getting her money back, or the UK decided not to dispose of nuclear waste in the 1990s because HM Treasury insisted on a real discount rate of 6 per cent, but post 2003, HM Treasury believe about 3 per cent is appropriate. All associated uncertainty has to be addressed in risk efficiency terms decision diagrams, or the Table 3.2–3.3 equivalents. However, often the real risk has nothing to do with the NPV parameters in a direct sense. It involves additional objectives not considered in NPV terms. For example, permanent disposal of nuclear waste may lead to radiation leakage with serious environmental and health implications. Not disposing of nuclear waste may lead to collapse of domestic nuclear power capability, energy security and cost problems, knock-on general economic problems, and further knock-on social and political problems. All these risk issues need serious attention in a holistic framework, at

individual project levels and at higher strategic levels. If they are not addressed directly in an integrated way, what often happens is that a 'risk premium' is added to the discount rate. This compounds the bias against safe long payback projects like hydro, favouring quick payback solutions, which ironically may be very high risk 'quick buck' projects. It also ignores the real issues – serious systemic risks involving a number of crucial strategic objectives are taken without recognising the implications. When HM Treasury dropped the 6 per cent real discount rate and moved to a multiple test approach (HM Treasury, 2003a), they indicated that taking a risk premium out of the discount rate was in part the motivation for their changed approach.

4. If a risk test is passed, the evaluate phase focus might shift to a 'legacy test'. A government must constrain how much it redistributes costs and benefits across generations – generally, society does not want to live well now at an extortionate cost to our grandchildren, or vice versa. At a strategic level, overall balance in these terms needs to be sought. For example, if most current government expenditure favours current generations at the expense of future generations, projects which work the other way should be viewed favourably, but projects which make matters worse should be discouraged, with a simple and transparent means of managing this effect. When dropping the 6 per cent real discount rate and moving to a multiple test approach, HM Treasury used an economic framework that treats this issue in discount rate terms. However, this issue needs to be addressed at a portfolio level, without confusing it with the treatment of the estimated actual cost of money. The cost of money is a project level issue whenever finance is contingent upon the project being addressed.
5. Further tests are possible in any context, and other contexts raise further issues. For example, this 'traffic light' process could be adapted for a highly geared private sector utility company, like a UK water and sewage utility. In the early 2000s most UK water and sewage utilities became about 80 per cent bond funded because of regulatory pressure on equity returns. To match available water to growing demand, two options from a larger set of possibilities are replacing old cast iron leaking water mains with new plastic pipes, and advertising water conservation measures. There is a good case for treating new water mains as bond funded, and advertising as working capital funded, with real discount rate differences. Both sources of funding may be constrained, but rationing in both cases needs an 'appropriate return' test. An opportunity cost increase in the discount rate will seriously bias the case against long term returns associated with investments like new water mains. An opportunity cost increase in the discount rate will also bias against investments like advertising to encourage reduced consumption, with short and long term implications. Further, constraints on the rate at which new water mains can be installed economically may arise because of a limited supply of

appropriate contractors. This warrants an additional 'test', with comparable resource constraints in other contexts, such as project management resources.

If a project viewed independently using this multiple test approach is clearly acceptable, it can be approved immediately, and if it is clearly unacceptable, it can be rejected immediately. If it is marginal, it will need reviewing with other marginal cases at the same time as the test rules are reviewed, as necessary, or on some regular cycle.

This 'traffic-light' process is not restricted to government or limited company contexts. It could also be adapted to a private individual considering insulation. If the cost of insulation is easily added to an existing mortgage, usually a low cost source of finance, this defines the actual cost of capital and the relevant discount rate. If mortgage funding is limited by 'hard' or 'soft' constraints, a return test equivalent is important, to assess the different insulation possibilities in conjunction with other potential calls on the house mortgage funding. Risks that need consideration include unintended consequences, like rising damp, but also any threats to the householders' ability to pay a larger mortgage, such as sudden unemployment in an economic downturn.

In summary, a single hurdle rate test, as advocated in most basic finance texts depends upon assumptions which clearly do not hold in the nuclear waste context. Once it is clear why, and how a simple multiple test approach could work in a government context, private sector equivalents become obvious, and the shortcoming of common practice single hurdle rate approaches, incorporating opportunity costs and risk in the discount rate, become obvious in any context. Even simple personal decisions should be clearer – such as how far to take energy conservation measures like insulation in any reader's home. Further, the need to link project selection decisions to corporate strategy becomes clearer, at all levels – from private households, to large corporations, to national governments.

The author does not anticipate an immediate radical change in approaches to discounting along the lines proposed in this section, by HM Treasury or any other collection of economists. However, those who want a clarity efficient approach to their projects or their corporate strategy with opportunity efficient outcomes cannot afford to wait. Of more immediate relevance – those concerned with good governance cannot afford to wait.

All strategy gateway PUMPs should include a fit for purpose test, which in effect audits the linked strategy-shaping PUMPs. It follows that the competence required to judge PUMP-based plans must include understanding all relevant PUMP pack concepts. The controversial nature of common practice 'risk management', and the nature and extent of common practice failings associated with the treatment of discounting, makes this an issue for all strategy gateway PUMPs, but it is probably most important for concept gateway PUMPs, and good governance has to address it without misplaced trust in any deeply flawed conventional wisdom.

Trust issues

Trust is the lubricant which is essential for all opportunity efficient activity. No one can reasonably expect those responsible for governance at any level to fully understand all the issues explored in this chapter. However, when those responsible for governance fail to test the efficacy of what they trust, the quality of their judgement can, and should, be held to account.

Companies which employ engineers who design structures which fail for reasons they should have understood, because explanations and alternative, better approaches are easily accessible in the relevant published literature, can be successfully sued on professional negligence grounds by clients and others who suffer because of the engineers' oversight.

A hierarchical approach to governance should be sought, which moves towards the notion that everyone within the overall process is competent and appropriately motivated, and that both competence and intent can be tested routinely, if trust in either matters. This is not a matter of compliance. It is a matter of enlightened governance, which is based on a combination of well-founded and properly bounded trust and competence.

Developing a clear understanding about what opportunity efficiency means in an uncertainty management framework should be a key part of this. The implications are obviously ambitious and demanding. However, anything short of this could prove misleading, because it is based on framing assumptions which cannot be trusted.

3.6 Trust and the rest of the project lifecycle

Until this point, the focus of this chapter has been governance aspects of a gateway process at the end of the concept strategy-shaping stage, the initial stage that begins the project lifecycle.

At this stage, much of the uncertainty involved should not be confused with risk – it involves ambiguity as yet unresolved. The shaping of the concept strategy needs to be followed by the shaping of the design and operation strategy, followed by the shaping of the execution and delivery strategy, followed by the shaping of all tactics needing attention before execution starts. This further shaping of the project before execution begins should realise opportunities and reduce uncertainty.

Governance at the end of the concept strategy-shaping stage involves a crucial assumption – those entrusted with further work on this project can address the rest of the project lifecycle in an appropriate manner. This chapter argues that an appropriate manner is an opportunity efficient manner – those entrusted with the rest of the project lifecycle know how to use the Figure 3.4 'knowledge lens' and 'performance lens' and all the other uncertainty management concepts discussed and alluded to earlier in this chapter. Approval at the end of the concept stage should be based on, and conditional upon, trust in this sense.

For this trust to be well-founded and properly bounded, further gateway processes are necessary as the project lifecycle unfolds. Each has to look for systematic reductions in uncertainty as knowledge is gained, and efficient expenditure of the effort involved in reducing uncertainty, by developing and refining all relevant plans, including designs, contracts and relationship plans beyond formal contracts. Surprises are to be expected, but not unwelcome surprises which could have been avoided by a robust uncertainty management process.

Lack of evidence of opportunity efficiency is a very basic good reason for stopping a project at any stage. The core purpose of good governance is an ongoing test of how well-founded is the trust in opportunity efficient completion of the rest of the project lifecycle.

3.7 Difficult and very difficult trade-offs

Trade-offs between attributes or multiple criteria associated with a particular attribute are always difficult, but some are relatively easy. For example, if future operating costs are properly discounted, and if the client has to pay for both operating costs and capital costs from the same retained profits, without complex taxation differentials, then 'capital cost' and 'operating cost' are two attributes which involve trade-offs that are reasonably straightforward. As another example, if 'expected cost' and 'cost risk' associated with the barge choice example of Figure 3.6, when both options are risk efficient, involves an additional £100 million cost risk exposure, but an expected cost saving of £5 million, and if an additional £100 million is just 'noise' in the context of £1000 plus total project exposure with many other comparable projects in the corporate portfolio, the 'cost risk appetite' issue should be relatively easy to deal with. Figure 3.6 uses expected cost and cumulative probability (of being within a given cost) metrics, so the trade-offs between criteria do not make any assumptions about measuring risk, such as 'risk = variance', and visually a decision-maker has full information, if cost is all that matters and the distribution has been measured appropriately – without bias including all uncertainty not identified as a condition.

The common practice probability-impact grid (PIG) based approach to 'risk appetite' issues assumed by HM Treasury (2006a and b) does not provide the clarity of the Figures 3.5–3.7 approach, but in an effective uncertainty management framework, misleading working assumptions can be understood and avoided.

An example of relatively difficult trade-offs arises if loss of life is a potential outcome, or massive environmental damage, or both. A clarity efficient approach addressing a minimum clarity position within the recommended uncertainty management framework for a current client involves an example which cannot be discussed, but it draws on the revisiting of an example which can – safety strategy decisions for a railway system.

Railtrack was the 'private sector' operator of the UK rail system post privatisation of British Rail. In the 1990s the author undertook a review of the Railtrack approach to safety at a strategic level. He provided a report recommending a significant shift in their basic framing assumptions. Several years later, Railtrack went out of business, arguably because they did not take the report's advice, and two major rail crashes within a short time period caused unanticipated operations, and political and financial problems. Railtrack was succeeded by Network Rail. Some of the author's concerns with the Railtrack approach to safety are explored in Chapman and Ward (2002, Ch. 7), but work for a current client suggests that greater clarity efficiency explored in much more specific contexts is a more fundamental concern.

To indicate the flavour of what is involved, say a railway operator considers three options for signalling systems for a particular stretch of track:

1. Leave the current system as it is;
2. Refurbish the existing signalling system;
3. Replace the existing signalling system with new generation system.

Assume these options are ordered in terms of increasing annualised cost and increasing safety – an efficient set of choices in terms of cost-safety trade-offs.

The Railtrack approach was based on using a 'value of an equivalent fatality' concept to judge acceptable safety standards. This was broadly consistent with common safety management practice in the UK, and interpretation of ALARP (as low as reasonably possible) approaches internationally. Three issues worried the author. In order of increasing importance they were:

1. Fatalities and serious injuries were aggregated using assumed trade-offs like '10 very serious injuries can be equated to one fatality', which may be reasonable but clearly could be debated;
2. Fatalities involving people ignoring barriers or red lights at level crossings were equated to fare-paying passenger fatalities, when possible Railtrack negligence was arguable and limited safety budget issues were involved, clearly a questionable assumption;
3. No direct formal account of the number of fatalities in a given single incident was built into the appropriate value per fatality, although it was recognised that 50 people killed in 50 separate incidents is very different from 50 fatalities in a single rail crash.

The author's report was focused on the latter, the need to formally manage the difference between stretch targets, expectations and commitments, and the importance of passenger, press and regulator expectations about low probability, but high impact incidents. Considering the signalling system example in the light of the current client's needs suggests a minimum clarity approach as follows:

Assume the railway operator has an unbiased cost estimate of the annualised cost increment associated with options 2 and 3 relative to the base cost associated with option 1. Further, assume they have the corporate uncertainty management capability to use the minimum clarity approach portrayed by Figure 3.1, or some higher clarity variant to obtain an unbiased estimate of the probability per annum of a rail accident involving fatalities on this stretch of track, because of signal failures for each of the three possible system choices. Say they can also use this minimum clarity approach, or some higher clarity variant, to obtain an unbiased estimate of the number of passenger fatalities if such an accident occurs for each of the three possible system choices. In the author's view, they ought to be able to do this using data as appropriate, but experience and expert opinion-based subjective probabilities as the inherent underlying framework. Any attempt to avoid doing so by preserving the use of a 'qualitative' probability-impact approach is not acceptable.

Now say they are prepared to use a 'value of an avoided fatality' parameter 'f', associated with one fare-paying passenger fatality in all comparable contexts to our signalling example. The value of 'f' should be interpreted as a shadow price associated with minimising the expected number of passenger fatalities per annum, subject to budget constraints imposed by regulators limiting fare rises plus the commercial pressures of a private sector organisation. This value could be related to other special case interpretations, but its basic nominal interpretation is a shadow price concept.

If 'f' was all that mattered, and all that matters was independent of the number of fatalities in any given incident, then choosing option 2 (refurbish the existing signalling system) implies a minimum to maximum range for what we might call the associated 'unadjusted f'. This f value would have to be lower than the minimum to justify option 1 (leave the current system as it is), and higher than the maximum to justify option 3 (replace the existing signalling system with new generation system). We have a clear-cut shadow price basis for trade-offs between expected fatalities and cost in safety budget terms. However, the number of fatalities is not all that matters, and the number of fatalities involved in a single incident matters.

Say n_1 is a plausible minimum number of fatalities for the safest of the three options (assumed to be option 3), and n_2 is the plausible maximum number of fatalities for the least safe of the three options (assumed to be option 1). Say those responsible for safety define m_1 and m_2 where m_1 is a factor which scales up f for n_1 to reflect 'everything that <u>m</u>atters', m_2 performing the same role for n_2. For example, they might assume $m_1 = 2$ because 'everything *else* that matters' is as important as nf if n_1 fatalities are involved, $m_2 = 11$ because 'everything *else* that matters' is 10 times as important as nf if n_2 fatalities is involved. That is, m_nf is the unadjusted f, and f on its own needs adjusting.

Then if these m_n values are used to define a linear relationship for the extent to which everything matters as a function of n, an 'adjusted f' can be used instead of the 'unadjusted f' discussed above.

This is a minimum clarity approach if n matters. If n does not matter m_n can be a single constant m for all n. If nothing except fare-paying passenger fatalities matters, then m = 1 is assumed. A more sophisticated non-linear treatment is clearly possible, and may be desirable.

The 'everything that matters' role for m can include staff fatalities, passenger and staff injuries, and all other considerations, including repair costs, additional operating or capital costs, and possible costs linked to regulator or government responses. It can also include an implied scaling up of f as a function of n, without explicitly attempting an f value that is a function of n. Some decomposition using explicit working assumptions and any relevant available data and views may be very useful. In any event it is the effect of n on everything that matters which is the minimum clarity issue.

If the railway operator wants to make similar choices for all stretches of track and all ways of reducing passenger fatalities, in a manner which is consistent and risk efficient, in the sense that it delivers a minimum expected level of passenger fatalities for any given expenditure on safety considerations, they need to define a value for f and apply it consistently to all choices. They also need to think carefully about appropriate m values in different contexts. In effect, 'f' and 'm' are the simplest set of parameters which can be used to make opportunity efficient trade-offs between fatalities and cost which avoid the kinds of problems that Railtrack faced. If 50 people are killed in one accident, this is not the same as 1 fatality in each of 50 accidents or 5 in 10 accidents, and a significant range of possible fatalities is a feature of the system involved. Further, fare-paying passenger fatalities, because there were budget constraints on safety related expenditure prior to a serious accident, are not the same as fatalities at level crossings, when people ignore warnings. Further still, there is no easy way to relate staff fatalities to passenger fatalities, or serious injuries to passengers or staff, but all these issues clearly matter. All parties will want to understand what overall trade-offs have been used if a serious accident happens, and transparency is essential for trust, without the need for agreement about a detailed component breakdown for m.

Railtrack had to deal with these problems in the context of a safety management culture and legal environment which demanded an approach consistent with transport industry interpretation of an ALARP (as low as reasonably possible) approach to fatalities risk. Such interpretation implies the use of a parameter like 'f' with industry norms for most contexts, from road travel (with relatively low values) to air travel (with relatively high values). Railtrack's special problem was a wide potential range for fatalities, which made the number of fatalities involved in a particular incident crucial. Most transport operators and government transport departments or regulators have used concepts like 'f' and 'm' for many decades, but lack of clarity is still a very serious issue in some people's view, including the author's. The general concern of the author is a failure to consider, in direct and explicit terms, the role of a clarity efficient approach to all relevant concerns in sufficiently specific contexts, and a failure to use an 'm_n' concept which captures both the role of n and a residual composite approach to 'everything that matters'.

If serious environmental issues were involved, as well as loss of life, this could be accommodated via an 'm' parameter, or more sophisticated variants. If fatalities are not an issue, but trade-offs between cost and environmental concerns are, the role of a parameter like 'f' might be replaced with a parameter like 'the value of an avoided tonne of oil spill' or 'the value of an avoided tonne of carbon dioxide emission'. Those responsible for good governance should understand these issues to the extent that they are relevant to their context. If they agree to decisions without understanding them, they may be agreeing with policies which might be shown to be bad management or negligent management.

Very difficult trade-offs arise when a judgement needs to be made involving important objectives which cannot be addressed in terms of a useful metric within the available time-frame.

Very difficult trade-offs also arise when the kind of 'shadow price' parameterisation of difficult trade-offs, discussed above, is not possible, because there is no basic metric such as 'passenger fatalities', 'tons of oil spilled' or 'tons of carbon dioxide emitted' – there is no relevant metric for a relevant objective treated as a constraint to generate a 'shadow cost'. An important, relatively simple example involves judging whether or not clarity efficiency has been sought and appropriate trade-offs made between clarity and decision-making effort. An important, relatively complex example involves judging whether 'the general public's best interests' are served by a political compromise between the interests pursued by parties to an argument about complex issues like 'a low carbon future'.

Good judgement and good governance has to consider the easy, the difficult and the very difficult issues. To fail to address any important issue is not acceptable. The most important issues are often the most difficult.

3.8 Benchmarking and industrial databases

Any benchmarking used as part of a governance process should consider all the key assumptions underlying the benchmarks used. For example, if a risk management process used by a project proposal is benchmarked against a process with flawed assumptions, that proposal is flawed. If a governance process is itself benchmarked against a process with flawed assumptions, that governance process is flawed.

Industrial data-base use should be approached with the same concern about all relevant underlying assumptions.

3.9 A concluding summary of what needs to be done

By way of an overall summary, good governance has to involve testing all assumptions that matter. These include assumptions about suitable trade-offs between all objectives which define the basic nature of the project outcomes anticipated, and all process assumptions involved. Process assumptions range from very basic assumptions like 'what do those involved mean by uncertainty, opportunity and risk', to very technical assumptions like 'what is the basis for an appropriate discount rate, and if a hurdle rate does not include opportunity costs and risk premiums, how are the associated concerns best addressed?' Good governance may also include issues like 'what value of an avoided fatality should be used?', or 'what value of an avoided environmental problem should be used?' It invariably includes the issue 'can everyone involved be trusted to do what the project proposal assumes they will do?' Crucially, there is no 'too difficult box' for assumptions that are not understood.

For those who would like outline guidance on what needs to be done, based on the framework provided earlier, the first issue is recognising the importance of the context. This includes the kind and level of governance involved. A private sector project involves a project manager, accountable for one level of governance, the board he or she reports to involves another level, and any regulators responsible for customers' costs or pollution issues involve a further level. Public sector or not-for-profit organisations may have comparable levels. A board, or its equivalent, is a suitable initial example for present purposes. Where the project is in its lifecycle is also crucial – the concept stage is a useful initial assumption for this section.

Well-founded and properly bounded trust is the next issue, starting with the body responsible for the governance being addressed. For example, for a new company director, 'the board as a whole is capable of exercising the required governance at the required level of competence' is a key assumption to test. If the project is a major information technology project, or office complex to be contracted out, client understanding of what is needed, and interpretation of those needs by professional advisors and a prime contractor, involves a set of assumptions about capability, motivation shaped by contractual provisions and integrity, which may need testing by the responsible client board.

Unbiased interval estimates of performance for all relevant measurable attributes is the next assumption which needs testing, starting at overall composite levels. For example, 'the expected total cost estimate and associated plausible maximum and minimum values can be trusted' is an assumption which needs testing. The documentation for the estimation process is the evidence basis for a quality-based judgement. A minimum clarity approach, or something near it, may be appropriate, as illustrated by the Figures 3.1–3.2 example, and the Highways Agency example using Figure 3.3. Whatever level of clarity is appropriate, all relevant uncertainty needs to be captured by the composite of quantified uncertainty plus the composite set of conditions portraying what has not been quantified.

Appropriate trade-offs between risk and expected outcome associated with each measurable attribute involve a set of assumptions needing individual attention. Figure 3.7 illustrates a minimum clarity portrayal for the office manager's photocopier decision. Figures 3.5–3.6 illustrate high clarity examples used for BP and IBM. Different attributes may require different risk-reward trade-offs. For example, a high appetite for cost risk to aggressively pursue profit may be appropriate, but it may be important to choose a low-pressure, long-duration approach to avoid vicious circles of cost escalation, when delay becomes an issue, and project delay risk may need a low tolerance, because of customer and profit-related knock-on effects. Decision diagrams are key tools, and inappropriate assumptions for any context, such as 'risk can be judged using probability-impact grids' have implications which need to be understood.

A different but related set of trade-offs between attributes needs attention too. For example, would quicker project completion at a higher capital cost provide better value for the organisation, and would a still higher capital cost with lower operating costs be an improvement?

Non-measurable attributes which are relevant need special care in terms of both sets of trade-offs addressed above. Simple context low clarity approaches were illustrated by the photocopier example and 'keeping your favourite aunt warm' when advising her on insulation. More difficult contexts were illustrated by the railway passenger fatalities 'f' and the related 'm' parameter discussion, and by the need for a multiple test approach to discounting in a nuclear waste disposal context, which requires proper, separate attention be given to the risk of nuclear contamination, the risk of premature storage and the risk of economic consequences, if nuclear power is not part of a country's portfolio of energy sources.

In addition to the 'effectiveness assumptions' noted above, 'efficiency assumptions' are also relevant for a board. That is, assuming that the clarity efficiency and risk efficiency components of opportunity efficiency are properly understood and effectively pursued to shape all relevant plans, is an assumption which needs to be tested. 'Doing the right things' is inherently more important than 'doing things right', but both matter.

As the project lifecycle progresses, governance processes have to use new knowledge gained in each stage to confirm or revise all earlier judgements. These include judgements about interval estimates, trade-offs, the competence and motivation of all relevant parties, and all underlying plans and mechanisms. Governance processes have to agree to expenditure needed to move to the next stage, if appropriate, but ensure that projects which display hard or soft evidence of future problems, not properly accounted for and managed in uncertainty management terms, proceed no further until these issues are resolved.

Some perspectives on governance may be able to ignore efficiency issues, but have to look at very subtle effectiveness concerns driven by efficiency issues. For example, from a regulator's perspective, preventing future incidents like the 2010 Macondo oil well accident in the Gulf of Mexico requires regulations and oversight which can relate the issues discussed in a railway safety context to the complex contractual and commercial pressures on all the parties involved.

Enlightened governance from an uncertainty management perspective needs a holistic approach, based on a combination of well-founded and properly bounded trust and competence. Developing a clear corporate understanding about what opportunity efficiency means in an uncertainty management framework should be a key part of this. The implications are obviously ambitious and demanding. However, anything short of this could prove misleading, because it is based on framing assumptions which cannot be trusted.

At its simplest and most fundamental, good governance is about testing all assumptions that matter to a significant extent. Ignoring what is 'too difficult' is not an acceptable governance option.

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4
Designing the Project

Andrew Edkins and Alan Smith

4.1 Introduction

In this chapter we are not striving to argue for one type of project design as a universal solution. Rather, we explore a number of issues and factors which those who are either tasked with the design of a project, or find themselves otherwise embroiled in the project, may find helpful to consider.

To avoid later confusion, it is important that we explain that under the term 'project design' we include the contextual setting of the project, how its manifestation is conceived and then governed, structured, monitored and controlled. These activities, together with the resultant bodies, protocols, systems, processes and procedures will hopefully (but with no guarantees) enable the project to reach its objectives, as well as delivering the many accompanying products of project management, such as the plans, reports, meetings, proposals and presentations.

One reason why a single panacea is not proposed is the recognition, from the outset, that the degree of novelty within projects varies from case to case, making each unique. Here we use the term novelty to mean bespoke, original or unproven. This uniqueness will have a profound influence on a project's design. We appreciate that projects vary according to numerous parameters, such as: the type of output produced; the sector they are in; the geopolitical circumstances surrounding them; the size and scale of the project endeavour; the relevant legal system; economic conditions; and the nature of experience, and conduct and predispositions of the primary players involved. As the chapter unfolds, we will touch on all these points and note not only their influence, but what we feel is the impact on the project's design.

The way that a project idea emerges, whence it emerges, and the party or parties which create, sponsor and subsequently 'own' it are all highly relevant to the act of designing the project. It is important for the person or party taking the role of project designer to understand the project origins and appreciate its background, knowledge and the experience of the parties likely to be involved. In this chapter we will explore the underlying principles, issues and viewpoints that are important when designing a project. One of the most valuable investments that can be made in a project is to consider, and then create, the right design at the outset.

The mere mention of the word 'design' in the context of projects will conjure to many the design process for the output that the project is charged to deliver. While the design of the output is clearly important, this rich area of discussion is not the primary focus of this chapter and is, indeed, beyond its scope. In considering the design of the project, the output design process is a detail, albeit critically important to the success of the project. We are interested, however, in the organisation of the team and facilities that come together to enable the creation of the design of the output. For readers interested in the design process of the deliverable, the seminal work, 'Design Methods' of John Christopher Jones (1992), as well as the works of Rowe (1987), Lawson (2005), and Blythe and Worthington (2010) are recommended.

4.2 The presence of risk

Some projects are simply riskier than others by their very nature. At one extreme, a project's success is driven by factors outside any simple control – this is exemplified in the pharmaceutical industry, where project success (defined as 'first-in-man registrations' over a ten year period from 1991–2001) was 11 per cent for the top ten pharmaceutical companies in the United States and Europe (Kola and Landis, 2004). The factors affecting success in this case are related to the unknown precise therapeutic benefits (or otherwise) of the drug and its commercial production viability. In this case a lighter-touch and hence riskier project design might be more acceptable, as the project will be dictated by contextual complexities such as the regulatory regime in play, the state of technology, and the speed at which the relevant science moves. Individual projects bearing such hallmarks would be expected to operate under the auspices of a portfolio management regime (Levine, 2005). However, in projects that demand very high success rates (for example, a high profile time-limited project, such as elements of the 2012 Olympic infrastructure), little or no additional risk can be added through the project design, which can be expected to be elaborate, detailed and comprehensive.

4.3 Start to finish

Before we can discuss design, we must first agree on what lies within the bounds of a project. Most fundamentally, a project is a set of activities that are linked to deliver some interventional change. It is often the case that the project will lead to a deliverable, which may be tangible, as in the case of a new ship, or intangible, as in the case of re-structuring an organisation. All projects will have a lifecycle which terminates when some new operational state emerges (the ship goes into service, or the organisation starts operating in its new guise). Some classes of entity, such as ships, buildings, IT systems and organisations, will be subject to a number of projects as they undergo periodic upgrade, refurbishment, or refreshes. However, it is important to recognise that there will be a project to initially create the entity, followed by periods of stable operation interjected with the potential for occasional projects. An important characteristic of an entity is therefore whether it is in a 'steady state' or a 'project state', and when and how the transitions between the two states occur. If we merged operational and project states, we would not be able to apply the valuable tools and techniques of project management. To not have clear start and end points would constitute the breaching of a fundamental attribute of any project – that it has to have a start and a finish. This may seem obvious to many, but in the modern and complex world in which projects are located, identifying these project start and end points is not as straightforward as may first appear.

Let us first consider the question: when does a project start? Many may feel that a project only starts once it is unique (i.e., it can be bounded and named), when the change to be delivered has been articulated and defined, the delivery team has been authorised, organised and supplied with the necessary resources, and a timescale for delivery has been determined. For some, a project only starts at the 'kick-off' meeting. In this view a project must have all the elements of the 'iron triangle' where the time, cost and quality specifications are given (Atkinson, 1999; Roger, 1999). This definition of the start of a project is, to others, merely the start of the execution phase (Morris and Pinto, 2004). Clearly much must have taken place beforehand; not least the events that see the embryonic project emerge from a sea of ideas. Indeed, such is the competitive and resource-constrained world, that even this activity *ideation* needs to be appropriately managed (Dahl and Moreau, 2002).

Once an idea has gained traction through some form of critical and hopefully considered deliberation, it becomes a potential project. In some domains each phase of definition and risk mitigation prior to commitment is a project in its own right. For instance, in the space sector there is a very significant amount of planning and engineering design that precedes a formal commitment to go to implementation (or 'launch'). A survey of opinions as to 'when did the project start?' will lead to a range of answers. To take a non-engineering example, when an organisation faces situations that require it to change in some substantial or fundamental way – as has happened to many since the 2008 global financial turmoil – the triggers of a project are set, but while these drivers may be understood, they are not necessarily the start of any project. For that you need to have some forethought as to what you are seeking to achieve. Thus, arguments in the Board Room about the possible courses of action an organisation may take become the debated proposals about possible projects that the organisation could embark upon. It will be for those in charge of the organisation to decide which of the possible plans to take forward, and thus formally start the project.

For many, the formal point at which a project is recognised will vary from sector to sector and client to client, but there will always be some degree of fuzziness at the earliest stages, as ideas are developed and tested against such issues as the potential to deliver value to the project sponsor, or the availability of the necessary resources and expertise. While these 'front-end' issues may seem obscure, they are the foundry for the project. Morris and Hough (1987) and Flyvbjerg (2003), together with respected official review bodies, such as the US Department of Defense (2012) (DoD), Government Accountability Office (2012) (GAO), NASA (2012) and the UK: National Audit Office (2012) (NAO) demonstrate that the early stages of a project are one of the primary points where strategic success or failure for the project is set.

With the starting point of projects being, in some cases clear, and in others less so, and with the importance of the front-end of any project having been noted, we now need to fast-forward to the end point, where the situation may be no clearer. Some projects will deliver an output, and that will be all. However, in other cases the output may require further projects through its lifecycle, making it less clear as to when the final project will be completed. One could argue that this is an irrelevant semantic argument, but it can matter, particularly if there is benefit in retaining and reapplying previous project expertise. Thus we may observe multi-phased and faceted projects that can be seen as a time-sliced, multi-stream combination of transformational projects interwoven with steady-state operational phases. The lifespan of such multi-phased projects (from commencement of the initial project to final disposal of the asset) can be many decades, and can certainly be longer than the career of any of the individual project participants involved. In the case of those in the construction sector, the use of public/private partnerships, or the private finance initiative (PPP/PFI) leads to a contract/project duration that is in part a function of the longevity and durability of the built asset, together with the time needed to recover the expense involved in the asset's creation. However, the principle of a project moving through phases over considerable time-spans can also be observed in other very different sectors, such as space missions, where both near orbit projects, for example, the International Space Station (ISS), and long-range missions, for example, NASA's Cassini at Saturn can take many years to complete. In off-shore oil and gas extraction, there are projects to create the rigs, then operational phases with occasional upgrade or repair projects, and finally decommissioning projects. This last project phase can prove highly sensitive, as was the case with the Brent Spar oil storage facility (Rice and Owen, 1999). In such cases, the implications on the project's design are such that it will need to consider the activities and issues that will occur at the end of life of the project's product at the early stages, thus factoring into the parameters the requirement for safe, efficient and effective disposal.

This consideration of the entire life of the product, or output of the project, will therefore have a significant impact on the design of the project. It will have affects and implications on the procurement and supply chain strategy, involvement of whole-life-cost methods as well as value management, project leadership, and governance and control arrangements, to ensure that a comprehensive and, ideally, holistic approach is taken. These top level concerns will influence and dictate the use of project management methodologies, tools and techniques that can track over the various phases of the project.

4.4 Factors affecting design

We need to be clear that we are separating what the project is from any other consideration. To achieve this, we will consider the significant impact made by the work of Shenhar and Dvir (2007) and the use of their diamond model. Here, a project's product is considered in terms of its novelty, technology, complexity and pace (NTCP). By mapping what the project is producing against these four axes it is possible to infer many of the project management challenges. In the following, we will expand and explore these topic areas to show how a variety of factors influence the optimal design of a project.

While there are other models, the success of NTCP in terms of its discussion in the academic literature illustrates an important point, that of the significant causal relationship between what the project is endeavouring to deliver and the design of the project. It is beyond the scope of this chapter to conduct a full review of project typologies to consider alongside the NTCP model, but a very useful review of such typologies has been conducted by Sauser et al. (2009). Their review finds that there is no agreement on how to consider a project and its management, and, indeed, their approach is to take a contingency-based view, that is, that the approach taken should not be an a priori fixed stance, but one that considers the considerable number of factors and parameters linked to the nature of the product, the sector and organisations involved, and the external environmental influences, such as the state of the economy and role of external legislators and regulators.

Linked to the need to consider the factors that make a project a contingent response, there is also the need to be clear on the frames of reference for judging the results. This brings us to the world of quality assessment and assurance. One can talk about quality in terms of the project itself, or in terms of the project outputs and resultant outcomes. Project outputs or deliverables should provide to the sponsor, customer, or user the predefined capability required and agreed. For the user of the deliverables, the outputs should be fit for purpose within the domain of anticipated use. This definition of purpose is often layered. For instance, a project may deliver a new work environment for a company trading in a competitive market. The purpose is to enable and facilitate efficient and effective activity. This activity should lead to increased profitability for the accommodated departments and, ultimately, to better commercial performance and a greater share price of the company. As a contrast, a satellite's solar panels will provide the basis of power for the satellite, which should provide a necessary communications link and so form the basis of revenue income and profitability to a satellite broadcast company.

This measure of quality of the outcome from a project's output can be highly complex, as it can enable many potential causal factors to coincide. Consider two very different examples. In modern in-patient hospital care, it has been argued that small bay, naturally lit wards result in both improved patient wellbeing and shorter bed space occupancy (the anticipated outcome) (Beauchemin and Hays, 1998). Moreover, rebuilding hospitals to achieve this will also eliminate a number of other problems inherent in older hospitals, by ensuring better compatibility with modern medical technology and making them easier to clean. A project to rebuild a hospital can also bring in new attitudes, ideas and players. However, while the rebuilding project may have all such consequential outcome benefits, it will be difficult to prove these as being solely attributable to it.

This complexity between output and outcome is illustrated by looking at a second, specific example. This is the corollary of success, and reflects on the severe problems that occurred with the baggage handling system at London Heathrow Airport's Terminal 5 (T5). This much heralded project (the building of T5) was reduced to negative headlines for the opening period for a number of reasons, but one in particular was singled out by the world's media – the baggage handling system failure. The baggage handling system (a significant project in its own right within T5) had to not only technically work, but also be understood by those working with the system. Although trialled ahead of full opening (confirming the acceptability of the outputs), the combination of novelty, complexity and unfamiliarity in a live operating environment proved to be too great when the volume and diversity of baggage increased, and a major failure occurred, resulting in financial loss, as well as reputation and credibility damage (Doherty, 2008); (House of Commons, 2008). The point being made here is that the project outcomes should be fit for purpose under all reasonable operating conditions, including immediately after commissioning.

As the strategic focus of the client, sponsor, or society moves from discrete project outputs to the anticipated outcomes, we would expect to observe that layering occurs, as elements of projects and sub-projects combine to form greater projects or programmes (Office of Government Commerce, 2007). The nature of the strategic objectives often requires complex supply chains and supply clusters to deliver diverse ranges of products and services.

To orchestrate all those involved in the supply of the project in order to meet both the breadth of its strategic objectives, and also all aspects of the 'iron triangle' of cost, schedule and quality performance, we argue that projects must be designed explicitly, and not left to chance.

In what follows, we will explore the design of projects and the factors that affect this. We have drawn on the NCTP model developed by Shenhir and Dvir, but have not slavishly followed it, preferring to consider a wider range of topics that, we argue, are critical for the designer of a project to consider.

Issues around pace

We start with the important consideration of temporal pressure. While some projects will not be time pressured, non-trivial examples of such projects are difficult to find. The adage 'time is money' is still as true today as when it was first coined. Where a project's delivery is dictated by a powerful supplier, such as in the commissioning of a work of art (say from a famous painter or sculptor), then a sponsor or client will potentially receive the statement 'you will see it when it is ready – not before'. However, the majority of projects are pressured to deliver within certain time-frames (for example, before the end of the financial year), or by certain deadlines (that is, a specific date). Indeed the drama of these delivery pressures can be heightened by terms such as 'deadlines' or 'a drop-dead date'. While time pressure is well understood, and there are many project planning and progress monitoring software tools available to assist in this, the nature of the world is such that time pressure is increasing as the pace of modern life quickens. Whether it is the short-term pressures resulting from relentless technological progress, or our increasing understanding about the changing nature of the Earth's climate, the pressure is to speed up. This pace issue directly impacts on the way projects are managed. Critically, it means that there may be pressure to compress the set of front-end activities that have been shown to be vital to project success (Flyvbjerg et al., 2003; Morris and Hough, 1987). We would stress that such time-saving here is foolhardy, for the evidence from both respected academics and august official reviewers is that rushing the front-end of a project will jeopardise its chances of ultimate success.

If, at one extreme, we have highly dynamic environments where rapid project cycle time is needed, as would be the case with some IT software, then we have one set of project design challenges. At the other extreme, we have complex built environment or space assets operating for decades, which pose an entirely different set of issues for those concerned. In the case of the rapid moving IT project, the current solution is dominated by methodologies and approaches that fall under the generic title of 'agile', being part of the body of projects represented by rapid application development (RAD) that has become part of the dynamic systems development method

(DSDM 2012). This can involve a range of specific approaches, such as SCRUM and Extreme Programming (XP). This rapid development is not just limited to IT and software. In manufacturing there is a thriving market of 'fast moving consumer projects', as illustrated by the mobile phone handset market. Here, the pressure of technology development, intense competition and a fickle demand market means that product manufacturers have to be constantly developing families of products that will appear in generational form. Indeed, the mobile phone transmission system is referred to by its generational tag (so we have 2G, 3G, 4G, and so on). Integrated circuit chips, as produced by Intel and AMD, display this rapid cycle development and short expected shelf life, driven by fickle demand.

In the case of long-lived projects (i.e., those with long operational lives, such as buildings, oil and gas rigs, or warships) the centrality of the contract is critical for continual organisational engagement. There has been an increasing trend for a whole life perspective, compared with the traditional divorce between those who produce the capital asset for the client or sponsor and those who go on to operate it. Clearly in some situations this makes sense, with the defence arm of a government acting as the client, against which contractors deliver warships, and naval personnel go on to operate the ship in use, with the navy taking full responsibility for the operational support and maintenance for the life of the warship. Outside such national security situations, however, the responsibilities for delivery and operation are increasingly being linked with the acronym DBO (Design, Build, Operate) across many sectors, ranging from civilian jet engines, through process plant, to buildings. Where this engagement is with one party, for example the concessionaire, the obligations to deliver the operational performance required and expected are typically enforced through law, either as common law, as is the case in many European countries, or contract law, as is the case in those countries that follow the UK's legal structure. With sophisticated assets, demanding operational requirements and long time horizons, the resultant complexity of the contract can be great, as has been the case with UK Private Finance Initiative (PFI) projects. This arises as there is an attempt in the contract to foresee all the possible futures – itself a topic fraught with likely error and omission – and the concern that owners want their interests protected in circumstances where a contractor is responsible for the delivery of the operational service and environment.

For projects where the deliverables are physical objects that are expensive to produce, such as ships, buildings, oil rigs and so on, it is vitally important not to proceed into a build phase with an immature design. Therefore the identification of the need for such a review and the mechanics of its functioning is a project design consideration. Iteration across a Critical Design Review (CDR) boundary is not an option, since repeating manufacturing cycles as the design matures is costly in terms of resources and time. In these circumstances the project's pace has to be considered against the risks being introduced or amplified. Moreover, for space hardware, compressing schedule beyond a certain point, especially for more complex deliverables, leads to a much higher chance of failure. As complexity increases, a point arrives where no individual can maintain a full appreciation of all the causal relations that create the emergent properties of the deliverables. It simply takes time to 'get to know' what one is producing. Time pressure can create a 'box-ticking' culture, where little time is spent looking for potential problems or really understanding what is going on. For NASA this, at least in part, led to the loss of four out of five space missions in its discovery programme in 1999 as part of its Faster, Better Cheaper initiative (McCurdy, 2001).

Issues around the definition of objectives

While it may not be a party's desire or intent, the external pressures on clients and sponsors to 'make progress' often results in projects being commenced or implemented with poorly defined or non-specific objectives. It may be the case that projects are launched with only high level aims and objectives in place, with 'the details to follow' – for example, the London-based celebratory exhibition for the year 2000 that became known as the 'Millennium Dome' (National Audit Office, 2000). This is likely where the context of the project makes its timely completion essential – often being driven by 'windows' such as ensuring a retail store is completed or refurbished in time for the Christmas trading period, or commencing an emergency flood defence before a predicted major storm hits. In such circumstances, capturing this detail as soon as possible (and ideally testing its validity) is something the project must be designed to do. To achieve this, mechanisms, processes and resources must be allocated in time to be of use, or else there will be an unnecessarily confused and wasteful exercise. Where insufficient attention is given at an early stage to the clarification of objectives, one should not be surprised by the turbulence that follows, as schedule pressure builds and different parts of the projects have interpreted the objectives differently.

Note also that project objectives may be less well defined that one might imagine. For instance while the development of some element of aviation electronics might seem tightly bound, on inspection of requirements documents or specifications, a surprisingly large number of 'to be defined' instances (TBDs) may be discovered. Resolution of these TBDs is an important early focus for the project. Moreover, TBD begs the question, 'by whom?'

Similarly, some long term projects can expect an evolution of objectives as the world moves on and needs change. Long-lived assets such as buildings, civil engineering structures and ships can all see their originally intended use adapt and alter. The viability of such alterations can, on occasion, be directly related to the knowledge that is retained about the asset's life. The precautionary principle of erring on the side of caution can cause an asset with an uncertain recorded history to be considered non-viable, whereas assets that can display their full history can be considered for further alteration.

This record-keeping function is highly developed in the military, but sometimes very poor in the construction sector. Accommodation of this volatility of possible future use has to be considered and designed-in. Otherwise it can lead to denial, lack of opportunity, or lack of convergence.

Coping with change in projects is a frequently discussed topic among both project management practitioners and academics, and much has been written on how to best avoid it occurring, or how to handle it if it does. Whether it is to review contract forms, emphasise the importance of relationships, develop better processes, or devise new technologies, much of project management is interested in how changes are managed (Brochner and Badenfelt, 2011). The development of agile methodologies (Lindstrom and Jeffries, 2004), value management approaches (Dallas and Clackworthy, 2010), virtual reality technologies (Arita et al., 2007) and dedicated change managers (Tullett, 1995), together provide a rich tapestry that shows the importance of this challenge. Indeed, the wide range of ways of dealing with change demonstrates the fact that projects are causally related to their origins. How a project idea emerges, whence it emerges, and the party who 'owns' it are all highly relevant to the act of designing the project.

Issues around the novelty

Tending to the corollary of novelty are projects from a production or product development paradigm that seek incremental improvement. In such cases, each project is effectively a variant on those undertaken previously, and we have noted that this class of project, as illustrated by the 'fast moving consumer goods' sector and their emergence and development lifecycle, are well developed, scripted, understood and respected by those players involved. These types of projects can be considered 'routine' or 'pipeline' projects, and, as such, their design would follow expected protocols and methodologies for governance, structuring, monitoring and control. Here, in-house project production approaches may be enforced, or there may be the adoption of generic project management methodologies, such as PRINCE2 (Office of Government Commerce, 2009). In mature organisations these protocols and methodologies may well be highly established, having been subject to review under the terms of lean thinking (Womack et al., 2007).

This tightly controlled, well understood 'comfort space' is progressively lost, as the difference between a future project/product and its predecessors becomes greater. At the other extreme from routine, or business as usual (BAU) projects, there are those considered as 'ground-breaking'. This class of project addresses situations in which there is little successful or useful track record within the domain of the project, and few, if any, of the organisations involved have developed from experience any project templates to form the basis of the project's design. Indeed, past experience may have been so problematic that a new way must be found to avoid the historic overruns and disappointments. Such projects can become paradigm shifting, with examples such as the Polaris missile and Apollo space programme establishing entirely new approaches to managing projects. History is scattered with other examples of extraordinary ground-breaking project achievement, but, to exemplify the point, consider what resulted from the efforts of those who worked on the Manhattan Project, where the goal was to develop a thermonuclear bomb (Groueff, 2000). The result could be argued to have changed the world, heralding the introduction of the nuclear age in both the military and civilian spheres. Some will argue that this man-made development has been to the detriment of our species and the planet we inhabit, others will disagree, but our point is that the result of the project was profound. When projects like these are designed intelligently, the success they can bring can be pivotal for generations after.

Between these two extremes, a balance has to be found between the promise of the profoundly new and the comfort of the past. 'Tried and trusted' or 'better the devil you know' may well be preferred over 'I've no idea – what the hell – let's give it a go', as the downside risk of project failure can overwhelm the upside prospect of venturing fully into the unknown. In many projects it will be the case that novelty or innovation is included, but this is entwined with much that will be regular and routine. The global popularity of the Apple brand of computing-based devices echoes the same story as Henry Ford when he was introducing the motor car to the mass US market. The leaders of both Apple and Ford illustrate that those who are prepared to challenge the received wisdom and develop new genres of product can become market makers. The challenge for those in charge of the London 2012 Olympic Games was not only to achieve the 'iron triangle' of success for the delivery of the Game's venues and associated infrastructure, but also to be a precedent setting intervention in terms of minimising environmental impact ('the first "green" Olympics') and facilitating long-term social and economic regeneration. This chapter is written before either the 2012 Olympic sporting extravaganza has taken place or the legacy affects can be assessed, but it is to be hoped that the strategic design of this complex project will achieve the short-term and highly specific objectives, as well as the longer term and more aspirational intent. For projects that are both substantially different yet can claim heritage in past projects, finding the balance can be difficult and well beyond the scope of platitudinous guidance. What is clear, however, is that setting out the strategy to achieve success is part of the manifest in the design of the project. Where novelty is an issue, the design must be adapted. The need to recognise the degree of novelty of both the goal of the project and its design is illustrated in Figure 4.1.

Figure 4.1 divides the project world along two axes: the novelty of the project design and the novelty of the deliverables of the project. Novelty of project design is considered from the project team's perspective and novelty may come from the breaking of extant cultural norms, adoption of new standards (e.g., ISO 21500) or new approaches (e.g., Agile), or they

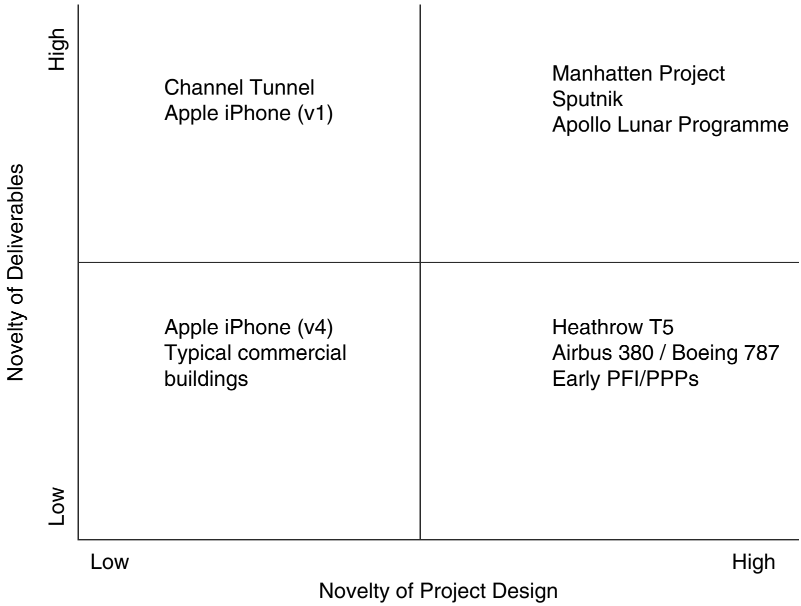

Figure 4.1 A two dimensional view of novelty within projects – with illustrative examples

may be breaking new ground in terms of contractual relationships (e.g., Heathrow Terminal 5). Novelty of deliverables considers how incremental are the deliverables of a project compared with either predecessor or peer comparator. Are the deliverables just the next version of something done before (such as a new version of an existing product line), or something very different to anything that has gone before with commensurate technical challenges? For certain genres of project one might consider replacing this axis with the Technology Readiness Level (TRL) commonly judged on a scale of 1–9.

We consider each of the four cells and the examples cited, starting with the bottom left. In the Low/Low quadrant we have the 'comfort zone' of numerous firms such as Sony, BAE Systems, Rolls Royce or Ford and the established product lines from Apple. Routine construction projects would sit here as well as would the output of many other project sectors. This is a good place to be, but there is the risk of becoming complacent with time as the market demands innovation (reduced risk and cost, more responsive and short time to market) that might not be deliverable through existing project designs. An alternative risk is that there may be the potential for firms to underestimate the degree of novelty of some change to a previous deliverable design and find themselves tackling a project challenge for which they are not set up – and thus drifting vertically upwards.

Low (Deliverables)/High (Design): Organisations seeking to break through into a new paradigm, as British Airports Authority (BAA) did with Heathrow's Terminal 5 and how Airbus and Boeing respectively specified for the A380 and built the 787. For readers concerned that all three of these projects were novel in terms of what they delivered we would counter with them being in essence incremental developments in the novelty of the deliverables concerned (an airport terminal and two commercial passenger planes). Also in this cell would sit early PFI and PPP projects, as would the early adopters of all new project management approaches such as PRINCE2 or Lean manufacturing principles. Organisations that sit in this space or are desirous of moving to this space should be sure of the benefits and invest in the necessary cultural impact both on themselves and their supply chain. Clients and other stakeholders will need to buy in to complex project design and recognize its implications otherwise they will not be able to judge progress.

High (Deliverables)/Low (Design): This has the potential to be a dangerous place to be if the extant approaches are not appropriate to the demands of a project. The range of technical challenges resulting from the building of the Channel Tunnel was to effectively overwhelm the project organisation created specifically to manage it (Anderson and Roskrow, 1994). Companies such as Apple can deliberately set out to become paradigm breakers as was the case with their release of the first generation iPhone. Noting our earlier comment it is of concern that organisations may have drifted into this space inadvertently and may find themselves struggling to keep control of the deliverables within iron triangle limits.

High/High: This can be the most dangerous place to be since there is risk associated with both parameters. However, as the three seminal projects referenced in this cell in Figure 4.1 testify, when the nature of the objective is of fundamental importance and significance it may be the only option. Coping in this cell is most effective when all parties recognise the gravity of the challenge and both aspects are given equal seriousness. Although it may be obvious that a proposed project is seeking to deliver something of great novelty, the successful ones will be those where the project design is fully recognised as being fundamental to this achievement and is invested in and resourced accordingly. In this cell therefore, the project's objectives should be to break new ground in the way projects are designed.

Issues around complexity

The complexity of a project is a consequence or function of its design. The complexity of the deliverables of the project will have a profound influence on the design of the project. Project products that are highly complex systems, the elements of which come together to deliver the emergent properties desired, will need projects that are designed to minimise the possibility of interface conflict between those elements. Take, for example, civilian aircraft development over the last decade or so. Both the major civilian aircraft manufacturers – Airbus and Boeing – have had significant problems in producing their next generation aircraft. With Airbus electing to design a vehicle to target larger payload volumes at the current range of travel distance (the A380) and Boeing going for unchanged payloads and longer range (B-787), both manufacturers have had to tackle major challenges in design and manufacture of the aircraft, as they push technological and material science to its current limits. Moreover, both have sought to implement radical changes within their supply chains by demanding the delivery of capability rather than specification, and engaging in very significant risk-sharing with Tier 1 providers. This approach has been copied by many, especially in the defence sector and, although not yet fully mature and established, its use has created a new paradigm in project and supply chain configuration. In the UK, the ambitious programme to unify and digitise health records for all patients within the National Health Service (NHS) required the development and deployment of various ICT technologies on a scale that had never been attempted before. The consequences of the programme's technological complexity was a project with a complex design, involving multiple prime contractors working to a bespoke form of contract, with highly complex governance arrangements. The problems with this project are a matter of both public record and heated debate:

> The delivery of both the Summary Care Record and Detailed Care Record have been delayed. Whilst the Department has now overcome the ethical issues that delayed implementation of the Summary Care Record, the delivery of care records systems to support the creation of the Detailed Care Record has proven to be far more difficult than expected. Previous reviews by the National Audit Office and Committee of Public Accounts have reported on delays in software development and delivery, difficulties in implementing standard systems across the NHS, and contractual issues that have led to one supplier exiting the Programme and the contract for another being terminated.
>
> (National Audit Office, 2011)

Issues around size

One cannot expect an organisation versed in dealing with a \$1,000 project to be able to deal with one in the order of \$1,000,000. A rough approximation is that cost is proportional to staff hours for any domain (although the constant of proportionality may vary). The number of potential interactions between staff is a highly non-linear function of their number and so, for instance, additional levels of organisational structure are needed to convert an exponential increase into a more linear increase.

As projects grow in size, it is not just the number of individuals involved which grows, but it is also likely that the number of stake-holding parties will increase. Moreover, as the number of stakeholders increase, so too does the general level of interest of these stakeholders. This, in turn, ratchets up the pressure on the project to manage and interact with them. If we take, for example, the case of the possible expansion of London's Heathrow Airport, we find that the prospective project of a third runway has not proceeded, due to the mobilisation of a large number of negative views about the implication of the expansion. This echoes the US experience of their rival to the Concorde supersonic passenger plane in the 1970s, where environmental opposition in the US effectively scuppered the project (Morris and Hough, 1987). For mega-projects such as the California high speed rail project (for details see the official website, California High Speed Rail (2012)), managing the number of project players and the large number of other stakeholders is a critical part of the project and needs clear strategies and adequate resources.

Issues around risk

Risk and novelty, while related, are not the same thing. While something might be done for the first time, it might also be considered very low risk, such as painting a golf ball a particular shade of pink. Projects that embody a great deal of risk will need to put in place contingency measures to avoid their consequences, and governance measures to ensure these contingencies are appropriate and put in place in a timely fashion.

For some project domains, risk mitigation is so important that the cost of the project might rise by an order of magnitude to reduce the risk of failure from, say, five per cent to one per cent – such is the impact of failure. In the arena of space projects, numerous attempts have been made within space agencies to reduce costs through a strategy that seeks to accept higher levels of risk. Most of these strategies have failed, as the implications of project failure become apparent and legacy practices reappear (McCurdy, 2001). This triggers concern from those in project leadership positions about the project's mitigation and contingency policies.

Projects will typically consider the strategic need for contingencies over mitigations as they reflect the unknown nature of the future. Whether the contingency involves solutions such as cash reserves, back-up servers, or people on 'stand-by', the principles are clear, and it is primarily a question of what type of contingencies are established and their level. However, underlying the formality of contingency arrangements, the practicalities of project management are often an exercise of constant mitigation. As reality has a way of not following the stated plan, project managers are often working out what to do in light of new information – clearly operating in both problem-solving and mitigation mode. The mantra of risk being borne by the party best able to deal with it is obviously sensible, but, in reality, there can be a tendency to bundle risks of varying types and transfer them 'wholesale' onto other parties who may not be best placed, or even cognisant, of the risks they are bearing. Insurance companies have strictly enforced checks and balances to ensure that they only accept appropriate risks, but this is not necessarily true for sub-contracting parties, who may accept contracts that contain risks to them that they are neither aware of, nor able to deal with.

While the Gulf of Mexico Deep Water Horizon disaster and tragedy involved a number of organisational players, the fact that BP was the obvious focus for the world's media illustrates the point that some risks will always remain with a specific player. The risks that deep water oil exploration poses are many and varied, and it was not the case that BP set out with a cavalier disregard of these risks. The massive consequences of the failure at the Macondo well have called on BP to consume substantial organisational contingency sums, and to sell parts of its business to ensure that it is able to cover the contingent liabilities that it may be handed as a result of the legal process. Other organisations involved in the Deep Water Horizon project will have considered making provision for the potential ramifications of their role, thus reinforcing the way that project risk can impact on many of the parties involved in the project's design.

Two points emerge: one is that the amount of risk avoidance must be commensurate with the likelihood and consequence of failure. Second, where projects are very large, the consequences of failure may disturb a nation, so national governments will become involved and political agendas come into play. Such governments are likely to hold the 'prime contractor' responsible for any adverse impact, regardless of any sub-contractor agreements.

Issues around the design expectations of the project

Some stakeholders will look to not just what the project is to achieve, but also the ways and means that it is to go about its business. In long duration projects with high levels of early commitment (e.g., to a particular deliverable, such as a bespoke technology) stakeholders will need the reassurance that decisions are being made in a timely manner based on a rational, and probably well tried approach. This expectation is going to be most difficult to achieve when the nature of the project itself is boundary breaking. Modern defence projects exemplify this, as they seek to move into new areas of technology and materials. When the project's success depends on the deployment of theoretical science or bench-top experimentation, then the risk of failure to deliver is present.

At one level, the project design must conform to an acceptable set of principles. This would be the case in mature public sectors, where compliance demands that such principles are explicitly met. For example, member states have to follow European Union procurement rules (EC 2012a) to ensure a fair and free set of market opportunities. Furthermore, it may be required that a comprehensive framework and process is adopted which is consistent across a domain, and across programmes. (The requirements for the EU of the coordination of procedures for the award of public works contracts and similar are covered by directives originally issued in 2004 EC (2012b)).

By this method, staff mobility is facilitated and higher level assessment of progress and risk is simplified. At its simplest, this may be a formal or informal stage-gate process, with common and agreed criteria for each stage-gate progression. In some domains much of the highest level lifecycle process is dictated (for example, in the definition of prototypes, test regimes, product assurance standards, or even use of particular materials). Organisations in the United States, such as NASA and the Department of Defense (DoD) routinely use such stage-gate models for their projects, and this approach is popular elsewhere, with countries such as the UK developing their own system for government funded projects, using a model originally developed by the Office of Government Commerce (OGC).[1] Major commercial organisations may develop their own stage-gated project processes; this would be a routine approach in sectors such as major transport infrastructure provision, major IT or Information Systems (IS) and oil or gas exploration and extraction.

Issues around the people involved

As we have noted, there are projects that are quick-paced and nimble, and others that are staged or phased and last for many years. Underpinning both these agile type projects and long-duration projects, is an intrinsic assumption about the way that parties will relate to each other. While contracts may provide the legally enforceable position, any project will actually rely upon, and centrally feature people. Paraphrasing from the work of Peter Morris, projects are run, and delivered, by people (Morris and Pinto, 2004). The role taken by individuals and the set of competences, experiences, biases and concerns they have are significant factors for any project, and thus become an area that will influence its design. This has become ingrained in different project sectors, with project managers now tending to inhabit industry silos where they only consider their world of ICT, oil and gas, heavy civil engineering, construction and so on. International organisations, such as The Project Management Institute, Association for Project Management and International Project Management Association seek to find common areas for sharing experience and expertise, and more nationally located organisations, such as the Major Projects Association in the UK, look to connect the project sectors. Leading universities, such as the University of Oxford and UCL in the UK, and Stamford in the US, are also now looking at cross sector post graduate courses that provide wider industry project perspectives.

For the more complex and multi-party projects, the allocation of key staff may well still be driven more by 'who is available' than who is ideal. The demand for project expertise and the supply of that expertise may be theoretically matched, but the timings of the demand and the supply can often thwart plans. As we have noted, projects do not always go to plan, and schedules may change, resulting in the planned release of key personnel from a project not occurring. This leads to both pressure on organisations, and the people involved. This sensitivity, or even fragility, is exacerbated by the very nature of humans, who are sentient and operate with free will. Any project design must necessarily be founded in reality and practicality, as people may leave their employment, or are otherwise vulnerable to many influencing factors that may make them unavailable as and when the project demands. Indeed, the question of where are the single points of critical failure for individuals on projects is important to ask, as a management philosophy based on no more than hope (that is, hope everyone involved stays in post and carries on working as planned) is not the most robust of approaches – yet it is one that many projects unwittingly deploy. Therefore a major influence in the project organisation and distribution of responsibilities inevitably comes down to what can be made to work, and what would trigger a tipping point to failure. A project that is comprised of a stable 'dream-team' of personnel is one that everyone hopes for, but not all will experience. The selection of the individuals and creation of the project team are the results of decisions and actions taken by those who sit in positions of leadership and governance.

Since much of modern project management is more about inspiration and persuasion than direction and instruction, 'politics' can become an important factor. Project design must therefore be at least cognisant of the underlying politics, the aspirations of the project team, and individual strengths and weaknesses. For longer projects, evolution of individual roles in the context of staff advancement is important.

Issues around cultural conformance

The word 'culture' can take on many forms and apply at many levels. At the highest level there are national cultures that can cascade down to regional and local variants. Projects that are designed to conform to local cultural norms are likely to be more effective than those that do not. This is a lesson that the major oil and gas companies, as well as international mining corporations, fully understand, as they have to negotiate on many levels to gain the geopolitical and local permission needed for their operations to take place. The collected knowledge of these organisations on cultural sensitivities is vast, as they have to research in the greatest detail the organisations and communities they will be interacting with and affecting. Not only is it now seen as morally and ethically reprehensible to simply 'march in', but there is also a market valuation in the positive reputation that can come from seeking to support affected communities and environments. With much damage done in the past, the business cases for these projects are now more necessarily complex, as they have to factor in possible remediation for past actions, even where those actions were at the hands of others.

Entwined with the nation-related culture is that of the sector in which the project lies, the organisations that are critical to the project, and the professional disciplines of the staff. The culture of the sector or industry can be highly persuasive, and those new to the project will rapidly appreciate the cultural norms on display as they see 'how the project is done'. This can lead to interesting tensions, when innovative approaches are dictated from higher management, or recommended by the project manager. Legacy practices within middle and lower management can be extremely difficult to break down. A 'civil service' attitude can be found much more widely than merely within the public sector. Where company mergers have occurred, evidence of fossilised cultures predating the merger can be found many years later. The popular satirical UK TV series 'Yes Minister' of the 1980s and its sequel owed much of its popularity to the underlying truths that it betrayed then, and even now. When designing a project, these cultural challenges must be addressed if the project design is to be respected.

At the project level, one of the reasons why we have previously noted the lack of movement of project managers between sectors is that, apart from lack of technical knowledge, a strong set of cultural norms may have been established. Take for example the worlds of fast moving IT systems (comprising software, middleware and hardware). Here, the need for speed of delivery and progress can be acute, and agile project management can involve meetings with no chairs provided (to culturally discourage being relaxed), whereas in the world of pharmaceutical drug development, the precautionary principles of avoiding harm can result in thorough discourse and the seeking of all participants' views prior to key decision-making events. The difference in approach in these examples is stark, but then their contexts are equally different. Thus difference in culture is to be expected. While changing cultures can be like turning super-tankers, the fact that the world in which projects operate is constantly changing requires these organisational cultures to adapt and alter accordingly.

We have noted that there may be a natural temptation to standardise projects, but in the discussion above we have argued that a one-size fits all approach in project design is not appropriate. However, many of the underlying principles remain relevant and these are discussed in the next section.

4.5 Principles

We recommend here the following principles that should be applied to any project design:

1. Articulate project objectives clearly and unambiguously, and relate them to stakeholder needs and wants.

Our first principle is critical. We argue that it is vital that the project objectives are fully understood and carefully articulated. While the project objectives may be given as the set of requirements that form part of a project brief and so are apparently well considered and thought through, we argue that a critical success factor is that these objectives are clearly linked to the satisfaction of all key stakeholder needs and wants, where appropriate. Many projects suffer from a failure to sufficiently communicate these highest level needs and wants, or to differentiate between them.

Stakeholders are not homogenous and like-minded. The hierarchy of stakeholders in terms of their power over the project and interest in it can, and should, be mapped. From such mapping it is fully accepted that in many projects there will be those stakeholders who benefit and those who suffer disadvantage or losses. The project needs to ensure that, as part of its design, it maximises the benefits given to the key stakeholders, and has strategies for dealing with those powerful and interested stakeholders who may suffer dis-benefits. Critically, if the volume and potency of this group of negatively affected stakeholders is sufficiently forceful, it may lead to the project not proceeding (see the examples of the US rival to Concorde, and Heathrow's third runway). Whether it is considered controversial from the outset, or develops to generate controversy, the project must have strategies, procedures and resources to ensure that it can proceed efficiently and effectively.

Downstream changes to the project's requirements, its scope and the project deliverables can often be traced back to poor communication early in the project lifecycle, leading to either additional requirements, or disappointment. A good example of this is the discussion about two of London's iconic structures. The Millennium Dome had no obvious use, post the year-long celebration of the year 2000, and, indeed, the negative publicity of the exhibition staged there led it to be seen as a problematic asset, which, for many years, languished unused – a classic 'white elephant'. The rejuvenation of the structure as the 'O2 (London)', involving the major international entertainment corporation, Anshutz Entertainment Group, has seen a remarkable turn-around, but this only came about as a result of an entirely different operator looking at the asset with a new perspective. Similar tensions are being seen in the discussions about the main Olympic stadium that will be the centrepiece of the London 2012 Olympic Games. While the stadium is fit for purpose for the summer Olympics, its legacy use has been debated between an athletics stadium, one used for professional soccer and an entertainment venue. The concern lies in the compromises needed in legacy use, and in all cases there will be some level of dissatisfaction of sub-optimality, as the legacy stakeholders' needs and wants are not sufficiently catered for in the 'as is' facility.

Where the project, for whatever reason, fails to meet the principal needs of the key stakeholders, then abandonment is always an option. The instances of this vary from sector to sector, with the IT sector experiencing more project abandonment than others, due to the nature of its products, but also in sectors such as defence, a newsworthy example being the UK's scrapping of the Nimrod Maritime Reconnaissance Aircraft (the MRA4) in early 2011, as it was suffering from significant technical challenges that were leading to both cost escalation and danger of being technologically redundant.

Sometimes a project sponsor or customer is not fully aware of their own real needs when commissioning a project, for example, where objectives/requirements require iterative consideration. The 'emergent requirements of projects' is understood in those sectors such as ICT, where it is relatively easy and quick to test initial propositions and gain different classes of user or other stakeholder perspective. This in part explains why some projects are found to not be at all suitable or viable, and hence cancelled. In the construction sector, as a contrast, alterations to needs or wants leading to the risk of downstream changes (expensive and problematic) have driven considerable technological advances in both digital representation through computer animated 'fly-throughs' and rich Building Information Models (BIMs). In addition to this virtual representation is the development of hard copy scale facsimiles through various advanced manufacturing techniques (3D printing, using moulding and milling approaches). These developments in technology are very useful for assisting the key stakeholders in considering whether the project will deliver to their needs.

The development and implementation of Value Management (VM) tools, techniques and approaches now means that there can be far better downstream appreciation by the client that a 'want' is not the same as a 'need', and this can lead to a profound change in priorities. The speed and nature of change being as it is, it also has to be recognised that circumstances change, and we should not be surprised to see new wants or needs appear, or original ones become obsolete during the duration of the project. The very nature of the project client's value definition may be a fundamental driver for the project's design. If the value system is unsure, fickle, or dynamic then it is likely that their expressed project needs or wants are likely to change. This can be contrasted with a project client who has a value system that is rigid, disciplined and unmoving. Here, the projects to emerge *will* follow the expected course for their design and execution, with any variation from this being treated as exceptional and highly unwanted. It is for each client to assess the trade-offs involved in their project between rigidity and flexibility. Such considerations can have profound effects on the strategic design of the project, from the selection of procurement route and project players, to the creation of a project culture and communications strategy.

2. Keep the project design as simple as possible.

All other things being equal, simple things go wrong less often than complex things and can be more quickly repaired. Simplicity promotes understanding. What is true for physical entities is also true for projects. For poorly formulated projects, the design may grow organically as its deficiencies become apparent and are patched over or re-worked. Ad hoc responses to issues become part of the project design but may lead to overlapping responsibilities and divergent objectives. Even when the scope and objectives are very well understood, the project design may be unnecessarily complex, either for political reasons (as a way of satisfying the aspirations of stakeholders) or merely because no effort has been made to simplify.

3. Structure the responsibilities with the project (the Organisation Breakdown Structure – OBS) in accordance with the Product Breakdown Structure (PBS) or Systems Architecture/Design.

If the deliverables can be imagined as a system, with sub-system elements, then an elegant solution is to ensure that there is a single responsible entity for each system element, and that the requirements for each element can be clearly defined a priori in terms of deliverables, cost, time and performance. Additionally, single points of responsibility should be given to the 'systems' level issues of system design, integration and verification. This approach will significantly contribute to the 'simplicity' principle. Moreover, it will avoid debate and confusion when deliverables are not meeting expectations. Given that we have noted earlier the potential for politics to play a part in the design of a project, the political decision to allocate parts of projects may not be optimal for the project *per se*. If such work-sharing is mandated, then those who lead the project will need to add an additional layer of communication and liaising that can become a complex cultural issue. From the perspective of the project, such purely politically motivated work-shares are to be avoided.

4. Ensure all responsible sub-groups/contractors are given clear, unambiguous, well-defined and harmonious scope of works, and that they are competent and have the capacity to complete the work within the constraints of the project.

Investment up front to ensure that every area of the project is well defined is as important as well defined objectives. The project-system will only work well if each element does its job and if the easily overlooked areas of interfaces to other elements are consistent. The use of sophisticated collaborative design environments, such as BIMs, is helpful in identifying the interfaces and potential problems. However, prior to this stage of the product design, at the commencement of a project, it is essential to ensure that the sub-groups/contractors being considered have the capacity and capability to deliver the work, noting that other work may have been won since they made their bid. This simply stated and well understood principle masks the considerable workload that the recommendation prescribes. To develop well-defined and coordinated requirements is far from simple, and involves high levels of expertise. These experts, whether considered at the personal or organisational level, need to be carefully vetted before being appointed, and there is now a great deal of sophistication within many project procurement paths to probe and test for both suitability and acceptability.

5. Deviate from local cultural practice only when justified.

Do not expect to change the culture of an organisation or location overnight. To insist on a new culture will lead to turbulence, with inevitable resistance from the 'shop floor' or the 'grass roots'. Cultural change is a strategic issue for an organisation, whereas the delivery of a given project is more typically pragmatic and tactical. When projects are used as a vehicle for cultural change, this should be recognised in their objectives, and the associated issues should be reflected in both the scope and the risk management. A concept from Object Oriented Design, 'encapsulation' can be helpful. Here, existing areas of functionality are surrounded by an interface function that converts local communications standards into system norms. Thus, in the project context, rather than always imposing project norms on sub-contractors, arrange that a transformation or translation is applied prior to inclusion at project level. A simple example might be the choice of scheduling tool. Rather than impose a tool on all contractors, merely ensure that the output of whatever tool they use can be simply converted by the project's tool of choice. At first sight, this might violate the simplicity principle, but, after all, project management is about judgement and no-one said that principles could never be contradictory – a balance must be found and ultimately the project design has to be pragmatic. This tension is being eased by the ubiquity of information technology. The rise of extranets and internet driven project communication protocols has driven the quest for interoperability, and there are now recognised standards in various sectors for this, thus diminishing the concern for compatibility.

6. Ensure that the project planning tools do not dictate the project design. Adapt the tools to the design, not vice versa.

Modern planning, risk management, requirements management, information management and similar tools take much of the burden from the project manager. They provide an effective environment, and if appropriately selected and set up, can form a highly integrated facility with common human–machine interface standards. Modern projects would be lost without them. However, it is important that the tool does not become the master. 'Computer says no!' is not acceptable. Only people should say no (or yes) based on their understanding and judgement. The project manager should always understand why things are as they are (such as the order in which activities need to be performed, the level of risk associated with an activity, the likelihood of schedule overrun, the realistic availability of required resources and so on). Simplicity will help enormously, together with an attitude of continual confirmation and enquiry by the project manager. This stresses the need for competence among project managers and the appropriateness of the information flowing to them.

7. Ensure clear leadership

The simplest diagram associated with the project design should be the organogram. Each organogram should ideally have an X-shape. At the top are sponsors and stakeholders, the cross-point is the project manager and in the lower part is the project team/supply chain/contractor organisations. Short circuits from top to bottom that deliberately avoid the project manager should be kept to a minimum and only employed in extremis (that is, where the PM is somehow conflicted in a decision process).

Much emphasis has been given over the last 20 years or so to mechanisms that will foster and build trust, and where this works well it can be seen as a proxy for the project manager being omnipotent. Where trust is present and integrity is a bedrock assumption, the project manager can be comfortable with more direct flows, but trust has to be earned and integrity established, so they are not positions from which many projects can confidently start. Separating the leader (a role) from leadership (a function), it is very likely that leadership will be distributed throughout a project, and will rest with those not formally designated as leaders. Those being led should display the required responses, which involve a range of considerations, from having trust in the leadership in order to obey, or having the confidence and respect to question or seek further clarification and justification. An overarching need, therefore, is for the leadership to operate in a true team environment on the project, although creating a team spirit on a project can be a major challenge in itself.

4.6 Design as applied to a project

A project can be seen as a multi-faceted system, and viewed as a collection of overlapping abstractions. No single view will encompass all aspects of the design and so we must look at each abstraction individually, recognising that where they overlap they should be consistent.

Interlinked activities: The network view of any project planning tool will show the causal flow between activities with predecessor and successor tasks. The network provides schedule detail and, when resource loaded, budget and cash-flow. It also provides a basis for progress monitoring. Note, however, that such networks are a simplification and abstraction of reality. Often finish-start relationships are violated on a regular basis as 'work-arounds' to delays are put in place. The interaction between activities is sometimes better modelled through a UML Sequence Diagram or Assembly Line rather than a Network or Gantt chart. However, the ubiquitous popularity of the Gantt chart and its natural calendar view means that, at least for progress monitoring, it will be with us for many years to come.

Hierarchies: Just like systems, projects can be hierarchical, with smaller projects making up larger projects or programmes of projects. For this reason the strength of systems engineering and system design to 'divide and conquer' can be applied to projects. By ensuring that each project element or sub-project is well defined, is coherent (typically by being within a well constrained domain) and has agreed interfaces with other projects (for example, through a master schedule), complexity can be hugely decreased. Projects can proceed in parallel, without fear of continual interference from one another. Such a view may prove to be contrary to the distinction made between projects and programmes. We do not see the distinction as being particularly useful in this context, as we consider programmes to be interlinked sets of projects, designed to achieve some form of strategic objective. With our maxim of 'keep it simple', we argue that the difference between a very large and complex project and a programme is a semantic one, with both presenting the same forms of challenge and requiring the same levels of considered and sophisticated thought and response.

Supply chains: A special form of hierarchy in which project elements are delivered through a supply chain of players may exist within a single organisation, or be arranged through a network of sub-contracts or other inter-organisational arrangements. The length of the chain relates to the levels of the hierarchy that the project requires. This becomes a function of the size, complexity and strategic importance of the project. It should be noted, however, that as the number of organisations increases, so does the number of agendas and information exchanges. Nevertheless, management of external supply chains is often less problematic than that of internal supply chains, where the authority of the project manager is reduced and there is no contract to fall back on. Some project supply chains come pre-set, with known parties appointed because of their experience and understanding of working together. Others are created entirely on a bespoke basis dependent upon the constraints imposed by the client, the market and operating regulatory regime. Neither is better, and both are appropriate in their own contexts, but, in all cases, managing the supply chain is another non-trivial task, as is testified by both practitioner and academic interest in this topic.

Collaboration of individuals: The human dimension of projects is a vital characteristic. It brings with 'soft' issues and human factors, group behaviour, leadership and motivation. Such issues are very difficult to deal with in a numerical sense (except perhaps some aspects of human performance assessment), but can be modelled nevertheless. There is increasing emphasis on the composition and make-up of project teams, and the range of available psychological and behavioural tools that can be used at both the individual and team level is growing, as are specialist consultancies that can recruit, create and develop project teams. Careful consideration of personality types, and group and team function is something that needs to occur early in the project's design. Failure to consider these will lead to the potential for unnecessary conflict, disagreement and numerous other non-helpful results for the project.

Collaboration of facilities and equipment: We have already noted that data management systems, communications, computer-aided design, manufacturing and test facilities, and so on may all be necessary within a project, and must be appropriate and available when required. The coordination of such facilities and their logistics is an important facet of a project. For some projects there will be a need for substantial investment to be made for the generation of mock-ups and prototypes, as well as realistic simulations and simulators. The budget and other resources needed to deliver this will have to be calculated and defended.

Lifecycle: The project lifecycle (PLC) is a common concept that imagines a project moving through well-defined phases, usually governed by phase or stage-gate reviews. The conceptual simplicity of a PLC is both an advantage and a disadvantage. With such a clear structure, PLC governance is more straightforward, and stage-gate reviews provide an opportunity to prevent uncontrolled risk propagation into later phases. However, they may only weakly map against the actual progress of the project, and can be arbitrary in their definition. Moreover, the potential for different priorities between stakeholders may lead to tensions manifesting at such stage gates. Thus it may be the case that commercially or politically focused sponsors of projects may seek progress even when there are currently outstanding project concerns. Equally, project managers may not be willing to present true views of their projects, thus leading to the potential for optimism bias.

As projects increase in size, scope and sophistication, it may be that, when considering complex deliverables, it becomes highly problematic for all project elements to be within a single lifecycle phase at the same time. As more and more violations of the simple model have to be accommodated, the elegance of its structure, and hence its value, is diminished. The key point here is, again, not to say that one view is more correct than the others, but rather that by accepting these multiple perspectives it is possible to create and implement a *design for the project and its management* that will address the diversity yet also be true to the above principles.

Robust design, coping with disruptive influences

Perrow (1984; 1983) characterises systems in terms of the complexity of their internal interactions, noting that certain facets of a complex system can make them predisposed to often catastrophic failure. While Perrow's work is focused on physical systems (power stations, aeroplanes and so on), the approach can equally well be applied to projects and, with the principle of simplicity in mind, the following can be recommended:

Spatial segregation: In physical systems the concern is that close proximity of system elements can lead to unexpected interactions. These unexpected interactions can de-stabilise the system and cause unexpected failures. For projects, co-location of teams is generally considered a good idea and the sharing of knowledge within teams is often helpful. However, this becomes problematic when the formal authority of external parties and of the project manager is eroded. For a project, informal, ad hoc, politically driven decision-making should not replace rational, evidence-based trade-offs. Moreover, multiplexing individuals or contractors with multiple roles and responsibilities can lead to anomalous behaviour, as local agendas, prejudice and false assumptions can similarly lead to *de facto* errors. Spatial segregation should, rather, be thought of as responsibility segregation. While it may sometimes be less efficient, it is also less prone to failure, assuming that good governance and communications exist.

Feedback: Modern physical systems are often completely dependent upon feedback loops to provide stability to the demanding performance levels involved (e.g., fly-by-wire jet fighters). The problem arises when the performance of the system is the result of unplanned and poorly understood feedback loops – that is, it seems to work, but it is not really understood why. Such a lack of understanding can result in actions leading to unexpected consequences. Feedback loops in projects are commonplace, and while many are carefully designed in (e.g., stakeholder feedback through structured and active engagement), others are not (e.g., the personal relations forged outside the project domain). Again a rigorous decision-making structure with clear delineation of responsibilities and simple organograms is the key here. Organograms with numerous dotted lines or multiple higher management boxes are to be avoided, as they breach the simplicity rule and will have the potential to confuse and contradict the person or party connected by such lines, as well as increasing the volume of communication flows.

Connections/control: In physical systems, dedicated connections are preferred over common communication pathways. In the latter there is the possibility that one part of the system will respond inappropriately to a message that is intended for another part. Similarly, noise from one system element can affect many other elements, due to the shared nature of the communications path. Much is the same in projects. Uncontrolled communications leads to overload, lack of focus and the opportunity for misunderstanding. The inadvertent copying of a document for comment to someone not qualified to contribute will lead to unhappiness when comments are provided anyway. Similarly, meetings with large numbers of attendees with wide-ranging agendas will have to be longer and consider many more issues. Sometimes it will be necessary for such 'inclusivity', but this should be the exception rather than the rule. With the use of email and other electronic messaging services now commonplace, the copying of messages to many may be necessary, but leads to the risk of message overload and the inability to detect the important from the irrelevant. Of course an apparently 'secretive' project is also a concern and is likely to lead to hostility where it is not already firmly within the culture of the organisation. For instance, in the defence sector an absence of 'need to know' categorisation leads to targeted messaging routines, which in turn can lead to silo thinking and ignorance or 'blind-spots', as the non-sharing culture may be prevalent even when unnecessary.

Communications paths should be planned with care and attention to distribution lists, and clarity as to what action is expected from the individual receiving the information (for information, for comment, or for approval). Timeliness of the action is also required and here it is preferable to be specific rather than vague, as ticking the box 'urgent' when the matter is not urgent will trigger the party responding to question both the integrity and judgement of the issuing party. Here feedback is valuable to ensure receipt and understanding of directives and information.

Information sources: Direct information is always to be preferred to indirect or inferential information. In extremis it is far from ideal to learn about something specifically relating to you and your project from the general news wires, and it can certainly be highly damaging to reputations to be 'door-stepped' by unknown parties who ask for your reaction to a situation on your project for which you have had no previous warning. Being caught out can occur at critical points, such as in important presentations, critical stage-gate reviews, or board meetings. For the more major projects this is at its worst when it is the media that is involved.

To effectively control a project, it is necessary to understand its status, particularly its variance from plan. Information can be gathered that relates to this, but such information can be influenced by factors that skew it from being objective and accurate, and it is important to be able to isolate the truth. For instance, a project might measure progress by noting the number of drawings released for manufacture. However, this may bear little relation to the effort involved or the risk mitigated, especially if 90 per cent of the drawings are of washers and only 10 per cent are of complex housings that lie on the critical path. Earned Value Analysis (EVA), if properly used, helps to overcome such difficulties, since progress is measured directly against plan and related to person-hours. Note though, earned value can be distorted, both because percentage complete is often over-estimated or subjective, and accomplishing completion may not correlate with the quality achieved.

Understanding: In projects that display the characteristics of systems with complex interaction, the operator may have little understanding of how the system elements collaborate to deliver the system performance – the project can be like a 'black box'. The project manager should both design the project (which automatically leads to understanding) and also continually verify its functionality to ensure that hidden interactions or changing functionality have not developed. Where the project is too complex for a single project manager to comprehend it all, the delegation through a project management team is essential, but so is the interaction between that team. Ultimately the highest level of authority on the project understands the highest level performance and all the related high level issues of the project when it is considered as a functioning system. The project manager should therefore take ownership for the project design to the appropriate level of detail, be able to explain it to sponsors and other key stakeholders and be accountable for it. After all, the project design embodies the project strategy.

Specialisation: A project delivered by a team of technical specialists who presumably know how to manage the project is likely to be more problematic than a project delivered by a team of project managed generalists. In the former case there is little opportunity to check the quality of the decisions made by individuals, since no others have the project management skills and the specialists will explain things in their highly specialised language. In the case of the managed generalist there will be procedures in place to ensure that progress and actions are compliant with expectations. This is what is found in piloting commercial aircraft, where cross-checking is natural and welcomed. Of course there is room for specialisation within projects, but each situation should be considered a single-point failure and mitigated appropriately (e.g. through external review). Cross-checking by one's peers is not the same as confused responsibilities, as anyone who has ever seen an operating flight deck will recognise.

Lower specialisation helps engender staff mobility across the lifecycle. In systems development projects, a 'V' model to depict the project lifecycle is often applicable (Stevens et al. 1998). This links the definition stages (requirements capture and design) to the integration and test stages. The continuity across the 'V' can be matched by horizontal definitions of responsibility (e.g., requirements and verification).

Perrow (1984) also looks at internal systems interactions in terms of the causal nature of their coupling, that is, whether they are tightly or loosely coupled. Tightly coupled systems can provide rapid response, but can also fail equally rapidly. Loosely coupled systems may seem sluggish, but may cope very well with failure, catching faults before they propagate to become serious problems. Note that coupling (as in the use of project supply chains) and organisation structures are quite different. Identical organisational structures can be either tightly or loosely coupled, depending upon the decision-making process within each node. The following issues are, then, relevant to projects:

Delay: A project that is too tightly coupled is likely to face numerous changes in direction, leading to nugatory work and lack of credibility. The former is expensive but the latter can undermine the whole management of the project to a point where it becomes largely uncoordinated. A too tightly coupled project can be identified by frequent re-issues of documents, leading to a sense of instability and the natural reaction of the receiver to stop reading them. While projects do not welcome delay, some opportunity for reflection, consideration, review and the development of consensus in the decision-making process is valuable. Such aspects can be designed-in through a more loosely coupled process definition and decision-making criteria, and by factoring in schedule margins.

Flexibility: The baseline sequence of activities is usually manifest in the activity network and is evident in the project Gantt chart. However, with thought and imagination the baseline sequence may be changed to accommodate unexpected eventualities (such as lack of availability of a resource). Where there is genuinely no interaction between activities, flexibility occurs naturally in parallel networks, and only the timing and resource loading is an issue. However, a flexible approach to reorganising schedules (that is, work-arounds) can allow progress, where otherwise it would be impossible. This approach is a natural inclination for any competent project manager and can be built into the project design through empowerment and incentive schemes.

Capacity: Excessive capacity above a lean minimum is usually considered to be unwanted, as it is a form of waste. However, projects are not entirely deterministic, and some additional capacity is needed to deal with unexpected eventualities, thereby reinforcing the arguments for flexibility. This additional capacity may take the form of a project contingency, or of less than notional 100 per cent workloads for some staff. Given that unexpected eventualities are almost inevitable, and some can be estimated from past experience through a risk assessment exercise, the notional less than 100 percent utilisation rate becomes a practical or realistic definition of 'full-time', if this is judged correctly. While additional resources to deal with the unexpected can be triggered by the risk management of the project, it can be argued that the additional management resource might be built-in by design. Projects benefit if what needs to be done is done when it is most effective, rather than as late as possible. Investment in quality decisions at the earliest appropriate stage of a project will lead to less cost, quicker and smoother schedules, and fewer performance issues later on. However, such investment is only possible if there is the capacity to accommodate it. Often this is not simply about a project manager's reluctance to spend money, but rather about the availability of key staff at the beginning of a project, when the end seems a long way away. The payback on this investment, if it can be arranged and implemented, can be substantial.

Project disruptions

In the above, we explored how a project might be designed to be more robust and less likely to fail. Design features may also be introduced or modified specifically to cope with disruption.

A common form of disruption comes from changing requirements. Requirements management tools, as often used in systems engineering, can be configured to characterise requirements in terms of their likely stability, which can encourage a focus on meeting stable requirements first, and then turning the residual volatile requirements into more stable ones. The small additional investment of effort in characterising requirements can have a very significant downstream benefit.

In other situations and contexts there will be requirement fluidity, or where the risk of sheer lack of definition is so overt that a fundamentally different approach is needed. As we have noted, agile approaches, common for IT projects, develop requirements in parallel with the product through an iterative approach which keeps the customer/user in the loop. New requirements can be accommodated through an incremental approach, given that the baseline product architecture has sufficient capacity.

There can often be confusion between needs and wants at the outset of a project. The project can be designed (through appropriate activity definition) to clearly separate these two aspects, discarding unachievable or irrelevant wants, identifying goals/needs where risk is too high or benefits too small, and focusing, in addition to the important goals and needs, on those 'wants' which are deemed sufficiently desirous to pursue. By getting to grips with this key aspect, many opportunities for downstream conflict are removed, but to tease out the good from the bad, and need from want can lead to the necessity for robust discussions that should be handled with care and consideration.

Risk and uncertainty management tools and techniques are specifically recommended to prepare for, mitigate against and deal with disruptive issues. Since, as part of risk and uncertainty management, there will be specific consideration of the levels of allocation of risk via the legal contract, it effectively addresses the strategic definition of the supply chain, as this will describe which party is going to be allocated which roles and responsibilities, where the authority lies and what sanctions are in place. Here, the work of Chapman and Ward in developing project related Performance Uncertainty Management Processes (PUMP) is commended for its balanced view which considers the opportunities to be grasped, as well as the concerns to be overcome (see Chapter 3 and Chapman and Ward, 2011). Upside risk or opportunity management also has the potential for disruption through distraction when the benefits are felt outside the project. Higher management may expect such opportunities to be pursued by the project team without providing it with additional resources, or project team members may chase exciting opportunities at the expense of the project.

Within the day-to-day world of the project, there will be a focus on the risk that all activities present. This drives the need for activity planning and monitoring software, which increasingly features integrated probabilistic risk profiling and modelling functionality. However, the mechanical linking of tasks through critical path type scheduling has been questioned, as it may lead to them being commenced before they should be. The more thoughtful consideration of all the precedents needed for a task (not just the predecessor tasks, but also the necessary resources and information) has been the stimulus for the development of next generation approaches, such as critical chain approaches (Goldratt, 1990) and the development in specific sectors (e.g., construction) of specialist toolkits, such as Last Planner (Lean Construction 2012).

Technological risk can be addressed in terms of progressive technological maturity (often measured through Technology Readiness Levels (TRLs)). By gating financial commitment through the achievement of appropriate TRLs, many organisations, including most of the major space agencies, have successfully mitigated against late technological 'showstoppers'. For instance, early prototyping can be used to demonstrate a particular technology and also acts as a test-bed to develop requirements. All this can be implemented as a sub-project prior to a full project implementation. Moreover, with modern simulation tools, much of this prototyping can now be computer based – using virtual reality simulations and Building Information Modelling (BIMs).

We noted earlier the role of the iron triangle and argued that project success is more than just achievement of this triumvirate of objectives. At a strategic level, a project will have a set of critical success factors that will include wider stakeholder contentment, impact on the social, economic and natural environments, and, potentially, the impact on nebulous areas, such as reputation and branding. We have considered the Olympic Games and noted that its success will be measured at different times, by different sets of stakeholders, against different parameters. While it may be a straightforward question to ask if the Olympics have been a success, the answer will be highly complex. Indeed, a full and complete answer will take many years to be revealed and is likely to be contested. Many 'Games' are heralded as successful, but the legacy they leave has been questionable (Preuss, 2004). Similarly, a space mission may start with a successful launch, but the continuing functional ability of the equipment cannot be assumed, and will take time to be determined. For the launching team the mission is a success if it achieves orbit, to the prime contractor it is a success if it is shown to be fully functional in orbit and to the user community and the space agency, it succeeds if it delivers the mission objectives. The current concern in the developed world about electricity generation has led to some countries developing markets for on-shore wind farms. While these may not generate carbon in the process of generating electricity, they are not a panacea solution, as, among other concerns, they have a visual impact on the environment. If through time we accept their appearance, and they make a meaningful contribution to electricity generation, then *maybe* they will be deemed a success, as the benefit of the electricity they produce outweighs the negative visual impact they have and the disruption they may cause to other species, such as birds. It is this complexity of consideration and the durations over which assessments are formed that can lead to projects being disrupted.

4.7 Adapting designs to suit methodologies or similar frameworks

Projects may be conceived into an accepted project management paradigm. There are numerous examples, such as: (1) UK government projects requiring the use of PRINCE2 or Managing Successful Programmes (MSP); (2) IT software development with agile type methodologies, such as XP or scrum; (3) Major project sponsor organisations where their own methodology is de rigueur, such as the UK national rail provider, Network Rail, and its use of its in-house system called the 'Governance for Railway Investment Projects' (GRIP).

In these situations the design of the project is strongly influenced, or potentially dictated, by the methodology. Such prescription must follow an evaluation where the benefits are considered greater than the disadvantages. In such situations, the choice may be between the use of the 'standard' version versus an adaptation. In the case of PRINCE2, the evolution of the methodology has seen it alter from a 'one-size-fits-all' to a more subtle set of options to be considered. It is therefore for the competent project manager to assess and judge whether the project fits the methodology and vice versa.

Separate from, but strongly linked to the use of methodologies, is the issue of the procurement route to be selected. The choice of ways of procuring a project is significant and the decision as to which route to take is non-trivial. Modern project procurement is increasingly influenced by the desire to seek an integrated project solution, where both project phases and player roles are linked to ensure smooth transition and progression. Such integrated solutions are not, however, without their own challenges. This can be illustrated by the example of the use of the Private Finance Initiative (PFI) and its various derivatives known as Public Private Partnerships (PPP). The public sector, as the project sponsor, makes the decision to use this form of procurement, and it has profound strategic consequences on the design of both the project and the product of that project. The results of the use of PFI in the UK have seen both positive and negative results. However, the positives achieved through more timely delivery of functioning buildings, that were delivered close to the expected budget, have been countered by the arguments that the cost to the tax-payer has been greater, that the building designs are often examples of functional design, rather than inspiring contributions to the streetscapes, and that the contracts in place do not suitably allow for the changes that are likely to be needed in the years that follow opening, as operational needs change. All these positives and negatives are a direct result of what we refer to as the 'project design'. The use of PFI/PPP for public sector projects occurred when Prime Contracting and Framework Agreements were also being used in sectors such as defence and private sector construction. The role played by these more complex and sophisticated procurement systems is the subject of constant discussion and debate, with no clear winners and losers, as each has its strengths and weaknesses. The substantial economic downturn suffered since 2007/8 has led to much re-evaluation of the best way to proceed, with no clear sense as to what the principle influencing factors are: many compete and many are in flux.

The use of templates in project design or the selection of project elements

The majority of projects will have certain characteristics and attributes that lend themselves to 'standard' solutions. The unique nature of projects clearly limits any universality of approach, but since projects do have common features, it is possible to select a range of standard solutions and protocols, and, indeed, there is a large market for both project managers and project management tools and techniques. This is demonstrated by the plethora of industry qualifications for 'certified' status. Effectively this means that the person holding the qualification has demonstrated knowledge and understanding of a prescribed syllabus from a specific body. Such qualifications can take on 'licence to operate' status, with employers mandating that all employees be so accredited. While individual projects may show variance from the pure approach prescribed, the very fact that there is variance around a central core gives confidence that projects will broadly follow a well-rehearsed script.

Although in national accounts there is no standard recognition of projects as a separate form of economic activity, the volume of project activity occurring at any time in any country would be expected to be significant in terms of economic value, numbers of people employed and impact on societies, economies and the natural environment. The interest and popularity is such that many project-centric organisations now exist. In the world of project management, the membership organisations, such as the Project Management Institute (PMI), International Project Management Association (IPMA) and Association for Project Management (APM) have many hundreds of thousands of individual members. Moreover, work is in progress to develop an international standard for project management (ISO/DIS 21500, expected to be published in 2012). This work, having itself been a project of approximately five years' duration since it was started in 2007, will no doubt spawn a number of commercial offerings that seek to apply the standard to many organisations which use projects or project management.

This expansion of the commercial space for project management solutions will build upon an already well-stocked market. In addition to certified training courses, there are a very large number of books and software products focused on the project management endeavour, ranging from entry level to the highly complex and advanced. For those practitioners and organisations that are inexperienced and unsure of venturing into the project space, there are many standard tools and techniques, such as the use of Gantt charts that we have mentioned several times already, and other tools such as project risk registers. These can be adopted at almost no cost, now that we are in a world of ubiquitous access to the internet. It is only as the demands of the project or the project players get more sophisticated that there may be a need to adapt such general tools to cope with the sheer complexity and diversity that projects can now cover. At this complex end of the project spectrum, there is still significant choice in terms of tools, techniques, and expert organisations, but there is a tendency to gravitate to the best established and most highly regarded suites of software tools and expert players. The only substantial difference at this level of complexity is the specialisation at sector level, with tools and players tending to cluster around industries such as construction and civil engineering; IT & communications; transport and infrastructure; bio-medicine and pharmaceuticals; aerospace and defence; process engineering; oil and gas extraction; and organisational transformational change.

Managing external interactions with customers, sponsors and suppliers

For many projects, it is imperative to recognise what the needs are of these important but 'arms length' bodies and organisations, and to ensure that the design of the project meets those needs. This would appear in the form of reporting structures and systems, technical specifications, awareness of external scrutiny, approval procedures in place, the need to demonstrate that requirements have been met and testing and validation of critical deliverables/supplies. In the case of highly complex and strategically important projects such as nuclear power stations, the involvement of these external parties can have fundamental impacts on the project. This issue was one of the many problems with the Olkiluoto 3 nuclear power plant built in Finland. This problematic project had a number of issues and challenges, one of which was the interaction of international suppliers and the Finnish regulators (STUK and TVO). As the following quote from an official report of 2006 notes:

> An additional problem was caused by the fact that the plant vendor was not familiar with the Finnish practices. According to the Finnish requirements, the detailed design of the safety classified systems, structures and equipment is inspected both by TVO and STUK. Designs and plans must be approved by all involved parties before the manufacturing of equipment and components or structures at site can be started.
>
> (STUK, 2006)

The unfamiliarity of the parties working in such a strictly controlled and regulated environment caused misunderstanding, disagreement, delay and cost escalation. This case of nuclear fuelled electricity generation highlights the interactivity of projects with their open environments, which is now accepted as being a significant component of project management. The examples of the public relations damage caused to the oil company, Shell, following publication of its plan to decommission its Brent Spar oil storage vessel, and the abandonment of the proposal to build a third runway at Heathrow Airport, further illustrate the openness of many projects.

4.8 Recommendations for designing the project

The plethora of factors affecting the design of a project that we have touched upon has precluded a point-by-point definition of all a project's design features.

However, by combining the principles with the factors, we hope to at least have pointed the reader in the right direction.

Where there is a high level of *novelty,* one of two approaches should be selected. Consider adopting a well proven methodology, suitably tailored, and seek to select and build the team/organisation so that it is thoroughly familiar with it (e.g., by selection and training). Further, ensure there is adequate resource available at the start of the project to allow the project team to fully come to grips with the scope of the project and understand what the key stakeholders will require for the project to be considered a success. If there is no 'out-of-the-box' methodology, then adapt a methodology to meet the needs of the project. Make this adaptation explicit within the very early planning phase of the project. Ensure each element of the adaptation (such as the addition of stage-gates) is justified in terms of the principles described above. Use Occam's Razor to avoid any unnecessary embellishments to the project methodology.

In every case select, adapt, or create a methodology that best complements existing practices and project needs. Select project tools that are, as far as possible, compatible both with the methodology and with current management infrastructure, even if this means some bespoke encapsulation may be necessary. For projects with a high degree of novelty, the selection of the project manager and his or her core team will be key. Ideally they should have domain familiarity and reasonable knowledge in the field of the project, so as to better understand and anticipate issues. Moreover, they should have a predisposition towards flexibility, since it is likely that there will be a significant evolution of the project plan as the project unfolds. Project managers will become single points of failure unless appropriate expert governance is put in place, which will require additional resource and schedule. Part of this governance process will be the need for explicit scrutiny of the project's progress and performance at critical junctures. Thus part of the project's design will be to have a clearly understood and articulated project lifecycle. As part of this, there will be a need to ensure that there are effective stage-gates in place, and that these gates are operated through the deployment and engagement with expert advice. It will be essential for these gates, and the gate-keepers, to operate as objectively and independently as possible. Projects should therefore conduct rigorous design and execution stage-gate reviews as part of the routine management and governance culture.

Large or *Complex* projects lend themselves to an in extremis demand simplification of the project's design, through adopting the principles and practices of systems engineering and system design approaches (Stevens et al., 1998). Projects should be considered and organised hierarchically, and divided into sub-projects wherever possible, following the arguments used for programme management. Key performance metrics should be identified that go beyond simple 'bean-counting', to show strategic achievement and record genuine progress.

Where there is a high level of *risk and uncertainty*, it is for those responsible for the strategic design of the project, and therefore its strategic success, to ensure that the risks and uncertainties are appropriately considered, managed and allocated across the project organisation and its supply chain. Any predisposition to let the risk register become a reporting tool rather than a management tool should be avoided, as both projects and project risks are dynamic. Rather, the risk register should be explicitly used to manage contingency and mitigation, and this should be reflected in the project design. Where the profile of the project is of sufficient concern, then risk workshops may, and, we argue, should, be held at regular intervals and around rigorous and independently advised gate reviews to ensure risks are captured and managed. Project strategies should clearly note their level of assumed and assessed risk. Achievement of superior strategies may need to be evidenced by setting objectives for interim deliverables, which should include the assessment or testing of acceptance of these deliverables. From active risk management should come project learning, and this learning should take place within the project between phases, tranches, or other obvious demarcation points. Learning is fundamental to improvement, and myopic short-termism is no excuse for repeating mistakes and reinventing wheels.

Project *design expectations* should not be confused with prejudice or ignorance of alternatives. Just as with 'solutioneered' requirements, stakeholder design expectations should be challenged. Where these contributions are valuable (for instance because of the stakeholder's experience and domain knowledge), the project should be designed so as to take note and utilise them where appropriate, but this should not mutate into handing over ownership of part of the project design to the stakeholder, even if he/she is the customer. Where expectations are not appropriate to an optimal project design, seek to gain kudos by explaining why, and do so with evidence-based confidence. If a suggestion is adopted, then it is imperative to be certain of your arguments and facts, and have alternative solutions to suggest. Where expectations are not appropriate and are also not negotiable, determine the nature and party that will bear the risk and make your decisions accordingly. Here you are facing the least worse set of decision options. Ultimately, be prepared to walk away from projects where your personal opinion, or the collective view of your organisation, is that the project's mission and proposed design carries an unacceptably high risk of inevitable failure. This may seem to be the bravest of decisions, but history is littered with failed projects that proved to be the end of careers or companies. If you face this predicament, then the best point in time to do this is at the beginning, but unhelpfully this is when there is the least understanding, and potentially the greatest optimism, so arrive at decisions using fact, learned understanding, and debated reasoning.

Since we have noted that projects are for people and delivered by people, be prepared to build your design around the *people* available, bringing in contractors and other peripatetic players to fill gaps, and introduce appropriate training, mentoring and cultural alignment. Include transition period(s) within the project phasing to allow the team to form and adapt, evolve and gel. Where individuals might contribute to a range of areas (e.g., a project manager with a specific and technical engineering background), carefully define responsibilities and manage their expectations within a career context. Draw on their technical skills, but seek to expand their breadth of understanding. Challenge the boundaries of their comfort zones. Monitor the project carefully, especially at the start, to ensure the project division of responsibilities is true in practice. Invest in understanding the prevalent culture that will pervade the project. This may be dominated by the sector in which the project lies, the project's dominant geographical location, or the economic context, and will almost certainly involve all three. Use the culture to the project's advantage, and only try to influence the aspects of the culture that support the project's aims and objectives. Only seek to radically alter the culture at your peril, and be aware of the risk that is run if the project culture is entirely dependent on only one or two individuals.

Note

1. The Office of Government Commerce was shut in 2011 and its role was taken over by the UK government's Cabinet Office which then established the Major Projects Authority. Their guidance, however, still follows the OGC's guidance, which is now part of the UK's National Archive.

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5
Decision-Making in Organisations

Tim O'Leary

5.1 Introduction

As previous chapters have discussed, project governance provides the management structures, policies, processes, roles and responsibilities which help ensure that (a) organisations choose projects which support their business strategy; (b) the objectives of business investment are translated into the right project objectives, activities and tasks; and (c) the project management structures and processes are in place such that implementation can be managed in line with objectives and business expectations. All of this is fundamentally about the organisational capability to make the right decisions at key points in the life of a project – where what is 'right' is a complex and uncertain matter on which multiple stakeholders will hold many different views. The effectiveness of project governance can therefore be seen in terms of how it supports organisational decision-making around projects.

This chapter explores the subject of decision-making in organisations and the implications for effective project governance of how organisations actually make decisions. Project governance structures and processes themselves do not make decisions – they simply provide the framework within which decisions can be made. People make decisions, in ways that reflect the rich complexity of human social life. We therefore look more closely at the normative assumptions of 'best practice' about projects and how decisions are made to govern them, and compare that with what research tells us about actual organisational practice. The assumption of management theory is that such decisions will be made rationally in terms of agreed project goals and an objective assessment of the facts, but in practice people do not always act rationally in the narrow sense, nor can agreement about project goals, or what constitutes 'the facts' always be taken for granted. Whether we would prefer it to be different or not, we know that organisational decision-making is fraught with politics, with emotion, with struggles for advantage or personal identity and with alternative perspectives often hotly contested. What are the implications of this organisational reality for effective project governance in steering projects to more effective outcomes? To consider this, we turn our attention to wider perspectives on organisational behaviour, reflected in the recent interest in 'practice-based' theories of organisational action generally, and of projects specifically. By drawing on some sociological perspectives on social action in organisations, we can conceptualise projects as 'social trajectories' whose path is determined by the social interaction between numerous parties with multiple objectives and interests. From this perspective, the whole notion of 'decision' may become less useful, with its rationalist separation of action and implementation from planning and analysis. We can instead look to methods of project governance whose focus is not just management structure and process, but the encouragement of behaviours and social interaction to ensure the ongoing alignment and coordination of collective action.

The chapter is structured as follows: Firstly, the underlying principles and assumptions behind the main project governance models are identified and discussed, notably how they rely on a particular view of how decisions are made in organisations, and a particular conception of projects. We then move away briefly from the projects field, turning to the organisational studies literature to explore research into the nature of organisational decision-making in practice, particularly the multi-party collaborative decision-making that characterises complex projects. Two key perspectives are identified from that literature – sense-making and politics – and these are illustrated in a project context by examples from case study research into projects. On the basis of this, the requirement is identified for a means of conceptualising projects which recognises the central importance of these social interaction processes to project outcomes. One such framework, drawing on social theory and the work of sociologists Strauss and Bourdieu, is then presented, characterising projects as 'social trajectories'. Using this theoretical lens draws attention to ways of extending the repertoire of project management approaches and the priorities for effective project governance. A range of specific management interventions are then described, which are familiar from the organisational development field, but not yet systematically incorporated within mainstream views of project management and governance fundamentals.

5.2 Project governance models – principles and assumptions

Principles of project governance models

Earlier chapters have demonstrated some of the mechanisms used to govern projects, particularly those aimed at establishing a sound platform for success in the early stages and maintaining progress subsequently in line with initial expectations. There is no single universal prescription here. There are numerous different approaches to detail in establishing governance arrangements, some of which are reflected in various formal project management methodologies such as PRINCE2 (Office of Government Commerce, 2005), and as the previous chapter highlights, it is, in any case, important to recognise the specific requirements of any particular project. However, it is possible to identify some underlying principles and assumptions which are consistent in 'best practice' approaches to governance. These combine a conceptualisation of projects in terms of the project lifecycle with some of the assumptions of agency theory and stakeholder theory which underpin approaches to corporate governance in general (Turner, 2007). Three central principles of these approaches to project governance are:

- the project lifecycle
- stakeholder representation
- delegation, escalation and limits to authority.

These are discussed further below.

Projects are typically considered to follow some kind of sequential project lifecycle in which the project moves from the early stages of concept, feasibility and design through to implementation and operation. According to Turner (2007, p. 105) the project lifecycle is 'inherent' to the whole nature of 'project', as a logical consequence of the essential character of projects. According to Morris (2004, p. 4), all projects, whatever their nature, go through a common life cycle whose 'sequence is invariant', and this is essentially what distinguishes projects from non-projects. This assumption is important from a governance point of view, as it is the basis for characterising projects in terms of clearly-defined stages which have to be completed sequentially. This offers a picture of naturally-occurring decision points at stage boundaries which directly shape the later stages and the subsequent progress of the project. This leads of course to the popular idea of 'stage gate' review and approval processes, now a standard feature of mainstream project management approaches.

Table 5.1 is an example from a UK government department of a stage gate approval process for projects, indicating the decisions that are seen as being required at a succession of distinct standard project stages.

The project lifecycle is also associated with a family of positivist assumptions (what one might call the 'dominant discourse' (Williams, 2005)) about projects as goal-oriented systems whose trajectory is planned at the outset, and subsequently monitored and controlled through top-down management action. This is essentially a cybernetic control model, associated with a 'management-as-planning' conception of management action (Koskela and Howell, 2002b), in which analysis and action are distinct and separate activities. Implementation is seen as a largely pre-specified activity once the right decisions have been made about project definition and planning. Decisions at the early project stage boundaries therefore become crucial to determining what is typically the much more resource-intensive implementation activity.

Table 5.1 A stage gate approval process

Stage	**Stage Exit questions**
Concept	Is this worth pursuing? Is it in line with corporate priorities?
Start-up	Is this worth doing? Broadly, how would we do it? Are we able to take it on? Do we want to implement it against other possibilities?
Initiation	Is it a good investment? Is it fundable and affordable? Have we included everything that needs to be done? Are risks manageable?
Design	Is this the right solution? Does it meet the business requirements? Is it technically right and strategically aligned?
Delivery	Is deployment going as expected? Are we on track to still deliver the benefits? Is the business getting what it asked for?
Acceptance	Has the project been delivered to Cost, Time and Quality expected? Is the business ready to receive?
Deployment	Are the on-going management processes established? Have the operational business owners fully taken ownership?
Closure	Have the benefits been realised? Has the Business Case been delivered? Have lessons learnt been completed?

It is assumed that the project objectives can (and must) be clearly defined at the outset, will not change, and will be universally agreed. Subsequent decision-making is concerned with monitoring deviations from the agreed plan and initiating any necessary remedial action to return to plan.

The second important assumption of project governance models is that successful completion of projects requires the collective endeavours of numerous parties with different (but ultimately reconcilable) stakes in the outcome. A project leader will be responsible for directing project activities, but will need to take account of the needs of these different stakeholders. Particularly important stakeholders are those commissioning and/or funding the project, who need to ensure that their business objectives continue to be met; as well as those who will be using or managing any new facilities or functions which are the outcome of the project, and who will thus be concerned to ensure that project designs properly fit operational purposes. There may also be many other internal and external stakeholders in large and complex projects, conducted in large organisations, for example, those concerned with maintaining corporate standards of various kinds. Governance structures are expected to provide the means by which the various interests can represent their views, and to offer some clear means of resolving differences of view and achieving an agreed position. There are two important assumptions here. The first is that, left to their own devices, project leaders and teams will not necessarily produce outcomes that reflect the best project outcome taken in the round – there is a need for checks and balances. The second assumption is that, notwithstanding different perspectives and interests, a group of stakeholders can act collectively, and that differences can be reconciled by reference to the agreed project objectives. This is evident in the treatment of Boards as unitary 'authorities'. For example, the collection of individual senior stakeholders which constitutes a Project Board according to PRINCE2 is 'the authority that signs off completion of each stage and authorizes the start of the next stage' and 'arbitrates on any conflicts within the project or negotiates a solution to any problems between the project and external bodies' (p. 395).

The third important principle is that decision points can be clearly identified with reference to pre-specified limits of authority, providing a structure of delegation, escalation and ultimately single-point responsibility. Multiple stakeholder views are acknowledged and assumed to be resolvable through discussion and reference to the project goals. However, if unresolved, they are referred to a higher level of authority in the governance structure, and can at some point be decided upon by a single accountable individual with the organisational responsibility for the project outcome. In the case of the PRINCE2 Project Board, the guidance spells out in bold type that: 'The Project Board is not a democracy controlled by votes. The Executive is the key decision maker because he/she is ultimately responsible to the business' (p. 398). For large and complex projects, involving perhaps several large and complex organisations, this is clearly a problematic issue in practice, as reflected in the PRINCE2 recognition that the Executive is (rather vaguely) 'supported' by other key Board members in decision-making. Nonetheless, the assumption is that appropriate structures of delegation, escalation and single-point responsibility can be put in place to achieve the right project decision for the organisation, by the appropriately responsible individuals acting within their authorised organisational roles and responsibilities in the interests of the organisation. In essence, this sees decision-making outcomes as reflecting the hierarchical power structures of the organisation, with parties making rational choices in the pursuit of the project goals.

Elements of project governance

These broad principles of project governance lead to the typical elements of project governance structure.

Stage gate approval processes – which specify the key decision points and decision-makers along the project lifecycle and the criteria to be met in order to proceed. We have seen an example of this in Table 5.1.

Collective decision-making bodies – where the key stakeholders, representing functional and corporate interests, make collective decisions at the key stage points, and decide on responses to problems and deviations from plan. These groups can operate at different levels of authority (e.g., Project Steering Groups involving the most senior executive level sponsors, Project Boards at operational director level, Change Control Boards at project team level and so on) with escalation routes for issues seen as requiring decisions at a higher level.

Formal roles and responsibilities – specified terms of reference for both collective bodies (above) and individuals (such as Project Manager), identifying scope and extent of decision-making (e.g., financial authority limits), and escalation routes.

Quality assurance – in the broadest sense, processes to aid collective decision-making by providing an independent view of the project's compliance with initial agreements and progress against plan.

Contracts and sign-off – use of documented agreements which are formally agreed within the governance process at the appropriate level and which form an agreed point of reference for resolution of any subsequent issues or disputes. Signed-off deliverables and contracts, the most significant of which mark the 'exit' from one stage and the 'entry' to the next, essentially 'embed' earlier decisions into what constitutes the project.

This brief conceptual overview of project governance in effect sets out a high-level normative 'theory' of project governance. As we can see, this reflects a particular view of the essential character of projects and how they can be effectively controlled through agreed structures and processes, whereby the appropriate decision-makers exercise closely defined authority at key points in the project. In applying such theory, it is useful to know how closely the assumptions on which the theory is based conform to practical experience. Also, it is clear from the above that project governance models themselves say very little about *how* decisions are to be taken.

The decision-making aspect of the project governance model is, of course, the stuff of normal management. In the next two sections we turn to the extensive body of research into organisational decision-making from the organisational studies field, and to work on collaborative decision-making in particular, before exploring the relevance of those findings to the management and governance of projects.

5.3 Organisational decision-making – the rational choice model and its limitations

Theories of decision-making are rooted firmly in the neo-classical tradition of rational economic man (Zey, 1992). Decisions are assumed to be based on preferences (e.g., wants, needs, values, goals, interests, subjective utilities) and expectations about outcomes associated with different alternative actions; and the best possible alternative is selected after evaluation of the outcomes against the preferences. Empirical research, however, whether cognitive psychology laboratory experiments, or in-depth studies of the way in which real decisions are made within organisations, has, for some time, cast doubts on the applicability of this model in its pure form in anything other than the narrowest of circumstances (Brunsson, 1982; March, 1988; Vickers, 1965). However, this model of decision-making is often taken for granted as the obviously best way of approaching a decision. As discussed above, this is essentially one of the implicit assumptions of the conventional project governance models. The organisational decision-making research field is dominated by this tension between the normative attractions of the rational model and its apparent limitations in providing good explanations of observed behaviour (Langley et al., 1995).

Two major figures in the field are Simon and March, who expanded the purely rational choice decision model, seeking to fit it better to actual practice through the notion of 'bounded rationality'. Bounded rationality recognises the information-processing limitations of human decision-makers in real world organisations, leading to 'satisficing' rather than 'optimising' choices (March and Simon, 1958; Zey, 1992): 'for the alternatives are too many and the time is too short' (Vickers, 1965, p. 91).

Simon's work has been very influential in providing an essentially rational framework for analysis of the decision-making process, seen as 'intendedly rational' albeit cognitively constrained (March and Simon, 1958, p. xxvii). While, as discussed further below, the non-rational has been an enduring theme in the literature, empirical researchers have mainly adopted some variant of the more rational model (Langley et al., 1995). Some have dealt with the evident complexity and richness of real-world decision processes by elaboration within the basic view of decision-making as a bounded rational process, which converges through a sequence of stages from problem solving to final authorisation (Mintzberg, Raisinghani and Theoret, 1976; Nutt, 1984). Mintzberg, for example, developed a complex model of seven routines subject to numerous external dynamic factors delaying or interrupting progress through the routines. While highly-contingent and iterative, this model remains within a basically rational framework – which Langley et al. (1995) refer to as 'cerebrally rational'.

However, March's work with a number of other colleagues has been influential in highlighting that the bounds of 'bounded rationality' may in practice be so extreme as to essentially invalidate the whole idea of structured rational choice (March, 1988). 'Human action is often less a matter of choice than a matter of imitating the actions of others, learning from experience, and matching rules and situations on the basis of appropriateness' (March and Sevon, 1988, p. 432).

Empirical research into what otherwise appear as disorderly and irrational outcomes in terms of rational choice theory suggest that numerous 'alternative rationalities' must be at work (March, 1988; Zey, 1992). *Limited rationality*, a form of bounded rationality, is used to explain such evident behaviours as incrementalism and 'muddling through' (Lindblom, 1959), where the drivers for choice are uncertainty avoidance, short-termism in the face of an uncertain future, and rules of thumb based on previous experience. *Contextual rationality* recognises the importance of simultaneity and chance in bringing problems and solutions together, illustrated by Cohen, March and Olsen's famous 'garbage can' theory of decision-making (1972).

Here decision-making is presented as an anarchic process, where problems and solutions get linked in an opportunistic and apparently random fashion. In the 'garbage can' model, decision-making is viewed as 'collections of choices looking for problems, issues and feelings looking for decision situations in which they might be aired, solutions looking for issues to which they might be an answer, and decision makers looking for work' (Cohen, March and Olsen, 1972, p. 1). *Process rationality* introduces the idea that the process itself may have value and meaning for participants beyond the outcome itself.

Posterior rationality turns the notion of a decision as a prior commitment to action on its head by emphasising experience-based learning and the 'discovery of intentions as an interpretation of action rather than as a prior position', drawing on Weick's ideas of 'enactment' and 'loose coupling' (Weick, 1979) – which, according to Mintzberg and Waters (1990) suggest that 'the relationship between decision and action can be far more tenuous than almost all the literature of organisation theory suggests'.

Brunsson (1982) also identifies that actions often precede decisions, rather than the other way around. He goes further to claim that the rational decision-making model actually 'affords a bad basis for action', as it ignores the motivational, commitment and social links from decisions to actions. Brunsson calls for a focus on action rather than decision, as an action perspective directs attention to the fact that action takes place for a number of reasons (or 'rationalities' in March's terms), of which explicit decision is only one. For example, agreement and coordination can arise without decision-making, because the actors perceive situations similarly and share general expectations and values (Brunsson, 1982, p. 32).

Mintzberg and colleagues also conclude that action may be a more productive focus than decision: 'It made more sense for us to study streams of actions, and then go back and investigate the role of decision, *if any*, in determining these actions' (Mintzberg and Waters, 1990). Their own research demonstrates what a difficult concept decision actually is in large organisations: 'not only are "decisions" difficult to pin down in practice, but … the attempt to do so may distort our perceptions of how action really occurs in organisations' (Langley et al., 1995, p. 270). This focus on action rather than decision is something that is picked up again later when we develop an alternative conceptualisation of projects and their management.

Overall, this brief survey of research into organisational decision-making certainly suggests that the process of decision-making around the effective governance of projects is much more complex than our models assume. This is particularly so when we consider that, as discussed earlier, a central objective of effective project governance is to make decisions – or, perhaps more precisely, to take coordinated collective action – which balance the different interests and perspectives of multiple stakeholders. In the following section we focus specifically on research into multi-party decision-making.

5.4 Multi-party decision-making in organisations

Organisational decision-making is typically a group process, and research into the way that groups make decisions further reinforces the importance of 'non-rational' factors in determining decision outcomes described above. For example, decisions can be influenced by 'group think' (Janis, 1982); by management fad or industry practice (Davenport, 1994); by the way in which issues are packaged and 'sold' (Dutton, et al., 2001); by a desire to be consistent with previous decisions (Staw, 1981); by psychodynamics and emotions (Gabriel, 1998); and by group diversity and different types of conflict (Amason, 1996).

But whatever the specific mechanisms at work, what seems undisputed is that the process of group organisational decision-making can be seen as a political process in the broad sense, in that it involves the need to accommodate the different perspectives and interests of different stakeholders. Lindblom (1959), writing from the viewpoint of public sector organisations, demonstrated that it was the need to accommodate the interests and positions of different groups which dictated the outcome of the public policy-making process, rather than the system of option evaluation and rational choice. Cyert and March (1963) showed that private sector firms were political entities also, composed of competing and shifting coalitions of multiple and conflicting interests, imperfectly resolving differences in demands and objectives through a process of negotiation and influence, often through the exercise of political 'tactics' of various kinds.

From this perspective, organisational outcomes can be seen less as a result of one-off decisions based on analysis and evaluation of potential solutions against agreed objectives, and more as a process of negotiating functional and personal interests (Pettigrew, 1973), where the ability to control resources is a crucial factor, and where outcomes may be at odds with rational choice theory.

The discussion that follows distinguishes two ways of looking at this process of multi-stakeholder interaction. One, a 'sensemaking' perspective, focuses primarily on the way different groups and individuals interpret organisational reality, and the processes by which a shared interpretation can be achieved. The other, which we are calling the 'political' perspective, focuses on how action is driven by different interests, views on respective advantage, and power relations. As we will see, these two perspectives are more difficult to distinguish clearly than may first appear (and in both cases what are normally considered to be 'political' activities may be involved), but the distinction proves a useful means of identifying the fundamental processes at work in multi-stakeholder interaction.

The sensemaking perspective

This view of the multi-stakeholder nature of organisations sees the adoption of different positions as rooted in the functional specialisation of the modern organisation, and in the different interpretations that these functional groups take in the face of uncertainty about ends and means. It is perhaps this perspective that best reflects the assumptions behind multi-stakeholder decision-making in project governance models discussed earlier. So-called political behaviour can then be seen as being largely caused by a combination of 'structural differentiation' (between different organisational or professional specialisms), and the complexity and uncertainty of the collective task, where there is lack of clarity about requirements, and where long time spans between decision and outcome make causal relationships hard to discern (Pettigrew, 1973). In these circumstances, characteristic of complex projects of many kinds, '[r]easonable people can be expected to disagree on major, uncertain and ambiguously defined issues, and to argue strongly for their personal convictions' (Buchanan and Badham, 1999, p. 21).

Competing perspectives may arise because different people 'frame' or make sense of problems and issues in different ways, using different mental models (Edmondson, 2003), and their attachment to a particular interpretation may reflect their own 'world view' (Strauss, 1993) and even become an issue of personal identity (Gioia and Thomas, 1996; Knights and Murray, 1992). Weick's work on 'organisational sensemaking' (Weick, 1995; Weick, Sutcliffe and Obstfeld, 2005) has been very influential in highlighting the processes by which individuals and groups in organisations make sense of the evident ambiguity and uncertainty which characterises organisational work, resulting from different (individually 'rational') ways of interpreting the stream of experience, of looking at the world. Weick sees sensemaking as an active and social process, involving seeing 'cues' bracketed out of the stream of events within pre-existing interpretive frames. Rather than 'seeing is believing', we tend to see what we expect to see, what constitutes a plausible story, and what reinforces important aspects of our own identity and emotional needs. This interpretive stance can therefore have a great deal invested in it. Weick also stresses the role of action and improvisation, and the retrospective character of sensemaking, where we seek to construct plausible and meaningful stories from essentially improvised and intuitive courses of action.

The sensemaking approach has not been explored extensively by project researchers, although the potential has been identified (Alderman et al., 2005; Thomas, 1998). However, we can draw on research in the organisational change field, where sensemaking has been seen as a productive means of interpreting organisational change projects (e.g., Mills, 2003; Balogun and Johnson, 2004). Here the use of coordinated action to achieve organisational change has been seen in terms of alignment of the different interpretations (e.g., of goals, priorities and approach) arising from the different sensemaking frameworks and identity needs of different individuals and groups. The ways in which this process takes place are many and varied, and range from the 'sensegiving' role of leaders (Gioia and Chittipeddi, 1991), to the persuasive actions of middle management 'change agents' (Balogun, et al., 2005), the exchanges between workshop participants (Thomas, Sargent and Hardy, 2011), and even the promotion of various terms and 'turns of phrase' in day-to-day routines and conversations (Rouleau, 2005). This complex, multi-level process of seeking shared meaning is a predominantly discursive process which can only be properly understood by understanding the minutiae of daily organisational social practice. Language is seen as the primary driver of the construction of shared meaning, and narrative approaches (Czarniawska-Joerges, 1997; Rhodes and Brown, 2005) seek to identify the alternative interpretations of different groups, and look to the development of a shared narrative as the basis for achieving effective coordinated action (see Box 5.1).

Little seems to be known about how these different perspectives eventually resolve in an accepted position. It does seem evident, however, that power and politics play a key role (Brown, Stacey and Nandhakumar, 2008; Marshall and Rollinson, 2004).

Box 5.1

Brown (1998) demonstrates the importance of different sensemaking narratives in explaining the various perspectives of different stakeholder groups in a hospital information systems project. This project experienced considerable difficulties and was sharply criticised by the National Audit Office as having failed to deliver the promised benefits, and for being poorly managed by the hospital. By presenting the different narratives of the project team, the ward users and the laboratory staff whose system was being replaced, Brown highlights the 'politically fraught' character of the project, where 'consensus and coordinated action were hard to achieve'. For example, according to the laboratory staff, the project team had refused to acknowledge their view of the requirements, and demonstrated poor leadership and lack of professionalism; while the project team blamed the users for their lack of cooperation in making changes in work practices: 'recognizing that the new systems threatened to impose controls that would alter existing work routines and modify their work relationships they refused to make meaningful use of it' (p. 52). According to Brown, the different narratives, while couched in acceptable rational language and often expressed in terms of the dominant discourse of 'patient care', were used to attribute blame for what had come to be seen as a failing project. 'Power is used, in part at least, in and through narratives which groups deploy to legitimate interpretations that they believe favour their interests'.

As Dawson and Buchanan (2005) observe in their similar study of project narratives: 'Whilst there are multiple and competing narratives, it is generally the case that not all stories or perspectives are heard, and yet, those that are can have a profound influence on decision-making within organisations' (p. 854).

The political perspective

Alongside the collaborative 'sensemaking' perspective, there is a 'darker' side to the view of the character of multi-stakeholder organisational activity, which in common parlance is seen as 'organisational politics'. This perspective focuses primarily on power and politics, with actions taking place within a political process of influence and negotiation seen 'in terms of an actor's subjectively realized intention of engaging in self-serving behaviours at the expense of others in the organisation' (Gandz and Murray, 1980, p. 237). This approach to the politics of decision-making sees organisational power relations as the prime driver of organisational outcomes, albeit perhaps 'hidden' behind an apparently rational decision process (Buchanan and Badham, 1999; Pettigrew, 1973).

There is a range of views on what is meant by 'politics', what constitutes 'tactics', and what are taken to be acceptable or unacceptable behaviours in promoting a particular position or view. While politics is an accepted part of organisational life, it is not often viewed positively. Many authors – for example, Hardy and Clegg (1996) in their paper 'Some Dare Call it Power' – make the point that concerns about the ethics and legitimacy of political tactics, and the difficulty of empirical research into practices which are often considered to be of doubtful acceptability, has hampered research and theoretical development. For Mintzberg 'organisational politics can be viewed as a form of illness' (Mintzberg, 1989), undesirable and damaging behaviour outside the normal lines of authority: 'divisive, illegitimate, devious, cunning, underhand, and unsanctioned – anti-social' (Buchanan and Badham, 1999, p. 58). A major characteristic of such behaviour is the attempt to conceal its true motive, as those involved believe that such tactics would be judged by others as unacceptable or illegitimate.

Some authors take a more positive view. Power and politics is a prominent feature of the practitioner-oriented prescriptive literature on managing organisational change projects – although it is more often expressed in terms of 'stakeholder management', 'forming coalitions', 'communicating the vision' and 'building the case for change' (Kanter, Stein and Jick, 1992; Kotter, 1995). Hardy (1996) sees power as a form of organisational energy, with politics (as 'power in action') as an essential mechanism with which to make change happen. The actions that are crucial to the realisation of project goals do not just 'happen'; power is needed to orchestrate and direct them, and the exercise of that power requires political skills. Such skills – of presentation, motivation, persuasion, negotiation and so on – are not just a matter of seeking personal advantage, they are necessarily required to achieve an aligned view. The processes of achieving shared 'sensemaking', described earlier, involve presentation and influencing skills which can be seen as political. So organisational politics can be seen as not only unavoidable, but a necessary characteristic in achieving the alignment of different perspectives and interests.

The clear distinction between the 'sensemaking' and 'political' perspectives begins to break down once we recognise that, to some degree at least, political tactics are part of the process of collaborative sensemaking; and also that power-knowledge relations (Foucault, 1977) determine and/or constrain interpretations, which can be taken to constitute meaning. The relationship between meaning and power has increasingly been recognised. In the 'management of meaning' (Hardy, 1996) or 'politics of interpretation' (Marshall and Rollinson, 2004) the interpretations of the most powerful are likely to carry most weight. Where there are different perspectives and interpretations, research shows that power relations play a key role in resolving 'discrepant sensemaking' (Brown, Stacey and Nandhakumar, 2008). These power-knowledge relations are enacted through the use of discourse, which shapes what can be said, how it can be said, and who can say it. According to Thomas, Sargent and Hardy (2011), 'the literature indicates that organisational change processes are contingent upon the negotiation of meaning which, in turn, is permeated by power-resistance relations'.

Because organisational change disturbs the status quo, and provides both opportunities and threats in new disposals of power, '[p]ower, politics, and change are inextricably linked' (Buchanan and Badham, 1999, p. 11). We should not be surprised therefore that politics and power are an endemic feature of projects (see Box 5.2). As Marshall observes (2006), projects are clearly 'fertile ground for disputes and disagreement' (p. 208) and 'it is difficult to avoid the conclusion that projects are the site of both strategically acting and interacting agents and places where multiple techniques, dispositions, norms and discourses interact'. This is almost a truism for practitioners, where it is widely recognised that 'effective managers are often those who are willing and able to employ appropriate political tactics' (Pinto, 2000).

Observers of organisational politics often refer to them as 'games', with the implications of rules, competence, and winning and losing. Mintzberg (1989) identifies 13 political games common in organisations, the key ones being games to resist authority, to counter resistance, to build power bases, to defeat rivals and to change the organisation. Of these, the most popular tactic is the selective use of reason, with arguments and data deployed to present the preferred outcome in a more favourable light than the alternatives.

There is clearly a very wide range of different kinds of political tactics (Buchanan and Badham, 1999), and considerable skill is required in choosing appropriate tactics in context (Pettigrew, 1973). This context can include many factors, including the history of the personal relationships of the parties involved, the personal circumstances of the players, the prevailing organisational values and so on – there are no general rules. Appropriateness requires not just consideration of effectiveness, but, critically, of acceptability or legitimacy (see Box 5.3). These judgements of appropriateness are made

Box 5.2

Markus (1983) presents a case study of a project to introduce a new financial accounting information system (FIS) in a decentralised organisation. The project experienced numerous difficulties, with considerable resistance from users, many of whom resented the necessary changes in their working practices, which they saw as imposed on them from corporate headquarters. Markus evaluated a number of theories in interpreting the case study outcomes, and demonstrated that the best explanation of events was in terms of organisational politics. The new system involved a substantial power shift from the divisional accountants to the corporate accountants, providing the latter for the first time with access to base financial data, rather than relying on summaries prepared by the divisions. Markus saw evidence that the original design of the system was a deliberate political move by the corporate accountants (described by a participant as an evident desire to 'take over the whole world') to redress the power imbalance they felt compared with the divisions. They staffed the project team without any representation from the divisions, and made some early technical decisions that embodied significant changes in the business processes, without consultation. The divisional accountants who lost control were the most resistant users, and engaged in a range of political tactics such as 'writing angry memos, maintaining parallel systems, engaging in behaviour that jeopardized the integrity of the database, and participating in a task force with the public objective of eliminating FIS and replacing it with another system' (p. 438).

Similar behaviours were observed by Knights and Murray (1992) in their study of an information systems project in an insurance company, which referred to 'internal rivalries and power struggles between distinct specialist and professional groups' and 'the chaos, and frantic attempts to displace blame that characterised the project' (p. 222).

McLaughlin, Badham and Couchman (2000) highlighted the influence of politics on the trajectory of a number of new technology projects in a manufacturing company where 'the ultimate fate of each project showed considerable variation from what was intended as the political processes and dynamics of the change process started to shape both process and outcomes'.

tacitly, requiring considerable practice-based improvisatory skills in context, and are part of what Buchanan and Badham (p. 17) refer to as 'the taken-for-granted "recipe knowledge" of most managers'. Inextricably combined with the influence tactics described above, are skilful use of conversation controls and impression management. Quite when the normal practices of social interaction shade into 'politics' is a moot point.

Box 5.3

> Observed political behaviours are often interpreted as blatantly self-serving. For example, a project study by Levine and Rossmoore (1994) observed that for the organisation's executives their 'privately-held values and goals were more salient and powerful to them than the publicly espoused goals of the organization and to a more significant degree than the public goals, determined the consequent behaviours'. However, this is not always the case, or at least not explicitly so. Hope (2010) describes a case study of an organisational change project where a group of middle managers, in pursuit of their view of what was the best outcome for the company, exercised a range of overt and covert political tactics to shape project events. Nonetheless, whatever their motives, their political ploys 'comprised a broad spectrum of legitimizing activities regarding their own ideas, and a broad spectrum of tactics applied to delegitimize the ideas and proposals from their opponents' (p. 205). Tactics included placing allies in the project team, controlling relevant information, and excluding those known to hold opposing views from discussions.

These 'micro-practice' considerations reflect a similar focus on 'social practice' to that emerging from research into the collaborative sensemaking process. They also echo some of the findings from ethnomethodologists' detailed study of the rules of social interaction in general (Garfinkel, 1967), of providing plausible accounts as justification, of self-presentation and the 'dramaturgy' of social performance (Goffman, 1959), and of everyday discourse analysis (Shotter, 1993).

Sensemaking and political action can thus be seen as part of the wider subject of negotiating one's way through social reality. Understanding what drives the processes of sensemaking and political action on projects would seem to require good understanding of the drivers of social interaction in general. While power and politics may be useful concepts in directing attention to the apparently 'non-rational' outcomes of organisational action, a deeper understanding of action and outcomes in projects may be gained by focusing on the social exchanges which are the fabric of day-to-day life in organisations – taking what is referred to as a 'practice' perspective (Jarzabkowski and Spee, 2009).

5.5 Extending our conceptualisation of projects

Mainstream views of project management have only recently begun to incorporate the implications of these findings from the wider organisational studies and organisational change fields about the fine-grain of organisational decision-making and action. Project management research has, in the main, reflected the underlying theoretical 'management-as-planning' systems conceptualisation of projects, and the commitment to a sequential project lifecycle, as reflected in the project governance models set out at the start of this chapter. There has been little theoretical treatment of the social and political processes, despite the evidence from empirical research (referred to above) of the importance of such processes in project outcomes; and that research, over many years seeking to identify the factors contributing to the success or failure of projects, (Fortune and White, 2006; Pinto and Slevin, 1987) has repeatedly emphasised what are often referred to as the 'people' factors. While these findings have served more to emphasise the inadequacy of universal solutions in the face of the huge variety and context-specific diversity of different projects (Sauer, 1999), 'success factors' research does consistently emphasise the importance of some broad social and organisational factors. Frequently-cited success factors include: top management support, active stakeholder management, leadership, good communications, good team working and motivation, and a clear shared vision or goal (Fortune and White, 2006). These can readily be seen in terms of supporting the interpretive (sensemaking) and political processes that the earlier discussion identifies in organisational studies research.

Furthermore, it seems that social factors are in themselves an important contributor to the range and extent of uncertainty and complexity that has been observed in projects in practice. Researchers distinguish a wide variety of different characteristics along a spectrum from 'hard' to 'soft' projects (Crawford and Pollack, 2004), or from 'planned' to 'emergent' projects (Lewis et al., 2002). Uncertainty, in both goals and methods (Turner and Cochrane, 1993), can range from 'foreseeable uncertainty' which can be managed by contingency and risk management, to the completely 'chaotic' which requires flexible, improvisatory responses (De Meyer, Loch and Rich, 2002). However, some degree of uncertainty seems to be endemic to all projects (Atkinson, Crawford and Ward, 2006). Even in the world of engineering capital projects 'the decisive majority of capital projects suffer until far into their lives from rapidly changing goals, from perpetual changes and unexpected constraints' (Laufer, Denker and Shenhar, 1996, p. 190). Projects that involve organisational change or new technology – which many projects in organisations do, to varying degrees – often involve the production of outcomes that are either uncertain or intrinsically imprecise in engineering terms, and subject to negotiation of meaning. Even the 'hardest' of projects need to be negotiated through the uncertainties of organisational reality.

The importance of social factors is particularly marked for those projects which, like information systems (Nandhakumar and Avison, 1999), or product development projects (Lewis et al., 2002), can be characterised as exhibiting high degrees of complexity and uncertainty (Shenhar, 2001), where the scope for alternative interpretations and interests is high. In such projects it seems that lifecycle stages overlap and iterate, the clear distinction between planning and action blurs, actions are improvised in the face of unfolding events (Ciborra, 1999), plans change and project goals and objectives are emergent. Real projects are characterised by 'a continuous stream of intervention, bricolage, improvisation, opportunism, interruption and mutual negotiation as much as by regularity, progress milestones, planning and management control' (Nandhakumar and Avison, 1999, p. 188).

If this is what projects are really like, if multi-party sensemaking and politics are so central, how should we seek to govern them effectively? Clearly, this view of projects and organisational decision-making is some considerable way from the principles and assumptions of project governance set out at the outset of this chapter. We need to consider what the implications of that divergence may mean, and whether we should think differently about projects and their management. There is a growing body of project management research that urges that we should. There have been repeated calls for recognition that the cybernetic systems control model of projects, together with the project lifecycle and its associated family of rationalist assumptions of control and predictability, should be seen as just one of perhaps several useful ways of characterising projects (Winter et al., 2006); and that there is a need to enrich the conceptual representation of project management to better reflect actual practice (Blomquist et al., 2010; Cicmil et al., 2006). The direction this might take was summarised by the UK Research Council's (EPSRC) 'Rethinking Project Management' research network, established in 2003 in response to the growing critiques of project management theory and research (Winter et al., 2006). This emphasised movements away from thinking of projects as staged lifecycles and towards projects as social processes, addressing 'an evolving array of social agenda, practices, stakeholder relations, politics and power' within the context of an organisational reality 'contestable and open to renegotiation throughout'.

In what follows, we seek to develop one such extended conceptualisation of projects, and then use that theoretical framework to propose some extensions to the mainstream models of project governance and the repertoire of 'best practice'.

What should such an extension consist of? We can draw two conclusions from the discussion above of findings from the organisational studies and organisational change fields:

1. It seems that the two key aspects of sensemaking and politics – the social interaction process of interpretation and developing shared meaning, within the context of organisational power relations and political action in pursuit of interests – could usefully be incorporated in a broader conceptualisation of projects. It seems that these two aspects are crucial components of the actual practice of projects, are fundamental components of social practice in general, and that their intrinsic uncertainty

and ambiguity arguably lie at the root of much of the observed practice and outcomes on projects.
2. If we are to develop our understanding of these processes in a project context, we could productively turn to a sociological, rather than systems, perspective on the nature of social practice in general – what we are trying to understand is a particular instance of social individuals working together in a collective endeavour.

There has been very little theoretical work done along these lines so far that is specifically focused on projects and their management, although, as mentioned earlier, some authors have introduced Weick's ideas on organisational sensemaking in a project context (Alderman et al., 2005; Thomas, 1998); and there have been recent calls for a 'projects-as-practice' perspective (Blomquist et al., 2010). Discussion of power relations in project settings is so far very limited (Marshall, 2006), as is project discourse (Green, 2006; Sillince, Harvey and Harindranath, 2006), although as we have seen, there is recent work on the social practice of organisational change that seems relevant to projects more generally.

5.6 Applying a sociological perspective

In the light of this, we turn to general social theory for new theoretical perspectives. Social theory, 'providing conceptions of the nature of human social activity and of the human agent' (Giddens, 1984), can be seen as offering a general (albeit broad-brush) conceptual treatment of social action which is at a similar conceptual level to the mainstream treatment of projects as controlled systems. In the IS projects area, there has been particular interest in Giddens' structuration theory (Jones and Karsten, 2008) and actor-network theory (Walsham, 1997). A discussion of the respective merits of different social theories in extending project management theory is developed more fully elsewhere (O'Leary and Williams, 2011); one particular treatment based on the author's own research is set out below.

In what follows, we branch out again from the project research field to explore some theoretical resources from the theories of sociologists Strauss and Bourdieu, later incorporating them into a conceptualisation of projects as 'social trajectories'. There is no suggestion here that this is the one and only 'right' way to conceptualise projects, or their social aspects. However, it provides a concise but comprehensive theoretical framework within which to discuss systematically a range of extensions to project practice and governance which place greater emphasis on the process of alignment of different perspectives and interests.

Before setting out the 'social trajectory' framework for projects, it is necessary to understand the key theoretical concepts that underpin it. We turn first to sociologist Strauss's 'theory of action' (Strauss, 1988; Strauss, 1993), developed from in-depth studies of a range of collective social endeavours involving different parties and interests. This work initially focused on understanding the interaction of different professionals and family members in medical treatment, but Strauss later extended the insights into organisational work in general, and even specifically to projects. We focus on Strauss's central theoretical construct of 'trajectory', which maps well to the time-based goal-seeking character of projects, and is a very natural way of conceptualising projects.

Trajectory in Strauss's theory of action refers to a course of collective action, and also to the interaction of multiple actors and contingencies which make up that course of collective action. The trajectory is only partially predictable, because of the intrinsic uncertainty of these social interactions, even when it has a preferred or expected path. No single actor guides or manages the trajectory, although some are more influential than others in their attempts at shaping it. As such, this notion of 'trajectory' shares many of the features of real project trajectories that have been described earlier as being observed on real projects; and it maps well to the multi-functional character of complex project teams and the multi-stakeholder landscape that we have seen is a central feature of our models of project governance.

Actors, (or, in more familiar project terms, stakeholders) are seen as members of different 'social worlds', involving 'various generalised commitments' which profoundly shape their members' perspectives and also provide a strong sense of identity for individuals and groups (Strauss, 1993, p. 41). Applying these ideas in a project context (Strauss, 1988), the coordination of different lines of work necessary to make progress is achieved through an ongoing process of 'articulation' – social interaction which establishes agreements about what is to be done by whom, where different social worlds adopt different stances reflecting both their own interpretation of organisational reality and their own interests. The outcome of the articulation process, and thus the trajectory of the project, is therefore determined by interaction between actors, including 'negotiation, persuasion, education, manipulation, and coercion, or the threat of coercion' (Strauss, 1993, p. 57). The project trajectory progresses through the achievement of sufficient alignment for the necessary coordinated collective action to take place.

Within this formulation, action to progress the project trajectory can be seen as involving both a 'sensemaking' interpretive process of developing shared meaning between different organisational stakeholders, and a 'political' process of strategically managing a preferential outcome. As such, it provides a theoretical framework within which we can accommodate these two key elements of multi-party interaction that we identified earlier from various strands of the organisational studies and organisational change literature.

In order to better reflect the political character of social action, we can extend Strauss's conceptual scheme, where the treatment of power is acknowledged as a gap (Corbin 1991, p. 34), by incorporating some theoretical constructs from the work of leading social practice theorist, Bourdieu (Bourdieu, 1977). Bourdieu's work has characteristics that are complementary to Strauss's trajectory framework and provide what can be seen as a very natural extension. Bourdieu's theoretical framework, like Strauss's, was built upon extensive empirical study of social groups, has similar epistemological foundations, and, similarly, sees social action as driven by processes of competing views and interests: 'a field of struggles' according to Bourdieu, echoing Strauss's similar description of the social arena as a 'field of battle' (Clarke, 1991, p. 129).

The core theoretical constructs within Bourdieu's theory of social practice are 'habitus', 'field' and 'capital', which act together to provide a simple but comprehensive explanation for the forces driving the social interaction that determines the course of the project trajectory. In terms of the discussion above, these concepts reflect the dynamic interaction between interpretive frameworks (sensemaking) and power relations. According to Bourdieu, social action is driven, not just (or even largely) by conscious rational choice, but by a 'feel for the game' which is rooted in individual dispositions and ways of seeing the world (the 'habitus'). The habitus determines 'the categories of perception, the principles of vision and division, the systems of classification, the classificatory schemes, the cognitive schemata' (Bourdieu, 1998) – some similarities to the cognitive frameworks and perceptual filters of sensemaking seem clear. The 'game' is played out in the 'field', where there is a constant struggle between groups and individuals for the accumulation of 'capital', which confers an advantageous position, and, in effect, the capability to exert power in the field. 'Capital', which confers prestige, reputation and authority, covers a range of resources, from the obvious economic capital and control of resources to cultural and 'symbolic' capital. Ultimately, symbolic capital is essentially whatever form of capital is deemed legitimate within the field. In a project context, this could be achieving project goals, expressing corporate values, having a reputation as someone who 'gets things done' and so on. Symbolic capital provides the power to legitimise the hierarchy of position and capital in the field, and to impose the legitimate 'common-sense' vision of 'how things are' (what Bourdieu calls 'doxa').

In Bourdieu's scheme, power relations are a permanent backdrop to social interaction, given that the perception of what constitutes capital is determined by the power structures of the field, and assimilated into the (largely tacit) structures of the habitus. In this way, Bourdieu's conceptual structure of habitus, field and capital can be seen to embrace what Hardy (1996) sees as the four forms of organisational power – the power of resource, the power of process, the power of meaning, and the power of the system, the latter being similar in concept to the Foucauldian dispersed network of power/knowledge relations (Everett, 2002). All social action can thus be seen in a sense as being 'political', although in a broad and subtle way which covers a much wider range of motivations (both individual and social) than the simple self-interest implied by the common-sense use of the term 'politics'.

Placing these ideas in a project context, the social interaction process identified by Strauss which determines the course of the social trajectory of the project can then be seen in terms of individuals and groups taking positions where they can improve their accumulation of capital, as they see it. Different 'social worlds' will tend to share a habitus, shaping the way that they interpret the project trajectory and issues, but also what for them constitutes capital, and how they can improve their position. Such positioning actions are accounted for, or legitimised, by their protagonists with reference to 'doxa', the discourses which constitute the self-evidently 'right' way of looking at the world.

5.7 Conceptualising projects as social trajectories

We combine these theoretical ideas of Strauss and Bourdieu to propose a conceptual framework for projects which emphasises the social interaction processes that have so far received little attention in mainstream project management theory. Following Strauss, we conceptualise projects as a 'social trajectory', the progress and outcome of which is determined by ongoing interaction between parties with different 'world views', seeking (following Bourdieu) to maximise their positional capital within a network of organisational power relations. This formulation clearly draws attention to the sensemaking and political processes that we seek to incorporate into our theoretical treatment of projects, and allows us to bring to the fore an important aspect of the work of managing projects – attaining alignment of meanings and interests sufficient to achieve coordinated collective action across the parties.

We assume that the completion of the work to reach the desired project outcomes is achieved through coordinated collective action between different business functions, seen to possess some autonomy of action, and inhabit different 'social worlds'. The 'social worlds' may include functional groupings, different professional disciplines, business stakeholders, partnering organisations and external stakeholders – and may extend well beyond the formal project boundaries. 'Coordinated collective action' here covers those important processes, for example, where objectives have to be defined and agreed, priorities need to be set, requirements have to be specified, plans and responsibilities need to be assigned, designs signed off, products developed and accepted and so on. All of these activities require coordinated action, and the absence of aligned interpretation and interests leads to delays, unnecessary work and wasted resources. The coordinated collective action to drive the project trajectory must, in some way, be negotiated around a shared definition of the situation, and agreement as to what needs to be done – what Strauss refers to as 'articulation' of the work to be done (Strauss, 1988).

In this process, the positions taken by different parties will accord with the way they define the project situation, and how they see their personal and group interests to be affected: in Bourdieu's terms, they will be disposed to act within their 'habitus' to maximise their accumulation of 'capital'. Capital, as described above, is gained by achieving corporate goals as well as personal interests, and is judged by all parties in terms of the power structures of the social field within which the social interaction takes place (so of course the achievement of the agreed project goals is likely to be an important consideration). In this formulation, power relations will therefore be of crucial importance in determining the outcome of this process of achieving alignment, as they determine the currency of the capital at stake.

As Table 5.2 summarises, this social trajectory conceptualisation has some significant differences from the view of projects as systems, controlled by top-down management decisions. Conventional project management theory assumes that the project trajectory is mapped out in advance and articulated in the project plan. Seen in this way, the project's trajectory is described in terms of progress towards its goals, in clearly defined project lifecycle stages, and is managed and governed by comparing the current level of achievement against a pre-defined plan of activities and resources necessary to achieve those goals. Should the current state of the project deviate from the plan, corrective action is taken to restore the project to its planned trajectory. In this model, once management decisions are taken, they are converted into action unproblematically, reading tasks from the plan.

Viewing the project in terms of its social trajectory is rather different. There is no objective unambiguous definition of the project status or even its goals, with different individuals and groups potentially following different sensemaking strategies and seeing things differently, often in ways that suit some broad conception of their interests, their view of what constitutes 'capital'. Also, there is no assumption, as in the systems model, that the path of the trajectory is fully controllable. Because it comprises an ongoing set of unpredictable social interactions between social actors from different 'social worlds', within a fluid social context, the trajectory is emergent, and its state, its preferred future direction and how to achieve this may all be contested. Some actors will be more powerful than others in influencing the trajectory, particularly those with hierarchical power, but even they will need to rely on political skills to impose their view. There is a constant, ongoing process of maintaining the alignment for coordinated collective action, generating the emergent trajectory.

Applying this concept of a social trajectory in a project management context, we can still talk of the project trajectory in terms of the conventional parameters (such as goals, objectives, plans, progress against plan, status and so on) that are readily recognisable from the mainstream view of project

Table 5.2 Comparing the social trajectory and systems control models

Social trajectory model	**Systems control model**
Project is outcome of ongoing negotiation to agree coordinated collective action, and the project's path is intrinsically unpredictable and iterative	Project is a top-down controlled system with a predictable path, which moves through sequential lifecycle stages
Trajectory is influenced by many parties both within the project and beyond, depending on interests and power relations	Project boundaries are clear and there is limited interaction with environment once project has been initiated
Multiple interpretations mean status is a matter of agreement where objective measures play only a part	Status is determinable against objective measures of time, cost and quality
Objectives and plans emerge and can change through project experience as the trajectory proceeds	Objectives and necessary activities to achieve them can be determined at outset
Plans have limited horizon and are continually updated	Plans to completion can be defined in advance and provide the objectively optimal path
Project activity responds to current agreed view of trajectory status, emerges through alignment-seeking process, is often improvisational and has unpredictable outcome	Project activity is pre-specified in the plan, and has predictable outcome
Project is managed by facilitating alignment and managing the politics	Project is managed by monitoring status against plan and taking action to reduce any deviation
Perception of risk varies and reflects interests of most powerful	Risks are managed through reducing uncertainty and improving the plan
Success is a matter of agreement emerging from an effective alignment process	Success is measured objectively against plan at outset and initial estimate of time, cost and quality

management. The key difference, however, is that all of these parameters, rather than being objective 'facts', are 'socially constructed' through an ongoing, mainly discursive, process of intersubjective meaning creation and a degree of political manoeuvering, in which respective power relations play an important part. Plans will be emergent and frequently revised. While the mainstream model places the emphasis on planning and decision-making, the social trajectory model emphasises the ongoing development of plans, and the ongoing work necessary to create coordinated action in an agreed direction.

Crucially, the model implies that the progress of the trajectory, and the eventual perception of the success of the project outcome, will depend upon the effectiveness of the 'alignment-seeking' process. Where this is difficult or lengthy, time and resources will be absorbed, and the progress of the trajectory will slow.

Figures 5.1 and 5.2 summarise this theoretical formulation of projects as social trajectories in diagrammatic form. Figure 5.1 illustrates the cyclical process whereby the parameters of the trajectory are generated by a continuous 'alignment-seeking' process, which provides the basis for collective action between groups with different perspectives, in the face of inevitable changes and emerging and unresolved issues. Where the alignment-seeking process works well in generating agreements and assumptions that provide sufficient basis for coordinated collective action, the pace of the trajectory will be high, and the project will move towards an outcome where the chances of agreement on a successful outcome are also high.

Figure 5.2 presents the operation of the 'alignment-seeking' process in more detail, following Bourdieu in seeing position-taking and the achievement of alignment in terms of the struggle for capital and the effects of power and discourse. An important aspect of this process is that those not actively engaged in some kind of 'negotiation' nonetheless participate in the construction of what is assumed to be so through acceptance or non-engagement.

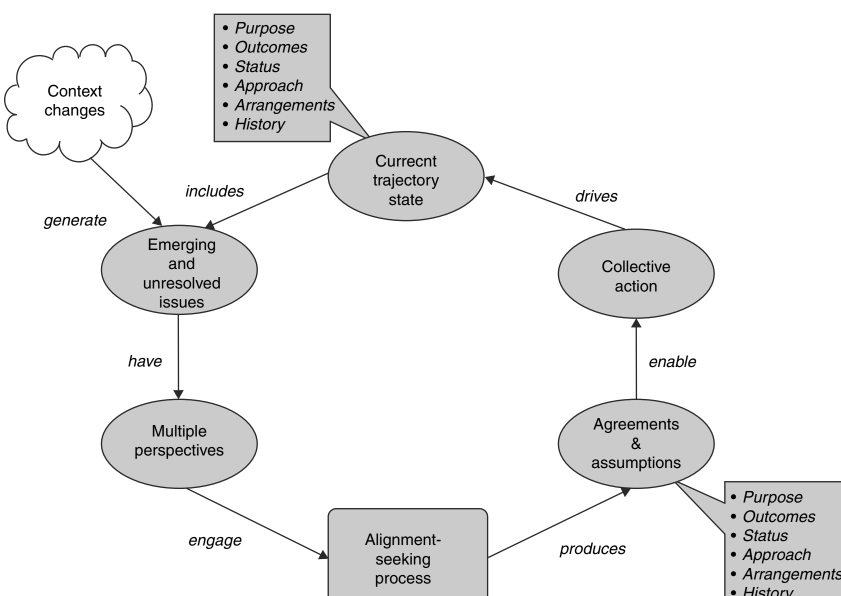

Figure 5.1 The project trajectory and the 'alignment-seeking' process

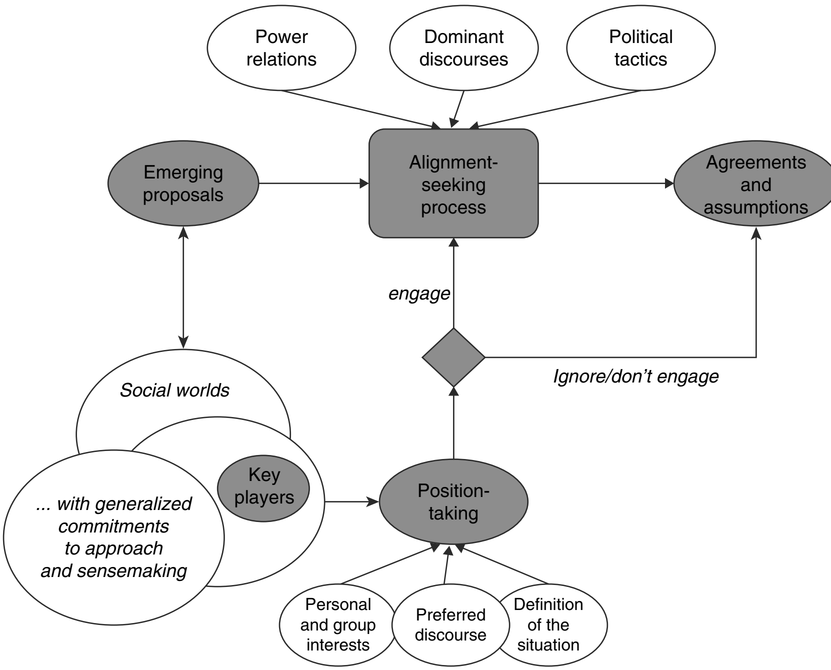

Figure 5.2 The operation of the 'alignment-seeking' process

5.8 Managing the social trajectory

If we think of projects in these terms as social trajectories, what does that suggest as a means of managing and governing them?

In this model, the key to project effectiveness is the effectiveness of the alignment-seeking process. We have already indicated that the social trajectory cannot be controlled directly by the actions of one individual (for example, the project manager or director) but that is not to say that it is not possible to improve the performance of the trajectory. Certainly, project leaders make a difference – it is an established empirical finding that project managers and sponsors who are seen as effective and committed have a positive impact on perceived success, and the extent of social and political skills to become an expert project manager are increasingly recognised (Thomas and Mengel, 2008). This reinforces the view that, from the social trajectory perspective, project management and direction are less about establishing plans-to-completion at outset and correcting deviation through objective monitoring and control processes, and more about facilitating an effective alignment-seeking process. This will help ensure that sensible plans can be agreed, and that the necessary collective actions can be taken to maintain trajectory progress towards what will be seen as a successful outcome.

It is worth making clear at this point that the social trajectory conceptualisation does not imply that there is no place for plans and control processes. Planning, monitoring and control are obviously advantageous methods, which are well tried in practice, and are typically used in a context-appropriate way by successful practitioners, who arguably already have something like a 'social trajectory' theory as a 'theory-in-use' (Argyris and Schön, 1974). The social trajectory model does suggest, however, that effective project managers and sponsors are those who have the social interaction skills – in Bourdieu's terms, a 'feel for the game' – to influence the 'alignment-seeking' process, and hence the project trajectory, 'playing the game' within the structure of organisational power relations.

We have presented the alignment seeking process as social interaction combining sensemaking and a power-influenced 'positioning' process in achieving agreement on what is so, and what should be done about it. Intervention in this process is complex, partly because much is either taken for granted (e.g., particular frames of reference, dominant discourses, what one can or cannot say), or undiscussable (e.g., personal motives, political tactics), particularly where emotional investment is high (Argyris, 1990; Edmondson and Smith, 2006). There is very little research available about the means of improving the alignment-seeking process specifically in a project context, or its impact on project outcomes. However, in terms of the social trajectory model, we can see that improving the alignment-seeking process in principle depends upon:

- *improving the sensemaking process* – establishing as much common ground as possible for sensemaking and implementing processes to rapidly identify and resolve divergent perspectives
- *improving the positioning process* – ensuring that political factors are dealt with expeditiously, explicitly acknowledging different interests, managing conflict, identifying political issues that may be blocking progress and providing clear and agreed routes to their resolution.

These two broad opportunity areas for improving the alignment-seeking process are discussed in more detail below.

Improving the sensemaking process

As far as the sensemaking aspect is concerned, Weick offers a wide and diverse range of maxims for improving the effectiveness of sensemaking. These include: the importance of action in sensemaking ('it is more important to keep going than to pause' (Weick, Sutcliffe and Obstfeld, 2005, p. 419); the benefits of improvisation and experimentation; the importance of retrospect in confirming a sense of direction; the need to construct plausible narratives in order to create sufficient meaning for action, where the sensegiving of leaders plays an important role; and the need for intense communications to help resolve ambiguity and divergent interpretations.

The three key areas from a sensemaking perspective on the improvement of the alignment-seeking process moving the trajectory forward therefore appear to be:

- The development of a shared narrative which helps project participants interpret their own activities and tasks in terms of a plausible and engaging story, where the 'sensegiving' of leaders plays an important but not totally determining role;
- Intensive and open communications, respecting the different perspectives of different parties, and recognising the importance of sensemaking to personal identity;
- Emphasis on early action and learning, recognising the sensemaking contribution of doing rather than planning, and the way in which the future can to some extent be created through 'enactment'.

(Weick, 1979; Weick, 1995)

It is interesting to see how these 'in principle' ways of improving the sensemaking aspect of the alignment-seeking process are broadly consistent with the prescriptions that have been developed for the management of complex and uncertain projects, ranging from product development projects to innovative technology implementations in situations of uncertainty (Laufer, Denker and Shenhar, 1996; Pich, Loch and Meyer, 2002). These emphasise the limits to the planning and control model, identifying the importance of prototyping and trial and error, and the need for far more flexible methods. What are referred to as 'agile' approaches have mainly been developed in response to the perceived inadequacies of traditional control-based methodologies in delivering customer value in the increasingly volatile business environment; and as an extension of 'lean' production management principles to project management in the construction industry (Ballard and Howell, 2003). More widely, they have been seen as offering an approach to managing projects in general, and even presented as offering a 'new paradigm' for project management (Koskela and Howell, 2002a). A number of these different practices have been brought together under the umbrella of the 'Agile Alliance', which has developed the 'Agile Manifesto' – embracing change, focusing on outputs and understanding rather than documentation, working iteratively, and relying on collaboration, empowered teams and communication for control (The Agile Manifesto, 2001).

There is a wide variety of different approaches under the 'agile' umbrella. Some of the more common themes are analysed below in terms of their impact on the project trajectory through improvements in the sensemaking process.

Table 5.3 Approaches to managing complex and uncertain projects

	Recommended approach	Sensemaking interpretation
1	Direction setting – establishing early with all stakeholders a shared vision and mission for the project	Provides early opportunity for development of clear shared narrative for sensemaking – a focused opportunity for 'sensegiving' from leaders.
2	Early action, prototyping, parallel rather than sequential development	Supports sensemaking through action and learning
3	Limited horizon planning	Recognises emergence through a learning process and the limits to planning; and need for continual review for retrospective sensemaking
4	Intensive and inclusive face-to-face communication	Supports collaborative sensemaking;
5	Cross-functional teams, co-located	Ensures multiplicity of relevant views and encourages collaborative sensemaking
6	Participative, empowering culture	Supports collaborative sensemaking; encourages action and improvisation.
7	Team building and motivation	Supports individuals' emotional and identity needs, and aligns them with project narrative; reinforces commitment to shared narrative.

Improving the positioning process

Quite what we might mean by improving the positioning process is perhaps more problematic. As mentioned earlier, much of the effect of power relations, personal capital maximisation and political tactics is either so taken for granted as to be invisible, or else is generally not publicly acknowledged or discussed. However, it is clear from numerous project case studies that, while power and politics are, as we have seen, part of the fabric of social interaction, political factors can play a very negative part in project progress. Our aim, therefore, should be to provide the means by which power is 'power for action' (Hardy, 1996), rather than an obstruction to the progress of the trajectory.

The mainstream rationalist approach to projects assumes that there is some objective means of resolving differences and issues. The social trajectory perspective sees this as an impossible aim, given the character of social reality, and directs our attention towards reducing the 'friction' that lack of resolution of different political positions introduces to the pace of the project trajectory. One means of doing this is to emphasise 'single point accountability', and to impose a highly directive top-down authority to close down the alignment-seeking process by executive dictat. While this has been seen as an approach to certain kinds of projects, it is of only limited application (Dunphy and Stace, 1988). There are two objections here. The first is that complex projects in (and between) modern multi-functional organisations actually require the different specialist perspectives brought from different functions, and that better solutions are thereby developed in this way. The second is that modern organisations simply do not work in this way. Power relations are far more complex – as Bourdieu says, there is always the possibility of resistance. Whatever the attractions of the all-powerful programme executive 'calling the shots', the extensive literature on 'user resistance' and 'resistance to change' is ample testimony to the limits to the top-down imposition of power in a project context. While the direction of powerful leaders clearly plays an important role in project success or failure, we nonetheless need to find means of coping with the challenges of achieving an effective alignment process between multiple parties.

The key considerations here seem to be visibility and transparency in avoiding the less productive aspects of inevitable political activity and exercise of power. Some of the relevant strategies include:

- Aligning project goals with the organisational power structures
- Ensuring explicit participation by power holders
- Clarity and visibility of accountability and commitment
- Actively surfacing and resolving difficult issues
- Developing political and conflict management skills.

These are each discussed in more detail in the paragraphs below.

Aligning project goals with the organisational power structure

If we see the positioning process as influenced by group and personal interests, then it is important that the project goals are aligned with the organisational power structures. In this way, it is more likely that personal capital can be gained by actions which drive towards the project goals, so that personal and project interests will be aligned. This is partly achieved by 'top management commitment', a recognised success factor from project practice. But it is also reinforced by the establishment of a project discourse which provides a narrative of why the project is important, and which is supported by behaviours, particularly by those more powerful. We can see that there is a strong reinforcing relationship here between the sensemaking activities discussed above of 'sensegiving', and the development of a shared narrative and establishment of aligned interests through a project discourse.

Ensuring explicit participation by power holders

Given that power relations ultimately drive resolution of the positioning process, it is important to develop processes which ensure that the relevant power relations are explicit and effective, and that positions that may prevent alignment are evident, in play, and understood by others. Again, this can be seen as applying the commonplace maxim of 'stakeholder management'. However, what is intended here is a broader idea of explicit participation of all parties who have an impact on the 'alignment-seeking' process. Such stakeholders are often not necessarily members of the project structures or closely involved in ongoing project activities, even where projects attempt to comply with advice on 'good stakeholder management'. Furthermore, the project manager may be a relatively minor player. Because project management is often seen as a technical task, early and active involvement and proper engagement of the key power holders may be very difficult in practice. It is often, for example, restricted to some kind of steering group membership, rather remote from the real project issues, or to involvement in one-off consultation exercises. However, this active engagement would seem to be crucial to an effective 'alignment-seeking process and a successful project trajectory.

Clarity and visibility of accountability and commitment

The exercise of organisational power, like any social action, is, in principle, subject to plausible justification and challenge, even though such challenge may be difficult or embarrassing within the rules of social convention, or where power relations are unbalanced. Where accountabilities and commitments are clearly and explicitly defined, and referred to in justifying actions or decisions, power structures become more visible and more widely accepted, and resolution of different positions is more easily achieved. Similarly, the process of challenge and review becomes easier and less personalised, as reference can be made to explicit public agreements. This clarity of accountability and commitment can be applied in numerous ways, ranging from project charters, to 'memoranda of understanding', even to adoption of conversational protocols (one such approach, the 'language for action' perspective, is discussed later).

Actively surfacing and resolving difficult issues

While it is important to acknowledge the difficulty of dealing frankly with issues which are politically motivated, particularly those involving the most powerful (Edmondson and Smith, 2006), in principle it seems that the 'alignment-seeking' process is likely to be more effective when issues can be revealed, situations of conflict or potential conflict identified, and arbitration processes of some kind can be deployed to resolve what can otherwise be long-running issues, preventing alignment and the progress of the project trajectory.

There are well-established techniques employed in organisational development, team development, counselling, arbitration and conflict management, which can be deployed to address these kinds of issues (Edmondson, 1999;

Roth and Senge, 1996). These techniques, some examples of which are discussed further below, aim at providing a safe environment for exploring difficult and challenging issues, and for removing unnecessary obstacles to alignment. However, while there is anecdotal evidence that such techniques are used to varying degrees in various ways on projects, they do not form part of most project management methodologies, and there is little research into the effectiveness of such approaches in a project context.

Developing political and conflict management skills

The final area to consider is that of building appropriate skills to perform effectively in a political world. Social theorists agree that the competence to handle the complexities of social reality is experience-based and tacit, a 'practical wisdom', reflecting what Giddens calls 'practical consciousness', rather than the more analytical and rational 'discursive consciousness' (Giddens, 1984). Effective social interaction in an organisational context has also been seen to require 'emotional intelligence' (Chrusciel, 2006), or 'personal mastery' (Senge, 1993) – skills that can, in fact, be learnt. The 'alignment-seeking' process seems more likely to be successful where more of those participating have developed such competence, a factor increasingly recognised in project management education (Cicmil, 2006; Thomas and Mengel, 2008). However, this competence needs to be extended more widely than simply the project manager, and should apply to other organisational leaders who play an important part in the 'alignment-seeking process'.

5.9 Key interventions in managing the project trajectory

There is a whole raft of management interventions aimed at addressing the areas identified above, both in terms of the more cognitive, sensemaking considerations, and the more political positioning process (as mentioned earlier, there is a strong relationship between these two aspects of 'alignment-seeking' that we have, for convenience, been discussing separately). Many of these interventions have their origins in the organisational development field. Particularly important is the work of Lewin, Argyris and Schein (and later Senge, with 'the learning organisation') from which have developed the 'people-centred' themes that, while they may not have been systematically incorporated within the mainstream project management discourse, can be considered as part of mainstream thinking on organisational change. These include the notions of psychological 'resistance to change', and the need for individual 'ownership', of change, and the importance of group dynamics in determining individual behaviour. To avoid psychologically based defensive routines that prevent full discussion and impede learning and effective action, organisational change experts see the need for 'process consulting', independent facilitation of groups to identify issues and help avoid unproductive conflict. These ideas, emphasising the development of organisational learning through radical cognitive and behavioural change, have been adopted into numerous change management prescriptions (e.g., Cummings and Worley, 2008), although the difficulties in practice of achieving the radical change proposed have been noted (Cameron and Green, 2004, p. 115). More recently, developments such as appreciative inquiry, large group interventions, and use of narrative and story-telling techniques have become prominent in the search for interventions that can address these 'people-oriented' aspects of change. There are, therefore, a large number of well-tried techniques and interventions, developed over the last 30–40 years, which are available to support a more effective 'alignment-seeking' process, and therefore the progress of the project trajectory (e.g., Cummings and Worley, 2008; Holman, Devane and Cady, 2007).

Many of these approaches can be seen in terms of the social trajectory model of projects as contributing to improving the 'alignment-seeking' process, through improved sensemaking or removing the obstructions to speedy resolution of the positioning process. We discuss below three types of interventions which address both of these aspects in different ways, are particularly relevant to the governance of projects, and which have been of interest to both practitioners and project researchers. These include:

- Large group interventions to support alignment-seeking
- Supporting alignment through conversations
- Top team facilitation

Large group interventions to support alignment-seeking

Large group intervention is the term used for a range of organisation development techniques designed to work with a whole system, including organisation members, suppliers, customers and other stakeholders. They are essentially structured processes for engaging large numbers of people in problem-solving, shortening decision-making cycles, and building commitment through participation. A variety of different methods have been developed (Bryson and Anderson, 2000) which emphasise particular aspects of this process, or use different techniques, but all share the basic concept of building a creative and fluid environment, in which large groups of people can bring their collective expertise and knowledge to bear on what may seem to be intractable problems.

These methods are in common use, with many organisations putting in place suitable physical spaces as 'rapid decision centres', 'innovation centres', or 'accelerated solutions environments'. As the examples below illustrate, these have been used successfully in projects, but have not been systematically incorporated into project management methodologies, or given priority in the way that the 'social trajectory' model would suggest they should.

Box 5.4

One UK government department introduced the idea of a 'Delivery Foundations Event' in the early stages of the project lifecycle. The specification for this event was defined as:

- to be held as early as possible once the project has been recognised and agreed in principle
- involving the project team, all senior sponsors and stakeholders
- scoping out high-level business case and agreeing business outcomes
- confirming resource and skill needs, and committing availability from different business functions
- sharing understanding and addressing critical issues *before moving forward*
- setting expectations for stakeholders, and gaining their commitment
- agreeing ways of working and key behaviours across the wider team
- identifying and committing to leadership behaviours
- building team motivation

This event was found to be very valuable in establishing a good start for a number of major project initiatives. However, once the main sponsors supporting its introduction moved on, the level of input required from senior stakeholders led to a decline in use. The original objective of making this event a mandatory element of the department's methodology was not achieved.

One reason for this, as illustrated in the brief case study in Box 5.4, may be the level of investment and organisation required to make such events work. They typically involve workshops and/or conferences extending over one, to as many as three days, usually demanding input from senior decision-makers and stakeholders. They require extensive planning and preparation, considerable logistical effort, and are usually supported and facilitated by skilled process consultants, who can design and manage an effective process and maintain focus. Furthermore, senior managers need to be prepared both to participate, and to accept the outcomes of these events. However, proponents of these methods point to success in reaching an agreed position very quickly, tapping participants' collective intelligence, and building commitment to politically acceptable and feasible actions (see Box 5.5). In terms of the social trajectory model, they clearly support and facilitate the 'alignment-seeking' process. They provide the forum for an intensive burst of collective sensemaking within a transparent and open process, where the political constraints are evident and where different positions can be frankly debated.

Box 5.5

> When the UK Revenue and Collection Service was planning to provide an online Corporation Tax service, it recognised that the requirements of different types of businesses were very diverse, and that the success of the service would depend on a wide range of both internal and external stakeholders. These included not only large corporations, but also accountants and professional bodies, and the software developers who produced accountancy packages for businesses. A carefully prepared three-day conference for more than 70 representatives of the different constituencies was held, which encouraged a fundamental look at both customer and third party needs, as well as the Revenue's own internal business processes. The event, held in consultant CapGemini's Accelerated Solutions Environment, was the first occasion at which all the relevant stakeholders were able to engage and explore their different perspectives. Sessions were very interactive and participative, and the level of energy and 'buzz' was very high, despite the apparently dry nature of the subject matter. What emerged as business priorities represented a significant shift from the original expectations of the project team and served as a guide for a project, which received widespread support from its users. Customer feedback was extremely positive, and relationships formed at this stage proved instrumental in ensuring an effective project trajectory over the implementation stages.

Supporting alignment through conversations

We have seen that the collective sensemaking and positioning that constitute the alignment-seeking process are essentially discursive activities, an ongoing series of conversations – which perhaps explains why 'good communications' is such an important part of the prescriptive advice on effective project management. Indeed, some organisational researchers have understood organisational change in terms of shifts in conversations, and the creation of new kinds of conversations (Ford and Ford, 1995).

In terms of the social trajectory model, ensuring that conversations take place effectively, without ambiguity or misunderstanding, will make a significant contribution to facilitating an effective alignment-seeking process. Organisation development consultants will often focus on the way language is used, and the way in which conversations take place between organisational members, when seeking to improve the performance of groups and to reduce the adoption of defensive routines (Argyris, 1990). This concern has been the focus of the 'language for action' perspective, originally developed by Winograd and Flores in the context of computer-supported co-operative work (Winograd and Flores, 1987), but subsequently applied, particularly by Ford and Ford (1995, 2003), to the management of organisational action.

Drawing on speech act theory, they identify different categories of conversations which have different purposes and follow different natural sequences. Managing change effectively means being clear about the nature of these different conversations, recognising the relationship between them and their natural dynamic, and avoiding 'breakdowns' in that flow. Building on the work of Winograd and Flores (1987), they identify the necessary steps in conversations which ensure that they are effective and directed towards action – that misunderstandings and ambiguity are removed about what the next step for each party to the conversation is. Of particular interest is the 'conversation for action' in which one party (A) makes a request to another (B). The request is interpreted by each party as having certain 'conditions of satisfaction', which characterise a future course of action by B. After the initial utterance (the request), B can accept (and thereby commit to satisfy the conditions); decline (and thereby end the conversation); or counter-offer with alternative conditions. Each of these in turn has its possible continuations (e.g., after a counter-offer, A can accept, cancel the request, or counter-offer back). Table 5.4 below illustrates the range of ways in which the 'conversation for action' can take place.

This analysis of the structure of conversations has been used to set protocols for the conduct of effective conversations, and, in particular, to build collective skills in 'conversations for action'. This approach has been adopted as an organisational development tool by numerous consultancies to improve organisational effectiveness, particularly around the management of change (Ford and Ford, 2005).

This is only one example of many approaches aimed at clarifying the underlying communication processes supporting the alignment-seeking process. The 'language for action' approach is particularly interesting in its focus on clarifying expectations, accountabilities and commitments between the parties in the process; as such, one could expect it to increase the effectiveness of the alignment-seeking process, and hence, the progress of the project trajectory, as with the brief example below. However, as with the use of large

Table 5.4 The structure of conversations for action (based on Winograd and Flores, 1987)

Initiator	**Responder**	**Completion**
Request (invite) (demand)	Accept (promise) Counter offer Decline Promise to promise	Thank you Cancelled
Promise	Accept Decline	Fulfilled Revoked
Offer	Accept Decline	Fulfilled Withdrew

Box 5.6

> When a major financial services organisation decided to set up a telephone and internet bank to a very challenging deadline, they appointed an experienced Chief Executive with a successful track record of business start-ups. In his previous projects, he had made repeated use of consultants employing a version of the 'language for action' perspective. The new bank executive team were all trained in the conversational protocol, which gradually became the accepted way of making and responding to requests, leading to far greater clarity and pace in management discussions about project issues and options. In conjunction with this, each team member developed a publicly-shared personal statement of their individual and functional accountability to the group, and where they stood personally in their view of the project and what they were trying to achieve. The team were coached and facilitated by experts in the technique, who would often cut through a discussion of an issue with the observation: 'yes, but what is your request of the group/that individual?' This simple technique encouraged a focus on achieving collective action, while recognising the validity of different positions based both on functional responsibility as well as personal values and motives. Where the team could not make or meet the requests from an individual in a way that that individual felt was necessary to meet their accountability, they could declare a 'breakdown'. This triggered an immediate facilitated workshop to analyse all aspects of the breakdown with the whole team, to identify the different interpretations of the different executives, and to develop a shared view of the actions necessary for 'breakdown to breakthrough'. This was a sometimes brutally frank analysis, though conducted within the conversational protocols, a gradually growing atmosphere of trust and mutual respect, and with explicit reference to commitments and accountabilities in such a way as to minimise unproductive conflict. In the author's experience, this allowed the achievement of an extraordinarily high pace of highly complex project delivery, meaning that the very challenging deadlines were achieved and the new bank launched on time.

scale interventions described in the previous section, there has been little systematic research of this kind of communications intervention on project outcomes, although as the example below illustrates, there is evidence of its use in practice in a project context (see Box 5.6). For example, Scherr (2005) reports impressive results in his practice of rigorous management of conversations for commitment and action in improving project delivery performance.

Top team facilitation

Within normal project governance structures, it is in some kind of top management team that the alignment-seeking process driving the project trajectory comes into sharpest focus. Here the views of different functions will be represented by senior representatives, and collective sensemaking will require alignment of the different 'world views' of powerful organisational players, who will often have important personal stakes in the outcomes. If issues reach this level, it is likely that resolution at lower levels has failed because of strategic differences. Research into top management teams (TMTs) demonstrates that TMTs face the greatest challenges of all kinds of work teams, both in the strategic, ambiguous and unstructured nature of the problems they face, and also in managing the diversity of personal interests of powerful players (Edmondson, Roberto and Watkins, 2003). In line with the political character of group decision-making discussed earlier, studies of TMTs show that 'decision-making in these groups often resembles multiparty, mixed motive negotiations rather than collaborative problem solving processes' (Edmondson et al., p. 302). We can perhaps most clearly see here the processes of sensemaking and political positioning operating together in the search for coordinated collective action.

Team effectiveness research has considered this issue in terms of managing the tension between the creativity for better, more innovative group decisions that diversity of different perspectives and expertise seems to offer, and the potential for conflict. Conflict in teams is not necessarily unproductive, with researchers distinguishing between generally productive 'task' conflict from generally unproductive 'relationship' conflict (Amason, 1996). However, separating these two is not always possible, and relationship conflict is a particular issue in top teams, where differences in the view of the task are likely to be characterised by deeply held differences in 'world view', where there may be little objective data to rely on, and where the personal stakes are high – what Edmondson and Smith (2006) refer to as 'hot' topics. In these cases, people will hesitate between the choice of remaining silent – where issues become 'undiscussable' (Argyris, 1990), and where political manoeuvering is likely to be more evident – or else risking unproductive emotionally charged discussions. Research into TMTs and teams in general seems to indicate that diversity is commonly associated with low collective action, although this is seen to be largely a result of the way in which the social process is managed. The benefits of diversity seem only to be gained when there is 'openness, collaborative participation and freedom to express doubts within a team' (Jarzabkowski and Searle, 2004, p. 409).

Jarzabowski and Searle (2004, p. 407) see effective top management teams as those able to balance the problem-solving benefits of diversity with the need to act collectively. Effective TMTs, they say, are those where 'it is possible to have productive disagreement and task conflict without the team dynamic deteriorating into social conflict' (p. 409). Such conflict is what, in terms of the social trajectory model, prevents the alignment necessary for coordinated collective action.

There are numerous prescriptions for achieving this productive balance, developed from practice and research, which echo much of the discussion earlier about 'in principle' means of facilitating the alignment-seeking process. They share a commitment to the value of independent coaching and facilitation for effective open communication, and, indeed, a conviction that TMTs can build their skills in this area. Edmondson and Smith point to the benefits of improving self-awareness through feedback and reflection; of 'managing conversations' by exploring different beliefs and the logic behind them, and acknowledging emotional investment and conflict where it has occurred; and 'managing relationships', spending the time to build trust and an understanding of differences. Jarzabowski and Searle itemise a number of other actions and processes which seek the same effect, for example, the development of shared and explicit 'super-ordinate' goals, creation of team behaviour norms, recognition of and respect for diversity, and the legitimisation of 'healthy' task-focused debate.

This kind of leadership team support and development is commonplace within organisations (see Box 5.7). However, as with the large group interventions and language for action approach discussed above, there is very little systematic application of this support for the multi-stakeholder senior teams which are such an important component of the governance of complex projects.

Box 5.7

A UK public body initiated a major business change programme, affecting almost all aspects of business operations. The radical changes proposed threatened existing positions of senior managers, some of whom saw that their autonomy and hierarchical power would be undermined by new flexible working arrangements. A Programme Delivery Board of directors from the affected functions of the business was set up to manage the change programme, under the oversight of the main Board. An independent team coach was engaged to help the new Delivery Board in working through the difficult issues associated with the business change. The coach observed the process of meetings, and gave feedback, drawing attention to areas where issues had not been properly addressed or concluded, and helping the group reflect on its performance. Private one-to-one interviews were conducted periodically to identify group issues that individuals were finding difficult to discuss, and which were then presented to the group where appropriate. The Delivery Board, in the view of the Programme Director, rapidly became highly effective, raising concerns in the main Board about their own governance of the project. To address and resolve this unproductive conflict, which had resulted in delays on several strategic decisions, joint facilitated meetings were then held to discuss this tension openly, and for each group to express their expectations of working together.

5.10 Implications for project governance

We saw at the outset of this chapter how our models of project governance rely heavily on assumptions about the nature of projects and the way in which organisations make decisions. Of particular importance were: seeing projects as following a predictable trajectory through a sequential staged life-cycle, where senior managers can exercise top-down control at stage boundaries; and treating project decisions as if they are made on purely rational grounds, reached through objective consensus between different stakeholders. Reviewing the research into organisational decision-making, and projects and organisational change in general, we can see that these assumptions, while they may have normative appeal, are not well supported by empirical research into the actual practice of projects in organisations. This chapter presents a 'project practice' extension of the current systems conceptualisation of projects to see them as social trajectories. Project outcomes are seen as driven by the social interaction processes of sensemaking and political positioning, which seek alignment of different perspectives and interests, in order to achieve coordinated collective action. This conceptualisation affords a view of projects as unpredictable, emergent, and highly context-sensitive, and reflects the observed character of organisational decision-making in practice. The social trajectory conceptualisation draws attention to the social factors which have been recognised as important to project success, but which have not hitherto been systematically incorporated into mainstream project management theory. It forms the theoretical basis for discussion of a range of management interventions, offering the potential for improving the effective progress of the project trajectory. Most of these interventions for facilitating alignment have already been tried and tested in the organisational development field, but have not been systematically incorporated into project management and governance approaches; three particularly relevant types of intervention have been described above. There is a need for further empirical research to understand the impact of such interventions at key stages of the social trajectory on project outcomes. There is considerable scope for exploring a range of management interventions to understand how, and in what circumstances, they can improve the 'alignment-seeking' process, providing practicing managers with a broader understanding and more effective toolkit to smooth the progress of the project trajectory.

The social trajectory conceptualisation of projects has clear implications for project governance. From a senior management perspective, there are three key areas to consider:

- Expectations of emergence and change, particularly of initial estimates and plans

- Creating a project delivery culture oriented towards alignment, through facilitation of sensemaking and resolution of the positioning process
- Active engagement throughout the project trajectory, but particularly at the outset.

Expectations of emergence and change

Conceptualising projects (particularly business change projects) as social trajectories pushes us to think differently about them. They might be imagined as exploratory collaborative 'journeys', with as clear a sense of purpose and direction as possible, but with perhaps only a broad initial specification of the final destination; where goals and plans are continually refined as more is learned about what is required and how to achieve it; where uncertainty is expected, and the management task is essentially to steer the project towards a broadly acceptable outcome. This is counter to the dominant 'best practice' discourse about projects, which seeks to eliminate uncertainty and emphasises control, but consistent with approaches to complexity, which seek to accept uncertainty and live with its consequences (De Meyer, Loch and Rich, 2002; Pich, Loch and Meyer, 2002).

The social trajectory theoretical formulation suggests a different response to notions of project success and failure than the claims of 'best practice' project management actually provoke. The inherent unpredictability of the social interaction process in a particular context means that business change project trajectories may diverge from what is, in effect, an initial 'best guess' as to outcomes. Perhaps the dominant narrative of repeated project failure reflects too simplistic a view of the complexity of real project trajectories, and the limited extent to which (like many social trajectories) their path can actually be precisely controlled. In their expectations of governing projects for success, senior sponsors need to recognise this characteristic, and be ready to accept its implications of flexibility, continual review, and rapid response to changed circumstances.

Creating a project delivery culture

A key governance task is seen as ensuring that the rules and processes are in place for effective project management and control. The social trajectory conceptualisation demands an extension to that conventional management infrastructure which recognises the central importance of alignment-seeking to the effective progress of the project trajectory. The earlier discussion has illustrated some of the processes and behaviours which encourage collaborative sensemaking, and which facilitate greater transparency in the handling of the political interaction which is an inherent characteristic of social endeavour. Some of this involves specific processes, such as the large group intervention event that we have seen some organisations introduce at key points in projects, or team coaching and development. Just as important is the development of a set of values and behavioural norms (e.g., a preference for action and learning, a commitment to honest reporting of status, respect for different perspectives, trust, and so on). This is best described as development of a 'culture' which is supportive of project delivery (Atkinson, Crawford and Ward, 2006; Schein 1993) – and as much of the experience of culture change suggests, organisational leaders play a key role in introducing such a culture (Schein, 2004).

Active engagement

As the project practice mantra of needing to gain 'top management support' suggests, senior organisational stakeholders therefore have a key role in creating the circumstances to facilitate alignment and the progress of the project trajectory. Conceptualising projects as social trajectories provides a means of understanding what 'top management support' means and how it might best be achieved. In addition to an enabling and facilitating role, as powerful players they also make a significant direct contribution to the conduct of the alignment-seeking process, and thereby to the direction, pace and ultimately perceived success of the project trajectory. We have seen the importance of the top management team as a focus for achievement of alignment, through aligning different interpretations, providing 'sensegiving', and resolving what may be challenging issues of different political interest. We have also seen that large group interventions, which can make a powerful contribution to alignment, require not only the support of senior management, but their active participation if they are to be effective. Obstacles to alignment, even if political in nature, need to be explicitly engaged with – they will in any case appear at some stage. This is particularly important at the outset of the project, where direction-setting and sensegiving is extremely important, as is establishing the ground rules for discussion and resolution of issues (see the example of the 'Delivery Foundations Event' described earlier). This level of active engagement is not easy to achieve. It is often difficult in practice to get sufficient time commitment from senior executives in project sponsor, or project board roles to play the part that the social trajectory model strongly suggests that they should.

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6

Fading Glory? Decision-Making around the Project – How and Why 'Glory' Projects Fail

Svetlana Cicmil and Derek Braddon

6.1 Introduction and positioning

In this chapter we wish to focus on the practice of governing relationships, collaboration and decision-making around the project, where 'project' is understood as a label for a complex process through which participants jointly accomplish a sophisticated cooperative task, declared or approved as worthwhile, or strategically important. We are primarily concerned with large-scale multi-party projects which are linked to significant investment decisions, as these are inevitably in the public eye and exposed to general scrutiny (Trapenberg-Frick, 2008). These projects are surrounded by an aura of glory through the rhetoric used to describe them – a narrated promise of extreme prosperity.[1] They are often born out of vanity or human ambition (Rehn, 2006), and associated with engineering, scientific or managerial achievements. Promised, declared and expected benefits of these projects relate to a large number of people and their livelihoods, so it is hard to question them (Trapenberg-Frick, 2008), but their work processes and development (neither always visible nor reported) often adversely impact on an equally large number of people and their livelihoods. They are costly – and often under-estimated (Flyvbjerg, Bruzelius and Rothengatter, 2003), and controversial socially, environmentally or politically. Moreover, the aura of glory is likely to create and perpetuate a specific decision-making *rationality* with 'a political dimension that can capture the imagination of political leaders and the public' (Trapenberg-Frick, 2008, pp. 242–3).

Such is the scale and risk associated with these large-scale glory projects that today they can only be undertaken by coalitions of firms, working together on a temporary basis, and drawing upon vast financial, human and technical resources, frequently requiring the involvement of government. This makes for a very complex, and sometimes unclear managerial structure for governing project decision-making and control, where project *ownership* and *accountability* become clouded by the different agendas of individual members of the project *coalition*, and the degree to which they genuinely have *shared goals* (March, 1989). The majority would agree with the statement that the core purpose of project governance is to evaluate and shape the development of the project throughout its life cycle in such a way that its outcomes remain safe, strategically aligned and beneficial to the stakeholders, as agreed at the time of approval (Miller and Lessard, 2008; Priemus, Flyvbjerg and van Wee, 2008). A good governance system is expected to contribute to making clear project goals, accountabilities and performance measurements (Hart, 1995; Samset, 2008). However, reports on the spectacular abandonment and failures of major extolled projects in the public domain are abundant globally (Ford, 2011; Lewis, 2011a, 2011b; Sheridan, 2011). The business pages of daily newspapers continually illustrate the widespread misgoverning of collaboration, evaluation and risk appraisal that has had significant, undesired or catastrophic consequences for specific groups of project stakeholders, whose interests were always supposed to be protected by the project governance process.

How such major projects, with a need for extensive intra-coalition collaboration, are governed becomes a key issue, and draws into the spotlight relational characteristics of a project coalition, such as the exercise of market power and political declaratory powers, accountability and transparency in decision-making and contract enforcement, opportunistic behaviour and intra-coalition trust. It has been acknowledged that structural interventions (modifications in contractual forms) alone are insufficient in dealing with the inherent paradox and complexity of multi-organisational projects (Cicmil and Marshall, 2005; Clegg, Pitsis, Rura-Polley and Marossheky, 2002).

It is not surprising, therefore, that the governance of projects has been a popular and widely researched topic. Some excellent insights into, and debates about theory and practice of the governance and decision-making around mega projects have been published in recent years, including the work of Flyvbjerg, Bruzelius and Rothengatter (2003), Klakegg, Williams and Magnussen (2009), and the collections by Priemus, Flyvbjerg and van Wee (2008), Hodgson and Cicmil (2006), and Pryke and Smyth (2006), to list only a few. This chapter builds further on these ideas and propositions about the problems with governing the risk appraisal and approval of mega projects and collaborative behaviour of participants, where both project governance and the project itself are seen as an interconnected social arrangement – a web of complex relationships among stakeholders. The aim is to advance the extant understanding of governance failures, by combining pragmatic theoretical conceptualisations with concrete empirical analyses in order to identify and address, in ways that matter, problems that are important for the affected individuals and communities, according to Flyvbjerg's (2001) redefinition of the purpose of social organisational research. Our theoretical repertoire spans ideas from complexity thinking, political economy and social organisational theory. As our focus is on the issue of values and power in context, we build our argument on the case of a glory project: the UK's

National Health Service 'National Programme for Information Technology' (NPfIT) and, in particular, the implementation of the Lorenzo medical care records computer system, having reconstructed it entirely from publicly available reports. Ultimately, the alarming implications of the abandoned project for a range of project stakeholders justify this focus.

Information technology implementation projects

Information Technology/Information Systems (IT/IS) projects have been a topic of intensive research and scrutiny globally since the early 1980s (Thomsett, 1980), because of general dissatisfaction with their performance (Cadle and Yeates, 2001). For example, McManus and Wood-Harper (2008) examined project abandonment and failure, focusing on 214 new information systems projects launched across the European Union (EU) during the period 1998 to 2005. Critically, only one in eight information technology projects launched in this period can be considered truly successful. Yet, despite such a high failure rate, huge sums continue to be invested in information systems projects, which are eventually written off. Across Europe in 2004, for example, the cost of IT systems project failure amounted to some €142 billion. This study has highlighted governance issues behind the failures relating to: the choice of contract, insufficient risk management, lack of management judgement, poor communication between stakeholders, poor contract management and poor delegation and decision-making (political agenda, lack of transparency in risk appraisal). McManus and Wood-Harper (2008) provided detailed insights into the potential causes behind IT project failure, and confirmed why a cautious approach should always be taken to promises attached to new IT software development, in whichever sector it may apply. Their evidence suggests that key aspects of a project (such as leadership, stakeholder and risk management issues) are not factored into projects early on, in many instances cannot formally be written down for political reasons and are rarely discussed openly at project board or steering group meetings, although they may be discussed at length behind closed doors. A considerable proportion of delivery effort results in systems that do not meet user expectations and are subsequently cancelled.

Turner and Cochrane (1993) insist on understanding the specific nature of unpredictability, risk and project management challenges associated with projects which are conceived to enable implementation of IT/IS and other sophisticated or novel technology. Particular issues are: the intangibility of both predicted outcomes and indicators of project progress; the unpredictability of technological innovation (fast changes over time) and its impact on people in the given context; and the resulting difficulties with agreeing on requirement specification early in the project life cycle. Acknowledging such uncertainties, according to Turner and Cochrane, is crucial for designing and establishing the systems of governance, risk appraisal and control of IT/IS projects – which is essentially relational, assuming trustworthiness and openness of the experts involved, their commitment to the wider project benefits, transparency in configuration development and changes, and care for the ultimate user.

In exploring the question of why organisations 'embark on questionable ventures and then persist with them well beyond an economically defensible point' (Drummond, 1999, p. 11), escalation is defined as irrational persistence in response to such predicaments, a situation in which costs are being incurred, negative feedback received, where there is an opportunity to withdraw or to persist, but the consequences of withdrawal or persistence are uncertain (Ross and Staw, 1986). The interplay of social and structural pressures, as well as psychological and project-related factors, is shown to be behind escalation of commitments, where decision-makers inherit a previously unsuccessful and long-established decision (as distinct from involvement in an *ad hoc* venture).

Conceptualising complexity, accountability and project governance

> The formation and operation of projects essentially relies on a societal infrastructure which is built on and around networks, localities, institutions and firms.
>
> (Grabher, 2002, p. 211)

Cicmil and Marshall (2005) offer a view on project governance as a form of collective engagement in project work, where agency and structure are interrelated, simultaneously constructing and reproducing one another over time. The authors claim that governance frameworks with regulatory intentions are not, in practice, enacted in a linear manner. As the project unfolds, as new goals are formulated and as new knowledge is created to achieve these goals, influence spontaneously arises in webs of power relationships within the project, as people interact intensively in order to create meaningful forms of activity that move things on. According to Cicmil and Marshall (2005), project artefacts, both rhetorical and technological, varying professional expertise and other forms of micro-diversity, simultaneously define, reproduce and change over time the identities of project participants and their power relations, obligations and expectations in an unpredictable manner. As a result, the governance of complex projects often evolves into a process of reconciliation of conflicting feelings of anxiety, scepticism, moral duty and contractual commitment. On the ground, it also always involves regulating and mediating human action through laws, procedures and institutions.

Cicmil and Marshall (2005) conducted an in-depth study of the impact of innovative contractual forms on team integration and performance of construction projects through the theoretical lens of complex responsive processes of relating (Stacey, 2001; 2003). They identified three interrelated and ever present aspects of projects that present challenges to project governance, and argued that governance processes must explicitly acknowledge and address such complexity in order to fulfil their governing aim effectively. These aspects are[2]:

- The ever present complex dynamics of interaction and power relationships among diverse project actors, making the problem of agency (behaviour of organisational actors/project members) and structure (the boundary of project organisation) inseparable over time, and interfering with the processes of control and evaluation of work;
- Ambiguity and equivocality of strategic expectations, project outcomes and project performance criteria among the members of the project coalition, making the notion of shared project goals problematic in practice;
- The consequence of time flux, that is inevitable changes over time within the contexts in which the project and its stakeholders are situated, combined with the specification changes, unpredictability of the outcomes and the resulting anxiety about facing the 'unknown' – makes project plans an unreliable reflection of the actuality of the project, and makes traditional approaches to risk management and project control paradoxical.

Mirroring broader definitions of governance (Monks and Minow, 1995), we find it helpful to understand project governance as the relationship between various parties in determining the direction and performance of projects over time, and, as Miller and Lessard (2008, p. 169) point out, 'a set of decision-making processes and methods for accumulating of knowledge [*sic*] to ensure that creativity and discipline are brought to bear'. The creation of relationships that allow a project to be reconstituted and to proceed, even after major changes in project drivers and the resulting payoffs to the various parties involved, is essentially about risk sharing and accountability (Miller and Lessard, 2008; Flyvbjerg et al., 2003). This makes the assertion by Hugo Priemus and his colleagues critically important for our analysis:

> Successful projects are not selected but shaped. Successful sponsors appear to start with project ideas that have the potential to become viable. These sponsors then embark on shaping efforts to influence risk drivers ranging from project-related issues to broader governance. The seeds of success or failure of individual projects are thus planted early and nurtured over the course of the shaping period as the choices are made. Risk is inherently linked to the choices made and moral responsibility for the action taken.
>
> (Priemus et al., 2008, p. 5)

Collaboration, transparency and commitment in an IT/IS mega-project coalition

> Contracts will always support a greater or lesser degree of interpretative flexibility, and this becomes particularly relevant at times of commercial

> conflict when different parties attempt to lay claim to contractual legitimacy by presenting their interpretation as a 'true' meaning.
>
> (Clegg, Pitsis, Marossheky and Rura-Polley, 2006, p. 223)

Trapenberg-Frick (2008) argues that the technological sublime[3] plays an instrumental role in the decision-making processes within project governance. It has the potential to fuel creative design, engineering and public involvement, and also optimism (bias) about 'the ability of design and engineering to overcome the technical complexities associated with implementing large-scale projects' (Trapenberg-Frick, 2008, p. 259) that often lead to time and cost escalation.

Drummond (1994; 1999) scrutinised a number of risky initiatives, including a major IT/IS project implementation disaster (the London Stock Exchange's Taurus initiative). In similar fashion to Trapenberg-Frick (2008) and Flyvbjerg (1998, 2003), she warned that the early stages of such risky initiatives, when they are declared and approved as projects, are crucial, because the decisions taken at that point become increasingly difficult to reverse as time goes by. Through the resulting 'means/ends reversal', the project becomes an end in itself, compounded by the difficulty of rational examination of interim outcomes, progress and risks, and decision-makers being so obsessed by the original commitment that they make sub-optimal choices as a result. Drummond illuminates the ethical, social and psychological aspects of such escalation, noting 'the imbalance between the power and responsibility' (1999, p. 14). According to Flyvbjerg 'The consequence is a Machiavellian make-believe world of misrepresentation' which makes it extremely difficult to decide which projects deserve support and which do not – not quite a risk management practice we would wish to see (2008, p. 137).

An important insight from Drummond, exploring the Taurus project, is the escalatory spiral of decisions around risky ventures 'whereby one sub-optimal decision forces another until the resultant "stuck up" becomes catastrophic' (Drummond, 1999, p. 15), illuminating a paradox of attempting to control IT/IS implementation in a linear manner. In effect, Drummond exposed the limitations of conventional axioms of large-scale IT/IS project governance to account for and address the impact of preoccupation with assumed possibilities of powerful technology on the decision-makers' rationality. Very little thought tends to be given to a wider notion of project complexity, as discussed earlier, which explicitly acknowledges non-linearity, flux, paradox and unpredictability. Accountability for potential risk escalation and failure, and moral responsibility for choices and their consequences are rarely made explicit.

The interplay of the technological sublime and radical unpredictability of IT/IS development and implementation makes the governance of major IT/IS projects exceptionally challenging. This complexity, highlighted in Turner and Cochrane's (1993) argument and conceptualised as the three interrelated aspects (Cicmil and Marshal, 2005), is inherent in projects conceived upon IT/IS implementations, and should never be overlooked in the process of their governance. Their intangible outcomes cannot be specified nor, for that matter, committed to in advance without a proper collaborative (rather than opportunistic) approach to risk sharing. Non-linear iterative change management processes and psychosocial aspects (escalation, conspiracy of optimism, the technological sublime and power and politics surrounding them) require a strong focus on relational dynamics, ethics of collaboration and accountability of decision-makers for choices made.

What would it mean to effectively govern temporary multi-party project coalitions that are formed to accomplish the project work and deliver the expected benefits amid conflict, sublime-bounded rationality and uncertainty? Opportunistic behaviour (Ive and Rintala, 2006) in project coalitions results from information, power and knowledge asymmetry. This asymmetry creates and is simultaneously created by radical unpredictability, emergence and evolution (incompleteness of plans) as well as by fragmentation of project work (specialisation). Cooperative intentions of the project parties and their ability to perform as expected are affected by multiple agendas, different interpretations of contract and key performance indicators, and by power and politics in executing project control. With a fertile soil for opportunistic behaviour already in place, the key governance challenge of glory IT/IS projects becomes the complex organisation of inter-organisational collaboration, through contracts and informal social mechanisms to curb opportunism, to facilitate accomplishment of the required project work and to involve key stakeholders in evaluating project progress, while protecting their interests where necessary.

The notions of long-term unpredictability and micro diversity run counter to the conventional notion of 'ordering' (attempting to regulate patterns of behaviour through structural interventions) in the pursuit of project goals, successful project completion and an improved planning process which programmes, in advance, the unfolding of project work. From this point of view, it is necessary to rethink the possibility of predetermined success criteria for a project, the controllability of the interconnected project activities to achieve the desired end in advance of them happening, and the kind of governance mechanisms (contracts) promoted as effective guardians of diverse stakeholder interests, planned action and risk strategies.

Miller and Lessard (2008) argue for an alternative type of project governance that relies on partnerships, cooperation, or relational contracts, rather than rigid specification-based traditional competitive tendering, as more adequate for the high level of unpredictability and dynamics inherent in the planning, development and execution of complex projects. Van Marrewijk, Clegg and Pitsis (2008) and Clegg et al. (2002) discuss technologies, methodologies and contractual arrangements for governing projects with multiple parties and stakeholders that have been developed, introduced and promoted. This would include a number of alternative arrangements, such as the Private Finance Initiative (PFI), Private-Public Partnerships (PPP), Build Own Operate Transfer (BOOT) alliances, and focusing on risk sharing to curb the opportunism of lowest cost tender so that the risk is allocated to the party best able to manage it, building in a strong incentive for managing risk at the lowest cost and gaining rewards through such management.

Pragmatically, contracts have a threefold function, to enable:

- **Work transfer** (to define the work that one party will do for the other)
- **Risk transfer** (to define how the risk inherent in doing the work will be allocated between the parties)
- **Motive transfer** (to implant motives in the contractor that match those of the client; to minimise opportunistic behaviour by offering incentives for collaborative behaviour).

However, the contractual framework, as a codified set of rights and responsibilities regulating collaboration can never capture, in advance of them happening, all the various situations that will occur over time, nor provide instructions for what should be done. Therefore it leaves some scope for interpretation and discretion, which often results in a fight among the parties concerned over the 'true' meaning of a certain clause.

It is widely believed that effective governing of a complex project can ultimately be achieved through building a collaborative commitment and transparency into the moral fibre of a project. Informal social mechanisms can facilitate socialisation of project monitoring, control and commitment, by enabling the participants to negotiate between themselves common rationality necessary for collaborative action, on the basis of reputation, history of relationships, future opportunities and current formal contractual clauses. This common ground, fragile and in constant flux, yet able to stabilise collaboration at a practical level, encapsulates the notion of trust, defined as mutual understanding 'taken to signify and represent a co-ordinating mechanism based on shared moral values and norms supporting collective co-operation and collaboration within uncertain environments' (Knights, Noble, Vurdubakis and Willmott, 2001, p. 313).

Clegg et al. (2002; 2006) argue that unless an exclusive culture of 'collaborative envisaging of the future' is established and so maintained 'by design' (a mixture of a partnering oriented contractual strategy and specific 'culture controlling' mechanisms) for the project as an independent entity, it will evolve into a time-bomb, an arena for continuous competitive renegotiation of the micro-diversity, and subcultures and fights for dominance. Therefore, a significant challenge for project governance is the structure/agency problem of prioritisation and focus between the social and the technological, that is, how the project contracts are distributed (structure), and how human interaction (agency) develops as a consequence of the organising process within the project coalition. It is not unusual in some economic/political contexts that a parasitic chain of several companies (from local government downwards) can evolve, receiving a 'rent' based purely on their connections, and doing practically no project work at all. 'By the time the first shovel of cement enters the mixer, the actual budget that remains allows for only the cheapest labour and often inferior materials' (Lewis, 2011b, p. 17).

Drummond (1994) notes that structural and contractual influences on governing project collaboration are particularly pronounced when involvement in the project spreads, via sub-contracting in the procurement process, and responsibility for the initial decision becomes detached from individuals. Commitments made often become sunk costs, while political pressures from outside investors or trade unions often emerge for reasons other than financial performance.

An analytical framework

Our review of, and deliberations about, relevant theoretical concepts strongly implies that the creation of relationships that allow a project to be reconstituted and to proceed – even after major changes in project drivers and the resulting payoffs to the various parties involved – is essentially about risk sharing and accountability (Miller and Lessard, 2008; Flyvbjerg et al., 2003). This has informed our analytical framework for studying the apparent mis-governance of a recent, ambitious software development and implementation initiative in the UK public sector, the NPfIT, shedding new light on the behavioural and structural influences on decision-making which brought this project to its (publically declared) collapse and demise. In summary, we are particularly interested in examining two phenomena:

- The interplay between the publically exalted nature of the original grand idea and the rationality and accountability behind subsequent project approval and risk appraisal decisions;
- Processes put in place to organise project collaboration, control its dynamics, and ultimately prevent opportunistic tendencies and morally unacceptable behaviour of the key project participants, typical of this kind of project.

6.2 Misfortunes of Lorenzo – The NHS IT project

In this section we outline the key features of the Lorenzo project, one of two main computer systems (the other being Cerner's Millennium system) that form key constitutive elements of the £11.4 billion NHS National Programme for IT. The Lorenzo case has been specifically reconstructed for the purpose of this chapter from information in the public domain, and will provide an empirical background for our analysis and conceptual deliberations in Section 3 of this chapter.

Lorenzo is a software system, designed and developed originally by the UK firm, iSOFT, but now owned through takeover by the Virginia-based US multinational, Computer Sciences Corporation (CSC). The original plan was to provide every NHS patient with his or her own electronic care record, which could then be made available by computer link to different parts of the NHS, so that medical staff could access accurate, up to date records on demand and whenever required. The estimated overall cost was expected to be in the region of £7 billion.

What began in 2002 as an admirable objective has, a decade later, turned into a major project disaster. A huge amount of public money has been spent on the new care records system, despite the fact that the project has been riddled with major system delivery delays and massive cost over-runs almost since its inception. Finally, in September 2011, the government effectively abandoned the National Health Service Programme for IT and its central project, Lorenzo. According to the Independent newspaper, this major IT project was

> meant to revolutionise the way the Health Service worked. But far from heralding in a new age of efficiency, the National Programme for IT is now widely perceived as the greatest government IT white elephant in history. As well as the huge costs involved, suppliers have walked away, projects are running years behind schedule, while medical professionals have complained that they were never consulted on what they wanted the new system to achieve.
>
> (Laurence, 2010)

The initial stage: Contracts and risk assessment

Ministers clearly recognised at the launch of the Lorenzo project that it was a highly risky venture as, at that stage, the suppliers did not actually have a tried and tested product to deliver. However, risk assessments had clearly been carried out by the Department of Health. As *The Times* reported in 2011:

> The risks of failure attached to the £11bn scheme to create a national patient database were concealed from MPs and the public. According to a leaked document seen by *The Times*, civil servants estimated at the start of the project that there was a one-in-three chance that software would be delivered late.
>
> (Kennedy, Pitel and Homann, 2011)

How far these risk assessments and their implications for the NHS were ever actually discussed fully with Ministers at the time remains unclear, since the same newspaper also reported that:

> In a surprising admission which raises questions about the level of scrutiny of the IT fiasco, the Department of Health said last night: 'we understand that this risk assessment was not shared with Ministers'.
>
> (Pitel, Smyth and Kennedy, 2011)

This document, leaked to *The Times* and dating apparently from 2008, contained a risk assessment under which a project score of 41 or above would indicate high levels of risk. As *The Times* noted late in 2011:

> The implementation of NHS computerisation was wildly out of the safe zone with a score of 56. In a remarkable omission, officials failed to include any figure for the cost of cancelling the programme when assessing the risks of termination.
>
> (Pitel, Smyth and Kennedy, 2011)

Contracts for the NPfIT project, when launched in 2002, were only offered to a few, very large computer companies, despite the fact that IBM, the world's largest software consulting group, had considered it too extensive and complex a project to contemplate. Presumably this strategy appeared sensible to Ministers precisely because NPfIT was correctly perceived as being such an ambitious and far-reaching project that it would take the major players in the industry to deliver it successfully. However, since contracts were to be allocated to bidders on a regional sole provider basis across England, this meant that the four original suppliers – Accenture (North East and East Midlands), Fujitsu (South), Computer Sciences Corporation (North, Midlands and East) and BT (London) – would effectively each hold a regional monopoly. As a result:

> Smaller companies specialising in health computing were frozen out of the market place and either went out of business or moved into other fields. As a result, there is now little or no competition available to maintain the software.
>
> (Smyth and Kennedy, 2011)

The contractual deficiencies within the Lorenzo project, which have become increasingly evident over its lifetime, include one further weakness, which could represent a financial time-bomb for the NHS. The original contracts with these large computer companies to install Lorenzo run out around 2015, after which they apparently have no obligation to carry out maintenance. Under what *The Times* has called zombie contracts, responsibility for maintenance and its funding will then have to move, directly or indirectly, to the NHS Trusts, who will have to negotiate new maintenance deals with exactly the same companies which failed to implement the Lorenzo system on time and to budget, and which now face little real competition in the market. To cite *The Times* again:

> This burden will put a squeeze on the Trusts, which are already under pressure to find £20bn of efficiency savings. Records show that it will need around £2.1m to cover the estimated costs of maintaining the systems. The Trusts will have little choice but to stick with the main providers, BT and the American giant CSC, which have been criticised by auditors and MPs for poor delivery.
>
> (Smyth and Kennedy, 2011)

In criticising the contract formulation process at the heart of the NPfIT and Lorenzo projects, it is important to appreciate that this process took place in an environment where the Department of Health was under immense political pressure to deliver rapid and successful outcomes.

Papers obtained by *Computer Weekly* in 2008 under the Freedom of Information Act showed that the Department of Health completely misjudged how long it would take to deliver the Lorenzo project and make electronic patient records available online. At a meeting in Downing Street on 18 February, 2002, attended by the major IT providers, policy advisers and health professionals, the Department of Health promised that the systems would provide 'seamless' care across the NHS by 2004/05, approximately half the time later allotted to the scheme. The *Computer Weekly* evidence, however, suggests that the political time-line for successful Lorenzo implementation was even tighter, and that the Prime Minister, Tony Blair,

> repeatedly sought to shorten the timetable for the NHS IT which would have brought visible benefits in time for a general election in May 2005. Blair told the meeting that implementing the programme faster than planned would underpin the Government's reform agenda and provide evidence of NHS modernisation to the public.
>
> (Ritter, 2008)

This political pressure was maintained, despite the fact that, at the time, access by patients and doctors to national summary care records was only at the trial stage, and contracts for the delivery and implementation of new national systems had been agreed as far ahead as 2013. Perhaps not surprisingly therefore:

> The Department of Health awarded a series of contracts in record time under the NHS's National Programme for IT in 2003, but some suppliers

> complained they were being given too little time to consider their proposals. The main part of the programme – a national electronic health record – is running three years behind the original timetable, in part because the idea is more difficult than first thought to put into practice. The papers raise questions about whether the timetable for the NPfIT was geared towards a general election, rather than the practicalities and complexities of the scheme – and whether the Department of Health put politics before realities in promising the programme in less than three years.
>
> (Ritter, 2008)

Finally, there is also evidence that poor contract negotiation and formulation by the Department of Health at the start of the project was responsible for its damaging impact on the NHS at the level of individual Trusts. As *The Times* reported:

> The programme's contracts were so poorly negotiated that the Government was obliged to deliver enough Health Trusts to the suppliers or pay compensation instead. One Trust was forced to choose a less attractive and dearer IT system, or face a £9m cut in its budget.
>
> (Pitel, Smyth and Kennedy, 2011)

The suppliers

As noted above, the Lorenzo project relied on a small number of key suppliers, each of whom had a different business agenda to be pursued and objectives to be gained from their involvement in the project.

Under great political pressure, contracts were drafted, as quickly as possible, to large, mainly American, companies from an 'approved' list – essentially comprising major players in the computer systems sector. These contractors, however, had virtually no experience of the UK NHS. Their experience was primarily in the very different world of private health care in North America. Another approved supplier, BT, although a British company, had little direct experience of the health care sector either.

Smaller specialist companies were, as noted above, effectively excluded from the project, and those larger companies who were given a contract would simply be dropped from the project, if they failed to deliver. This suggests that there was clearly no real sense of commitment to the contractors concerned and, hence, little chance that they would, in turn, feel a sense of 'project ownership' or responsibility. Not surprisingly, after a time, some suppliers wanted to leave the programme, while others spent significant sums to persuade other contractors to take over their previously agreed responsibilities.

Problems with the main suppliers began to show themselves in 2007. In July 2007, Accenture withdrew from the project. Following its withdrawal, most of its responsibilities were transferred to the CSC Alliance. The Fujitsu Alliance held responsibility for client cluster in the South until May 2008, when their contract was formally cancelled. Health service IT decision-makers had become increasingly concerned about Fujitsu's progress with the project. In March 2004, Fujitsu signed a £900m contract to deliver systems to 17 Acute Trusts, 36 Community Trusts and 8 Mental Health Trusts. With only one system having been installed, Fujitsu's contract had to be renegotiated; contract negotiations broke down in 2008 and Fujitsu's role in the project was terminated. Even now, in 2012, the UK Department of Health remains in legal dispute with Fujitsu over the 2008 contract termination for the South of England cluster, potentially one of the largest ever civil actions in the UK, that could see the Department facing legal liabilities of more than £1bn (Ehealthinsider, 2011). In response to the criticisms of its performance, the company has stated that 'it is "proud of the excellent work it did" on the programme' (Pitel, Smyth and Kennedy, 2011).

Within two years of the initial project launch, then, half of the key suppliers to the programme had either pulled out, or had their contracts terminated. Since May 2008, only two IT providers remain in place for the main body of the programme: the CSC Alliance and BT. As well as the major casualties in the project team noted above, several other smaller companies, working in alliance with the major players, have also come to grief. In August 2005, for example, IDX Systems Corporation lost its position in the Fujitsu Alliance in the Southern cluster, due to repeated failure to meet project deadlines, and was replaced by the Cerner Corporation. In 2006, ComMedica's contract with the North West/West Midlands cluster was terminated and, somewhat ironically, the company was replaced by GE Healthcare (the new owners of the IDX Systems Corporation).

The experience of the CSC Alliance, a key player in the Lorenzo project, illustrates further supply problems with the implementation of the system, and the legacy issue that often accompanies single-supplier dependence. In 2008, the CSC Alliance was awarded, by the Department of Health, a £3bn contract to replace Accenture, and was tasked with implementing the new electronic patient record software in 166 NHS trusts in three major clusters throughout England. Initially, CSC made good progress delivering 'interim' systems to hospitals in primary and community care, but was then unable to fulfil its agreement to deliver the leading-edge Lorenzo integrated patient record software on schedule (with the exception of a few pilot sites). In February 2011, CSC was held to be in breach of contract by the Department of Health for its inability to meet a series of Lorenzo deployment deadlines, culminating in September 2011 with the Department finally terminating what remained of the original NPfIT programme.

The UK National Audit Office has recorded over three thousand defects with the Lorenzo system and its implementation, and the MP, Richard Bacon, a member of the Public Accounts Committee, has described the Lorenzo project as

> one of the most egregious mistakes (of the NHS IT saga) ... I hadn't heard of the term 'vapour ware' at the time but that's what it was. It hadn't been written. It was just an idea in somebody's head.
>
> (Kennedy, Pitel and Homann, 2011)

That key suppliers can create such havoc with leading-edge computer software installations – particularly in such sensitive areas as the Health Service, for more than a decade is bad enough. The supplier situation is, however, even worse, at least with regard to the CSC Alliance, for three reasons. First, the NHS refused to provide information about the company's poor performance, requested under the Freedom of Information Act, in case 'disclosure might damage the US manufacturer's share price' (Pitel, Smyth and Kennedy, 2011).

Secondly, CSC is seeking a £2bn 'extension of its contract after it failed to deliver fully functional software to any of the 166 NHS Trusts in England' (Pitel, Smyth and Kennedy, 2011) Apparently, CSC had

> boasted in a Wall Street filing that it expected an extension of its contract to provide electronic patient records and that the British Government was unlikely to sack it in light of the risk and cost of a lawsuit from the Americans.
>
> (Pitel, Smyth and Kennedy, 2011)

Thirdly, there is now a suggestion that CSC actually knew three years before the termination of the Lorenzo project that it could not deliver the online patients record system in line with its contract. The information was unearthed by Canada's second largest pension fund, Ontario Teachers, which is suing CSC for their disastrous performance in the Lorenzo project. As the *Sunday Times* reported late in 2011, Ontario Teachers had stated that

> [a]ccording to Lorenzo's deputy head of testing, Lorenzo was never the correct software for the job.
>
> (O'Driscoll and O'Connell, 2011)

The same newspaper report alleges that, in 2008, CSC sent an internal audit team to the UK and India to investigate the Lorenzo project. The team apparently concluded that CSC could not deliver the NHS contract from a technology and operating perspective. The same newspaper also cites an e-mail from a senior CSC executive in the UK later that year, concluding that 'the project was on a death march' (O'Driscoll and O'Connell, 2011).

Clearly, at the very least, the Department of Health failed to get the best out of its suppliers. CSC has not yet delivered the bulk of the systems for which it is contracted and has, instead, implemented a large number of interim systems as a stop-gap strategy. It is now an accepted fact that the implementation of the new NHS records system, built around iSoft's Lorenzo software, has proved to be a technical and financial disaster, not just for the NHS, but for the supplier as well. In six devastating months in 2011, iSoft was forced to issue three profit warnings, admitted a further two-year delay in the delivery of its revised software package and, most seriously, became mired in revelations of accounting irregularities and a Financial Services Authority inquiry. Eventually, the company was taken over by one of its main customers, the CSC Alliance, in August 2011. This takeover has important implications for the NHS and its future plans, as it now guarantees that CSC will benefit directly from new maintenance contracts to be issued in the future for the electronic records systems. As *The Times* noted:

> CSC spotted the potential value of maintenance deals many years ago and … had been keen to buy the rights to maintain the computer programs from the business … CSC had no rights to the maintenance of the solution after the expiry of the contract. It got them by buying the company.
>
> (Smyth and Kennedy, 2011)

The cost here for the Trusts that assume responsibility for maintenance after 2015 may well be substantial. In the same news article, for example, *The Times* commented that Oxford and Buckinghamshire Mental Health Trust have estimated additional costs of £350,000 each year for six years to maintain the system after 2015.

The other remaining supplier, BT Healthcare, has also had its share of problems, and has also apparently been unable to deliver against its original contract. The Department of Health eventually agreed a revised contract, reducing the number of systems and increasing the price for each system BT had to deliver. In the view of the Public Accounts Committee in 2011:

> The Department is clearly overpaying BT to implement systems: BT is paid £9 million to implement systems at each NHS site, even though the same systems have been purchased for under £2 million by NHS organisations outside the Programme.
>
> (PAC, 2011)

The Committee also noted that the difficulties experienced by BT in delivering care records systems, particularly in acute hospitals:

> have required the Department to significantly revise its approach in London, moving away from delivering standard systems towards more

> locally tailored products. The introduction of local tailoring has, however, resulted in significantly higher costs. The Department has removed half of acute trusts, all GP practices and the London Ambulance Service from its contract with BT – but this significant reduction in scope has led to cost reductions of just £73 million against a contract value of over £1 billion.
>
> (PAC, 2011)

In 2008, BT replaced Fujitsu in the South of England cluster and, once again, the Department of Health had to change its approach to delivering these systems.

6.3 Sublime rationalities, the paradox of cooperation and the challenge of managing advanced technological expertise

We discussed earlier in this chapter the fact that the governance of glory projects is ultimately about uncertainty communication, that is, the negotiation of risk sharing strategies, responsibilities and accountabilities for choices made, and for actions emanating from them. The body of empirical evidence available for the analysis of the Lorenzo project indicates some major omissions and failings. For example, the possibility of cancelling the programme was ignored as uncomfortable and hence non-discussable, and was not included in assessing the risks of termination. The risks of failure (e.g., software implementation delay) appear never to have been discussed properly and were virtually concealed from MPs and the public by the Department of Health (DoH). There is always a risk with interpreting information and making decisions about something that is not yet tangible – such as Lorenzo. This project, like so many others, fell into such a trap. Below, we analyse it in more depth.

From the sublime promise to the failure to consult properly

The very name of the overall NHS IT initiative – The National Programme for IT – and its initially approved budget, the investment of £11.4 billion, 'to provide every NHS patient with his or her own electronic care record which could then be made available by computer link to different parts of the NHS so that medical staff could access accurate, up to date records on demand and whenever required, resonate with our discussion of the ambition and technological sublime surrounding glory projects. The original promise, captured by a number of similar statements in the public domain, seems to have served as the principal mechanism for engaging the public with the idea. Pronouncements about the revolutionary intent, a long-awaited solution to an undeniable problem, carrying unquestionable, admirable benefits to medical staff and NHS patients alike, can be captivating and irresistible. The determination of the project promoters to harness the potential of technology for providing solutions to problems for which they are held responsible (i.e., *to revolutionise the way the health service works in a new age of efficiency demanded within the political arena*) is obvious in these statements. However, despite the visibly significant impact of the initiative on a large number of people and their jobs, well-being and safety, it remains unclear what kind of consultation process actually took place at any stage of the project as part of the governance process to engage with NHS professionals and other potential systems users.

Richard Granger, appointed in 2002 as director general of the NHS IT programme, was given the job of turning the national programme into reality. However, as MP Richard Bacon commented in a speech in the House of Commons on 14 June 2011:

> Mr Granger had no patience with what he saw as special pleading by medical staff, whom he believed were unwilling to accept the ruthless standardisation that was necessary to deliver the advantages offered by the IT system. He effectively believed that he knew what the clinicians needed better than they did themselves.
>
> (Hansard, 2011)

Despite this, many clinicians were determined that they would have an effective input into the decision-making process, and Dr Anthony Nowlan, the health informatics expert and, at the time, the executive director of the NHS Information Authority, was asked to ensure this happened. The aim was to

> obtain a professionally agreed consensus about what was the most valuable information to store, and what was achievable in practice.
>
> (Hansard, 2011)

In practice, however, while this user-led requirement consensus was completed and included in the specifications, it apparently played a very minor part. In reality, as Bacon noted:

> The large majority of the so-called output-based specifications, and the crucial major hospital systems at the heart of the programme, were developed without involvement and scrutiny by the leadership of the health profession. That happened despite the fact that involvement by users is essential if one wants software that works and that people will use.
>
> (Hansard, 2011)

Indeed, Dr Nowlan is on record before the Public Accounts Committee as stating that

> it became increasingly clear to me that efforts to communicate with health professionals and bring them more into the leadership of the programme were effectively obstructed.
>
> (Hansard, 2011)

Perhaps the least satisfactory aspect of the failure to communicate fully with end-users of the system during its early development came about when Dr Nowlan was asked to produce a list of all those people who had been involved in specification work, so that project reviewers could see for themselves the degree of consultation that had apparently taken place. As Bacon observed:

> [I]n fact, all that had happened was that an e-mail had been sent out. Quite understandably, Dr Nowlan thought that saying that people had been consulted because they had been sent an e-mail was not consultation in any proper sense, any more than compiling a list of people who had been sent an e-mail was proper validation. He regarded the claims as a sham, and refused to co-operate.
>
> (Hansard, 2011)

The blueprint for the NHS IT reforms was published in June 2002. It was entitled: 'Delivering 21st century IT support for the NHS: national strategic programme', with the aim of connecting NHS healthcare with the capabilities of modern information technology. Citing Richard Bacon MP again:

> There was, however, an odd discrepancy at the outset. At the back of the original document were four appendices, one of which contained the project profile model and stated that the project's estimated whole-life costs were £5 billion. It provided a total risk score of 53 out of a maximum of 72. In other words, the project was very high risk. When the document was published, however, that project profile model had been removed and there were only three appendices—the likely costs of the project and the true risks were concealed right from the start.
>
> (Hansard, 2011)

Here we see the 'dark side' of project concept evaluation (Flyvbjerg, 2008, pp. 136–7) illuminated in Wachs's (1989) study of 'lying planners': 'the most effective planner is sometimes the one who can cloak advocacy in the guise of scientific or technical rationality' (Flyvbjerg, 2008, p. 137). Instead of being open, communicative, participatory and democratic, planning is often closed, an instrument of domination and control. Decision-making behind planning by definition should be about rationality but, according to Flyvbjerg (1998), it is often about power.

Lack of proper consultation about the project's purpose and expected outputs, and the absence of risk communication, at times bordering on deception and irrationality, has been highlighted as detrimental for projects in the work of Loosemore (2006); Flyvbjerg, Holm, and Buhl, (2005) and Drummond (1999), among others. The explanations are found in psycho-social, political, structural and ethical elements surrounding the given initiative which, in combination, form and simultaneously reproduce a specific shared ontology within which decision-makers make their choices, declare preferences and condone actions. The Lorenzo project, and for that matter the overall NPfIT did not escape this trap.

Project contracts and structure: Design for collaboration?

Rehn's (2006) thesis that economies are systems of waste, overlap and excess, using efficiency only to waste in more glorious ways, is relevant here. The unfolding trauma of project failure, according to Rehn, is a mask for a more hard-to-handle truth: that we are engaging in creating follies. The aura surrounding the NPfIT and the Lorenzo project was 'revolutionary and exalted' in every sense from the start. So powerful was the ambition, that it excluded effective reality checks. The evidence of its impact on the Ministers' logic can be seen in the approval of procurement in 2002/3. The contract process itself exhibited a kind of desperate urgency which, in turn, opened up scope for opportunistic behaviour (see below). It is clear from the Lorenzo case study that contracts were offered, bid for and secured in a remarkably short time. Furthermore, there is clear evidence that the risk element associated with the project was hidden right from the start, even as contracts were being signed.

Contracts were awarded to a few, very large computer companies – major players in the industry – as an assurance of successful delivery, a decision that has turned out to be detrimental to a number of smaller specialist companies, as well as to the ultimate delivery of the project. The collective optimism bias and rejection of uncomfortable risk assumptions under the spell of Lorenzo's technological sublime was fuelled by immense political pressure on the Department of Health to deliver rapid and successful outcomes. The promise of 'seamless' care across the NHS by 2004/5 was obviously influenced by the timing of the general election scheduled for 2005. This was the driving force for a rapid award of a series of contracts, the negotiation and formulation of which was completed during 2003, with irreversible consequences (to be discussed below). It was already clear by 2007 that both the project schedule and the delivery of the system with expected functionality were being compromised.

In May 2003, potential bidders had been presented with a 500 page specifications document and apparently told to submit bids within just five weeks. The great speed at which contracting was completed meant that all the complex issues had to be faced after the contracts had been let; in effect, a large number of key contracts were signed before the government really understood what they wanted to buy, and those bidding to supply actually understood what was expected of them. The scale of mismatch between the contracted strategy and the radical uncertainty of the venture was immense here. It hardly formed the foundation for a successful major IT venture.

As noted in the Lorenzo case study, the approach from the top appears to have been one where established IT market players would be awarded contracts on the basis that they should be able to deliver output on time and to budget, and, should any fail to do so, they were expendable and would be replaced. For example, Richard Bacon M.P. has noted that

> Mr Granger made it clear that things would be different on his watch. Contractors would not get paid until they delivered, and those not up to the mark would be replaced. He even compared contractors to huskies pulling a sled on a polar expedition: 'When one of the dogs goes lame, and begins to slow the others down, they are shot. They are then chopped up and fed to the other dogs. The survivors work harder, not only because they've had a meal, but also because they have seen what will happen should they themselves go lame'.
>
> (Hansard, 2011)

The case explicitly illustrates the problem Drummond (1994) identified about a relational dynamics and unpredictability in a project increasing with the expansion of sub-contracting in the procurement process, making accountability and responsibility for the initial decision detached from individuals. The damage to the Lorenzo project caused by the exclusion of smaller specialist companies, and, crucially, the exodus of the key suppliers over time is explained in section 6.2. Moreover, a chaotic management of changing conditions within the delivery team did not contribute to 'shaping and directing' of the project so that 'creativity and discipline are brought to bear' (Miller and Lessard, 2008, p. 169) and project outcomes assured to remain safe, strategically aligned and beneficial to the stakeholders.

Our analysis of the case has shown the failure of the contract negotiation and formulation process to ensure attainment of all three pragmatic functions of a contract, mentioned earlier in the chapter: work transfer, risk transfer and to implant motives in the contractor that match those of the client, thereby minimising opportunistic behaviour by offering incentives for collaborative behaviour.

Expert contractors, misplaced optimism and opportunistic tendencies

We can also recognise here all the aspects of Drummond's (1999) dynamics of escalation of decision-making around a large-scale IT/IS implementation as a project resulting in an escalatory spiral of decisions, a means/ends reversal and paradoxical imbalance between power and responsibility, with catastrophic consequences. There is little evidence that the governance of Lorenzo operated on the basis of knowledge of a wider picture of what goes on in social construction of IT/IS projects and project management. It seems that there was no analysis of who is included in, and who is excluded from, the decision-making process, what determines the position, agendas and power of different participants with respect to issues, and how these different agendas are combined and resolved in the process.

The Lorenzo project also provides a good example of misplaced optimism in glory project management. This can be found both in the overriding expectation of project leaders that poor performance in the past would suddenly be transformed into improved performance in the future, without a significant change of direction or purpose and, perhaps more important, in their effectively ignoring a succession of 'alarm bells' issued by those monitoring the project's development from the outside.

For example, in April, and again in October, 2006, the refusal of the Department of Health to make available to external monitors (including even MPs) concrete, objective information about NPfIT's progress prompted 23 leading UK academics and experts in computer-related fields, to raise concerns about the programme in two successive open letters to the Parliamentary Health Select Committee.

Again, in June 2006, a critical report from the National Audit Office concluded that 'it was not demonstrated that the financial value of the benefits exceeds the cost of the programme'. The report questioned whether the programme would ever actually deliver care records as planned, and noted that some of the renegotiated contracts had failed to show value for money. For example, the NAO found that the average cost of three new acute systems in the South was 47 per cent more expensive than in London, where BT was also the key supplier. The NAO also concluded that, crucially, the Department of Health lacked fundamental management information on the number of systems delivered and the amount spent on each system, as well as the cost implications of changes to the contracts for the delivery of systems (NAO, 2006).

In the same year, a report from the British Computer Society (BCS, 2006) stated that 'the central costs incurred by the NHS are such that, so far, the value for money from services deployed is poor'. In April, 2007, a highly critical and detailed 175 page report on the programme was published by the Public Accounts Committee of the House of Commons. The Chairman of the Committee commented that 'this is the biggest IT project in the world and it is turning into the biggest disaster'. The Committee noted that key suppliers to the programme were struggling to deliver and would not be able to meet the planned schedule. Furthermore, it drew attention to the fact that Lorenzo still had to win the 'hearts and minds' of NHS professionals, as there had been little detailed consultation with them at any stage of the project (PAC, 2007). Furthermore, a report from the Kings Fund, also in 2007, attacked the government for its 'apparent reluctance to audit and evaluate the programme' (Kings Fund, 2007).

In a second report on NPfIT in 2009, the Public Accounts Committee noted that key project deliverables were 'way off the pace', and the risks to the eventual deployment of the entire national system were 'as serious as ever', primarily because 'essential systems are late or, when deployed, do not meet expectations of clinical staff' (PAC, 2009).

In its third report on the programme, in 2011, the Public Accounts Committee noted with concern the problems they and the National Audit Office had

> faced in getting timely and reliable information from the Department. Information provided has frequently been late, has contained inconsistencies and has contradicted other evidence.
>
> (PAC, 2011)

Finally, the Cabinet Office's major projects authority noted in 2011 that

> The project has not delivered in line with the original intent as targets on dates, functionality, usage and levels of benefit have been delayed and reduced. It is not possible to identify a documented business case for the whole of the programme. Unless the work is refocused, it is hard to see how the perception can ever be shifted from the faults of the past and allowed to progress effectively to support the delivery of effective healthcare.
>
> (Cabinet Office, 2011)

The Cabinet Office authority concluded that

> there can be no confidence that the programme has delivered or can be delivered as originally planned', and that therefore Ministers should 'dismember the programme and reconstitute it under new management and organisation arrangements.
>
> (Cabinet Office, 2011)

In consequence, then, after ten years or more of obfuscation, delay, costly over-runs and, as MP Richard Bacon put it 'a sense in 2008 that Ministers were spouting rubbish, saying everything was fine when it plainly wasn't' (Pitel, Smyth and Kennedy, 2011), the revolutionary reform programme for information technology in the NHS and its flagship Lorenzo project has ended in abject failure. Somewhat ironically, the providers of NHS care, such as hospitals and GP surgeries have now been effectively left to strike whatever IT deals they can afford with the same software installation companies that, between them, effectively destroyed the Lorenzo dream.

All responsibility for shaping and directing the project in order to ensure its outcomes remain safe, strategically aligned and beneficial to the stakeholders seems to have been abandoned, and replaced by inertia and inhibition of those who govern to react, oblivious to the 'alarm bells' and sense of impending disaster. The case shows irresponsible negotiation of contracts and no explicit addressing of 'fair' risk sharing, where a blind confidence in the ability of 'world experts' to deliver a glory project was (mis-)used by the experts, to behave opportunistically, with very little professional ethical or moral responsibility to the vulnerable stakeholders (GP practices, NHS services and staff, patients and taxpayers). The relational process of project governance 'turned on its head' and 'the Government was obliged to deliver enough Trusts to the suppliers or pay compensation instead' (*The Times*, 9 December, 2011, p. 3), with opportunistic, low-performing contractors (CSC, BT Healthcare) receiving undue advantages.

An unbalanced combination of the penalties in contracts designed to protect the client, and the compensation rights designed to protect contractors involved in projects which are terminated, serve to create further complex problems in managing glory projects with intangible outcomes which are difficult to specify in advance. The Lorenzo case study provides a good example of the penalty/compensation dilemma. As *The Guardian* reported on 4 October 2011, the Computer Sciences Corporation was paid some £200m in April 2011 by the NHS to cover the projected costs of delivering Lorenzo patient records to Trusts in the North, Midlands and East of England in 2012. But after the NHS declared itself unsatisfied with the progress of the work on 30 September, it requested the taxpayers' money back, and NHS Connecting for Health was re-paid some £170m by CSC.

Just over one week earlier, however, *The Guardian* also reported that

> Ministers are considering offering one of the NHS's worst-performing IT contractors financial help to keep the company from ditching a troublesome software package which is 'not fit for purpose', according to Cabinet Office documents. The plan to offer the US group Computer Sciences Corporation (CSC) one last chance to fix the software risks a furious backlash over 'payments for failure', in the latest twist to a fiasco that has generated years of delays at considerable cost to the Health Service.
>
> (Bowers, 2011)

Here, then, lies the dilemma that intensifies the problems of contract management for glory projects and renders them almost impossible to terminate. First, the Department of Health declares that the Lorenzo project will be scrapped, as it is now not fit to provide the modern IT services that the NHS needs. Then, while the project itself is brought to an end, the Department of Health decides not to actually terminate existing contracts, even though CSC's plans for the Lorenzo software package are seen as undeliverable, and a long way short of the full functionality of the contracted solution. Part of the reason for this decision is that the Department of Health is still contesting a long-running feud with CSC over a £3bn agreement to install IT systems in the Midlands and in the North and East of England, and is concerned about potential legal action that may follow. However, the Cabinet Office report, mentioned in the Lorenzo case study and recently declassified, reveals that programmers are still having to provide 'bespoke' code changes to Lorenzo, months after its installation at Morecambe Bay, the first Acute Hospital Trust to take the system. Pennine Care Trust was also supposed to be a Lorenzo 'early adopter', but has pulled out.

Paradoxically, the resulting situation around Lorenzo is that there is now little or no competition available to maintain the software, turning a glory project into, effectively, a financial time-bomb for the NHS. Moreover, the governance of Lorenzo contracts and cooperation failed to live up to one of its most important responsibilities – to protect the vulnerable stakeholders, while allowing undue advantages to non-performing contractors. The Lorenzo project illuminates how specialist expertise, opportunistic behaviour, (in-)competence to perform, the letter for original contract, the lack of accountability and basic moral responsibility for the conduct at all levels in the web of governing relationships, are paradoxically entangled.

The Lorenzo project, therefore, illustrates clearly how decisions around the project based on different rationalities, selective interpretation of information and persuasive powers linked to the possession of unique expertise, can undermine its chances of success. Furthermore, Lorenzo is not alone in this respect. For more than two decades, we have witnessed a succession of major complex IT projects encountering a predictable array of problems including: the tendency to exceed budget and schedule targets (sometimes involving massive discrepancies between planned outcomes and actuality in terms of cost and time profiles); the repeated experience of 'project creep' (attributable to the failure at the outset to set clear and manageable objectives for the project); the failure to consult fully with those most affected by the project's implementation, or to listen adequately to their views; the tendency to proceed with a project long beyond the point at which it is no longer viable or valuable (Cavendish, 2012); and an additional array of new and complicated management challenges that such projects inevitably create.

6.4 Key insights and concluding remarks

As discussed in the earlier sections of this chapter, the core purpose of project governance is to evaluate and shape the development of the project throughout its life cycle in such a way that its outcomes remain safe, strategically aligned and beneficial to the stakeholders as agreed at the time of approval. Can evidence of any of this be found in the Lorenzo case? What new light has our analysis shed on the process of glory projects governance? Why is this governance with its regulatory, disciplinary and moral accountabilities so easily abandoned in the case of glory projects, and how is it made possible time and time again? Is it only about the glory lost, or much more than that?

Firstly, we identified implications of an aura created around a project involving advanced technology for decision-making rationalities present in the Lorenzo governing process. On reflection, the project was approved without a rational reason or, perhaps, with seemingly irrational reasons. It was hard to challenge and question the decision, due to the project's technological sublime. Here an interplay of rationalities, power and lack of participation is visible. Yet, although Lorenzo would have had an impact on a large number of people, and their safety, careers and well-being, our analysis indicates a lack of transparent risk appraisal and its communication to the affected groups – a problem exacerbated by a rushed contract formulation. Here we encounter one of the classic failures in many large-scale IT projects – the failure to consult adequately with potential system-users. Moreover, the absence of mechanisms for curbing typical conspiracy of optimism can also be noted. As a result, controversy and paradox increased on multiple fronts – managerial, social, environmental and political.

Another of the major problems identified in the forgone analysis of the Lorenzo project is the apparent absence of any evidence of effective attempts to shape and re-direct the project to induce discipline and accountability, let alone much-needed transparency. The analysis shows a clear failure to structure and organise the project coalition and control the dynamics of collaboration within it to prevent opportunistic and irresponsible behaviour of the key players. There are three key issues here:

Problems with shaping the project

Contractual strategies of glory projects, even those advanced towards collaboration and partnerships, in practice often seem powerless to prevent opportunistic tendencies and profit seeking; mistrust; hidden costs to the public sector and the tax payer and little accountability and transparency in the process of risk appraisal, sharing and management among the contractual parties during project execution. Our case confirms that the issues of politics, inertia and powerlessness are inseparable from experiences with glory projects. The necessary balance of strict contractual forms and informal mechanisms to cope with the simultaneous order and chaos of a complex IT/IS project, and ensure a collaboratively negotiated transfer of work, motive and risk, was not achieved for Lorenzo.

It seems that the rushed and instrumental approach to contract negotiation ignored the inherent non-linearity of project work unfolding over time (the complexity of IT/IS projects) thus omitting to ensure an adequate level of confidence in the contractors' collaborative behaviour. The assumed competence of the contractors to perform the expert work took priority over ensuring cooperative relationships and behaviour, ending with a misplaced reliance on the contractors' good-will and trust, with very few adequate control systems in place.

Problems with re-directing the project

The analysis illuminated an unclear, inflexible, mixed-up decision-making structure around the project, with elements of escalation, unresolved conflicts of interest and undesirable merging of the roles of project promoter and guardian of public (stakeholders') interests in a single entity, discussed earlier. An important aspect here is a lack of timely risk reassessment and consultation to protect vulnerable stakeholders (taxpayers, patients, medical and other NHS staff on the ground), while allowing undue advantages to low-performing contractors.

Problems with ensuring that accountability, creativity, transparency as well as discipline are brought to bear on the project

In the analysis of the procurement and contract design of the Lorenzo project, there is no evidence of efforts to address the risk of power and paradox of technology-based expertise through adequate disciplining mechanisms, both formal (contractual) and informal (socialising), that may regulate collaborative behaviour and curb opportunism.

Our analysis of a large software development glory project initiative in the UK public sector sheds more light on the nature of project governance, and the process of governing such a complex project, amid reports of catastrophic failures of such projects elsewhere. It has confirmed the need for understanding the governance of glory projects as a social arrangement of complex human and institutional interactions, as the relationship process itself, not only as a system or mechanism of rules, available control procedures and their ordering effects based on neutral, rational and expert decision-making. It is difficult and unhelpful to separate the agency and structure in the practice of project governance, but it is useful to adopt a complexity lens that gives primacy to unpredictability, non-linearity and the paradox of human relations in these kinds of project settings.

Recommendations

Our exploration of decision-making around a large-scale glory mega-project such as Lorenzo raises several important questions. What does it mean in practice to govern mega-project collaboration among strangers in an inherently non-collaborative world? Does collaboration yield political and economic benefits that can be maximised through choice of a particular project collaborative framework? In particular, are the notions of 'mutual interest' and 'willingness to share risks' realistic in light of the disposition of human beings in their natural, self-preserving state to trust and cooperate, and if so, under what set of circumstances? How can any conflicting prioritisations and focuses be reconciled, for example, between individual agency versus organisational performance; between assumptions about the sameness/commonality of key concepts, such as values, expectations and culture, and about inter-connectedness in risk sharing and response (that is, the idea that 'we are all in the same boat', regardless of who generated the risk and for what gains)? This raises the issue of moral agency and action and, inevitably, the status of the individual agency versus corporate performance; in essence, what values or principles are most appropriate for managing collaborative glory projects ethically, and should collective actors as well as individuals in such ventures have moral status?

Challenging the sublime

The paradox of glory IT/IS projects seems impossible to eliminate without a radical rethink of the conventional wisdom. This firstly requires a need to reconsider conceptualising IT implementation as a traditional project, as the project form itself gives rise to misconduct, opportunism and poor governing process (Hodgson and Cicmil, 2006), and should include considering an alternative project life cycle model in planning, promoting and assessing the risks of these initiatives. The second step requires a shift in focus away from the sublime and the dream of technological promise and power associated with 'big' experts, towards an exploration of more appropriate ways (smaller scope, collaborative processes, or bounded ownership) of solving the problem of efficiency, even when it includes IT/IS projects. The final step must be to hold those responsible for allowing so many 'fading glory' projects to collapse (such as Taurus, the NATs Control system and Lorenzo) fully accountable for their choices in the face of an unknown future, and, in addition, morally responsible for any adverse impact of their decisions on the lives of an immense number of people who, inevitably, cannot be entirely shielded from the substantial risks that can never be completely eliminated from complex mega-projects.

A new governance approach would need to be able to address the causal ambiguities, interest conflicts and legitimacy issues (Suchman, 2000) that appear from time to time in all such sublime projects, and would need to abide by virtues of prudence and practical wisdom (Flyvbjerg, 2001). The choice of contract, the form of project organisation, and understanding its limitations are therefore key tasks for those governing the project. In reality, successful mega-project management requires a kind of 'virtual learning' for practitioner development, ensuring that all players attain appropriate skills in self-awareness, diplomacy, ethical, cultural and political aptness.

Formal and informal contractual mechanisms

With reference to literature and extant research (see section 6.1) these crucial issues could be addressed through the adoption of a project governance system which combines a balance of stringent monitoring systems and informal (social relational) mechanisms. Such a governance process should ensure both transparency of commitment under unpredictable conditions (relational, technological, economic) and contract enforcement. Moreover, due care needs to be given to the level of trust towards experts. Confidence in their non-opportunistic behaviour should be built realistically on the combined evidence of both their technical competence to perform, and their cooperative attitude. This can be achieved by balancing the assumed level of trust/good-will with control systems in place. Ultimately, however, the question remains: is ethical collaboration on revolutionary IT/IS projects in a global context possible, and, if so, how it should be governed (not just structurally formalised but socialised) in practice?

It may therefore be helpful to view decision-making within project governance – particularly in addressing the technological sublime – as an art form, as implied by Foucault's concept of the art of government and 'governmentality' as the design of a more collective and practical consciousness within which to make sense (Clegg et al., 2006). The art of governance of glory IT/IS projects can be understood, therefore, as an amalgam of technology, rationality and knowledge present (used and reproduced) in concrete project settings, providing the participating agents with the ontology (shared/negotiated reality), a way of being which determines what we see and therefore what is, for us, logical to do, or what is possible to achieve (Braun and Castree, 1998).

Viewing mega-project governance as a relationship-regulating process and at the same time as the relationship itself, we avoid separating the structure from the agency and acknowledge the importance of observing power asymmetries, complex interactions (opportunism, deception, cooperation, competition) and conflicting values in the given context, and acknowledge how the emerging nature of these, in turn, shapes and changes the governing regulatory framework. Crucially, mega-project governance does not happen in a vacuum, and it is the effectiveness of decision-making around a project that will ultimately determine its fate.

We argue that the governance framework of glory projects should be understood, not as a 'stabilised' mechanism, structure, or system of control, but as heterogeneous and becoming, as a generic social technology, or spatial-temporal framework, a process 'for institutionalising social habits and patterns of behaviour so that it then becomes possible for us to communicate with each other and develop practical norms' (Chia, 2002, p. 867).

The practical norms are necessary for governing the joint action of members of project parties in otherwise chaotic, ambiguous and unpredictable reality.

A good deal of literature (Stacey, 2001, 2003; Flyvbjerg, 2001; Raelin, 2001; Holt and Rowe, 2000; Bresnen and Marshall, 2000; Sydow and Staber, 2002; Chia, 2002; Weick, 2002) suggests that, in an unpredictable world where the outcomes of an action cannot be known in advance, managing should be seen as a process of continually rearranging the paradoxes of organisational life, through a different type of leadership. Similarly, Flyvbjerg argues for an approach to studying social practice in complex arrangements, by refocusing attention on the need for judgements and decisions made in a manner of virtuoso social and political action. The implied virtues of 'prudence' and 'practical wisdom' are inspired by the themes of politics, power, and situational ethics, while making judgements and decisions under radical unpredictability.

The ethics of collaboration

As our case study shows, it is difficult to escape or overlook the issue of ethics of collaboration and governance in dealing with the sublime: irrationality, inherent unpredictability and intangibility of IT/IS product (software, system and cyberspace) all serve to render the soil underpinning such projects fertile for unfounded managerial enthusiasm and unchecked imagination, opportunism and the pursuit of players' own agendas.

Collaborative ethics involves 'the calculation of individual interest in a context in which human beings are obliged to cooperate with each other' (Hutchings, 2010, p. 48). But, in a wider context, through the process of globalisation, we are economically, socially, culturally and politically 'embedded in, and depend on, relations with strangers from all parts of the world' (Hutchings, 2010, p. 4). What needs to be put in place is a process through which 'parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible' (Gray, 1989). To change 'undesirable' patterns of joint action, a new shared thematic framework needs to be enacted (Suchman, 2000) through processes of communication and power-relations that draw on new themes and symbols. The aim is to create and stabilise a coherent set of practices in the context of software development and IT/IS implementation.

Overall shift in approach

The shift we propose departs from more common normative/rational approaches to the nature of project governance, to embrace the psycho-social dimensions of decision-making and the operation of power and interaction among project parties, without discarding the pragmatic complexity and ethical ambiguity of glory projects in the name of rationality (March, 1989). Project governance and decision-making should be studied from multiple theoretical positions, so that 'getting investments right' is treated as a problem of delivering economies, as well as relationally. Such an approach to governance would need to be both moral and ethical in nature, and driven by performance-enhancing possibilities, participation and future-oriented options, rather than by 'explicit rules governing practices' (Holt and Rowe, 2000). Project governance from a relationship perspective would require control mechanisms to be not just structurally formalised, but also socialised (that is, a combination of contractual and informal mechanisms), joining together the endeavours of two otherwise separate functions: project implementation and project governance, when there is no value-equilibrium.

With the governance of a mega-project, we need to create a collective identity as a community of inquiry and encourage the collaborators to reflect together on the quality of their participation (Raelin, 2001). In dealing with project unpredictability and complexity, participant reflection should take on a public form and, in turn, influence the emergence of collaborative learning practices within the governance coalition.

Building on Taggert and Silbey's (1986) rather cynical proposition of a political development cycle of IT/IS projects, and modified by the insights from our own analysis, we argue that the following is empirically justifiable as a pragmatically helpful framework in understanding the relational essence and stages of managerial failure commonly associated with mega-project governance: 'initial wild enthusiasm, emerging disillusionment, total confusion, search for the guilty, punishment of the innocent, and promotion of villains, trouble-makers, opportunists and non-participants; all of these in contrast to the conventional view of the rational project life cycle model'.

Our overall approach has combined pragmatic theorising with concrete empirical analysis to address the challenges of governing a complex project in a critical and constructive way, focusing on the issues of context, values and power as related to the local, national and global aspects of project governance and its key pillars – quality, safety and basic trust intrinsic to human relationships. Inevitably, mega-projects have global scope, both in terms of the problem they are supposed to overcome (for example, sustainability imperative, instant communication, efficiency), and in terms of the implications of the project (due to the inter-connectivity and inter-dependency of our globalised world). They are likely to be more numerous, controversial, costly, unpredictable and problematic in the future, reinforcing both their complexity, and the governance challenge they present.

Notes

1. A definition of 'glory' in the *Collins Concise Dictionary*, 1999, 4th edn. HarperCollins.
2. See also Cicmil, Williams, Thomas and Hodgson (2006); Cicmil, Cooke-Davies, Crawford and Richardson (2009).
3. We borrow the notion of the technological sublime from Trapenberg-Frick (2008, p. 239) who defines it, after Nye (1994: xvi) as being about 'repeated experiences of awe and wonder, often tinged with an element of terror, which people have had when confronted with particular natural sites, architectural forms and technological achievements'.

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7
Decision-Making in the Political Environment

Tom Christensen

7.1 Introduction

The focus of this chapter is on the political and administrative decision-making processes that are connected to deciding on major public projects. Large projects are, on the one hand, about systematic planning and technical processes, but on the other hand, they are also about how political and administrative actors decide on the projects, which makes the wider political-administrative context highly relevant. Processes related to major public projects may have features that are similar to many other types of public decision-making processes, but also reflect that large public investments mobilise particular political and administrative actors/stake-holders, problems and solutions. One can also expect variety in the way different decisions on large projects unfold in a democracy.

The first question to be considered is what generally characterises decision-making processes in a political context? This is a basis for understanding the decision-making processes related to major public projects. What are the major concerns and considerations related to public decision-making and what characterises the way they are organised?

The second question deals with what kind of theoretical perspectives or decision logics can be used to analyse and understand the political-administrative decision-making processes related to major public projects. Four decision logics taken from organisation theory will be used: instrumental, institutional, environmental and garbage can logics (Christensen et al., 2007; March and Olsen, 1976 and 1983; Peters, 2011; Pollitt and Bouckaert, 2011). They relate to important dimensions in decisions in different ways, namely whether the political-administrative leadership has control of the decision-making process or not, and whether or not actors score high on rational calculation or unambiguous organisational thinking (Dahl and Lindblom, 1953). The ideal is that public leaders have both control and clear goals/intentions to deal with problems and find solutions for large projects, as reflected in the instrumental logic. The reality often shows that control and rational calculation may be partly lacking. This may be due to negotiation features, information problems, cultural resistance or use of symbols (Christensen and Lægreid, 2001).

Thirdly, the relevance of these decision logics will be exemplified using the experience of 23 large public projects in Norway during the last decade (Whist and Christensen, 2011). The connection between actor patterns, problems and solutions will be discussed, and, more broadly, the significance of the different decision logics analysed. Do these public investment processes fall clearly within some of the logics, for example the instrumental logic, which is often the point of departure for actors involved, or does one see a variety of different decision logics in a complex interplay of actors and organisational thinking?

Fourthly, the implications of the results will be discussed. The discussion will consider the main preconditions when deciding on major public projects in an often complex and turbulent political environment, and, more broadly, the lessons learned. What is typical for public investment processes that seem to be successful, according to criteria of rationality, and those that deviate a lot from this? What are the lessons learned from this concerning future large project processes? What are the trade-offs of having broad and democratic processes related to major public projects and the need for technical-economic rationality?

Finally, how do the processes related to major public projects measure up to the more general features of public decisions in a political context?

7.2 Decision-making in a political context

The basis for public decision-making is the principle of popular sovereignty, meaning that in elections people delegate authority to political representatives in elected bodies (Olsen, 1983). These elected bodies, whether on a central, regional or local level, then delegate public authority further to executive politicians, who use a neutral administrative apparatus to implement the policies decided on by the elected and executive bodies. A major precondition for a democratic political process is that this 'parliamentary chain' works smoothly: that people should be able to influence decisions and policies by changing their representatives where necessary during an election period, that elected bodies are able to appoint and control political executives, and that the executive political leaders are able to control the administrative apparatus. Decision effectiveness and representation supplement these principles; hence the political-administrative system has the capacity to define and solve public problems, and the political actors are representing the people, either through their opinions and actions, or through their social-economical characteristics (Christensen et al., 2007).

Egeberg (1997) emphasises some principles that supplement the basic tenets of the sovereign people and that have implications for how the public apparatus is formally organised. One principle is related to the rule of law and securing people's civil rights, which is reflected in the basic pattern of laws and rules regulating public activities, in the establishment of independent bodies, such as ombudsmen institutions, or regulatory or complaint bodies. Another is the principle of professional competence, meaning that public decisions must be based on solid professional knowledge and premises (Simon, 1957). This principle is balanced against the principle of political loyalty. Thirdly, the principle of involving affected actors or stake-holders is also central. Inside the public apparatus this means that if a decision affects many different institutions, they should have the opportunity to express their interests and opinions, and be able to participate and influence decisions, for example, through intra or inter-organisational collegial bodies. Externally, this means that affected stake-holders, and interest groups, should have committee-style participation rights.

Taken as a whole, decision-making in a political context is both simple, and potentially complex. At one extreme, a public decision may be governed by strong hierarchical control of political executives, may be narrow in a professional sense, and affect few internal and external stake-holders – which make the process effortless. At the other extreme, public decision-making may be characterised by problems of hierarchical steering, heterogeneity and conflict between coalitions, involving many external stake-holders, problems of professional knowledge and concerns about judicial aspects, and so on, making processes much more complex and ambiguous. Between these extremes, there are many possible uses and combinations of the principles mentioned.

7.3 Decision logics

March and Olsen (1976) emphasise that decision-making processes can be based on two main dimensions: the *decision structure* – the structure of the participants or actors related to the control aspect, and the *access structure* – the structure of the problems and solutions, or organisational thinking. If the decision structure is narrow and exclusive, for example dominated by political executives, who have unambiguous definitions of problems and solutions, that is, score high on so-called rational calculation, it is easy to predict or understand why certain decisions are made, for example on major public projects. Public investment project processes would mainly be some kind of routine politics where it is pretty much given who should participate, and what the major and important aspects of the projects are.

But decision structures may be more open and broad, potentially bringing in a wider variety of actors, making it more important who is actually *activated* and how they *define* public problems and solutions. This openness may be related to democratic norms of participation, to the need for specialised knowledge and also to problems of capacity for the executive leadership

(March and Olsen, 1983). This may lead to more legitimacy, but it is also open to conflict between actors from different organisations or institutions in a tug-of-war about goals and motives. Overall, it is more difficult to think clearly about decisions in public decision-making processes than it is to control the participants (Pollitt and Bouckaert, 2011). Participants can come and go to decision-making opportunities without having much clue about what to do, or they may have very divergent opinions. Also, preconditions for making decisions can change, and decisions themselves can be appealed against and changed, making the process quite unpredictable.

Characteristics of public decision-making processes, like major public project processes, may also have democratic implications, but these are not always clearly defined. The rational ideal, that the decision-makers are elite actors, with a mandate from the sovereign people, having clear motives and thinking behind their decisions, may, in many situations, be the most appropriate (March and Olsen, 1989). But broader decision-making processes, bringing in a variety of actor groups and single actors, may be seen as even more democratic and legitimate (Mosher, 1967). Unambiguous thinking will often have support, because we want leaders who are rational, but the downside could be rigidity and lack of adaptation to changing preconditions for decisions (March, 1994).

First, different decision-making logics for major public projects, based on organisation theory, will be discussed. An *instrumental logic* would expect leaders to be controlling decision processes and thinking clearly about plans for large projects (Christensen et al., 2007). Leaders would be able to design the formal public structure so that they would have relatively strong control over decisions, and organise the apparatus to give themselves strong professional support, which is a major precondition for scoring high on rational calculation (Egeberg, 2003). The logic is not built on any 'economist' type of preconditions, but is more inclined towards administrative features (Boston et al., 1996, March and Olsen, 1989). Actors have limitations on their memory, motives/goals, attention/capacity, expertise and so on, making it important that they select certain decision premises, something that a conscious design of the formal surrounding structure should help them to do (Simon, 1957).

The instrumental logic comes in two versions. A *hierarchical version* takes it for granted that the top political and administrative executive leaders dominate the decision processes (March and Olsen, 1983). They do so because they have exclusive rights of participation in the most important decisions in a public organisation, they have a strong overview and coordination instruments and they have the necessary expertise at their disposal. The *negotiation version* delves into some of the potential problems of hierarchical steering of a decision process. The executive leaders may have attention or capacity problems, or different views and interests, leading to fluctuating participation, discussions and conflicts, which can both undermine or modify their control of the processes and the rational calculation. Decisions under such conditions can either happen through winning coalitions, sounding out processes and compromises, or a sequential attention to goals and quasi-solutions of conflicts, the latter referring to log-rolling processes, where actors agree to disagree and allow each other the fulfillment of interests at different points in time (Cyert and March, 1963; Cohen, March and Olsen, 1972).

Using this logic to analyse features of major public project decision processes means to focus firstly on whether there is an unambiguous centre of authority that is reflected in the processes. Are chief executives, cabinet ministers or top administrative leaders – or comparable leaders on the regional and local level – in charge of the processes, or are the processes located in other centres of power at a central, regional or local level? Are the responsibilities shared between just a few political and/or administrative actors, or divided between several levels, institutions and individual actors? Is the pattern of participants accordingly narrow and exclusive, or open and characterised by many actors? Is the level of conflict high, or are the processes characterised by a lot of agreement? Are the goals, intentions and solutions behind a public investment project clearly stated, or ambiguous and changing during the process? Are clear solutions stated at the start of the decision process or are these developed gradually? Are new problems or solutions added during the process, or do they remain stable throughout? How much of a compromise is the final decision, and what type of actors are most influential?

An *institutional logic* puts most emphasis on historical traditions, path-dependency and informal norms and values that may affect and modify instrumental features (March and Olsen, 1989; Selznick, 1957). The logic is based on the notion of a gradual development of informal norms and values, adapting to internal and external pressure, and creating a set of distinct cultural features in the public apparatus. The context and 'Zeitgeist' that is typical when a public body is established will further influence the organising and working of the organisation, that is, 'roots' will determine 'routes'. Actors will be more preoccupied with what is *appropriate* for them to do, according to matching of roles, situations and decision rules, than with what is rational (March, 1994). There is a distinction between the process whereby cultural norms are developed and how they are used in practice (Christensen et al., 2007). The organisational culture developed may support the effects of the formal structure in a public organisation, but may also run counter to, or modify them.

The role of the leadership in institutional processes is seen by Selznick (1957) as a form of 'statesmanship', making 'critical decisions', relating to major public projects. Acknowledging the 'necessities of the past', leaders act according to traditions, but also participate in changing the historical path of the institution (Boin and Christensen, 2008). This is done through stating clearly their visions and goals, which embody the purpose of the institution, and recruiting actors who are committed to the main norms of the institution. Institutional leadership may also participate in breaking a long historical path for a public institution, at a critical juncture, where a 'window of opportunity' might be opening up (Kingdon, 1984). A major public investment may be an opportunity for an institutional leadership to support and continue a historical path, for example through advocating traditional solutions to new challenges, but also to break away from the historical path and start on a new one.

The institutional logic in our analysis will primarily be used to analyse the importance of path-dependency in large project processes.[1] This means that one can look for arguments about, or features of, determinism, that is, when actors take it for granted that there are no alternatives and that they are in some kind of forced situation. This could, for example, be related to physical conditions, such as disputes that a road or public building could only be located in a certain place, because of existing physical structures, or arguments about the need to continue investments in the same type of 'military platform'. But one can also find arguments that represent a discontinuation of a path, because of limitation on physical space or existing technology.

An *environmental logic* places events and actors in the environment that may affect the decision-making processes related to major public projects. One can make a distinction between *technical* and *institutional* environment (Meyer and Rowan, 1977). *Technical environment* relates to instrumental aspects, for example, political, social, technological, or economic pressure from the environment on political and administrative executives – a pressure that may be particularly important if the dependence of institutions and actors on the environment is strong. If an organisation gets resources from the environment, or if those resources are pressured, there are incentives to adapt, in particular if the dependence on one source is high. *Institutional environment* deals with symbolic pressure from the environment, where there could exist myths or symbols, for example to adapt to international or national trends on organisation, leadership, recruitment, planning, products/investments and so on (Meyer and Rowan, 1977; Sahlin-Andersson, 2001).

There is, however, also a dynamic between the two aspects of the environment. Leaders in a public organisation often have to balance 'talking' and acting (Brunsson, 1989). They must show that they act to fulfill demands from actors in the environment they are dependent on, but also gain legitimacy through talking in certain ways, using myths and symbols, so that the image of the organisation is improved, without actually always following up the promises – which is possible, since the world is so complex. The balance between talk and action can be handled in at least two ways by the leadership. A public organisation has some units that are specialists on talk and action respectively. Or an organisation has a symbolic message to some parts of the environment, while other parts hear an action message. Both technical and institutional environmental factors can, on the one hand, be very deterministic, making the public organisation a 'prisoner' of the environment, but can also be one of many factors influencing the decision-making processes.

Using environmental logic when studying major public investment processes implies the need to acknowledge the importance of external actors for the decisions being made. One can imagine that external actors may undermine the authority of public executive leaders to influence the processes, but are more likely to engage in coalitions with internal actors. Whether this will strengthen or weaken the influence of executive leaders will be an interesting question to discuss. Another aspect to consider is whether actors in the environment use certain symbols in their arguments to support or go against a major public project, and the influence of these symbols on the end result.

A *garbage can logic* emphasises that decision-making processes are characterised by actors coming and going, actors having problems with their capacity and attention, loose or unpredictable connections between actors, problems, solutions and decision opportunities, and so on (March and Olsen, 1976). This is based on the notion of decision-makers being part-time participants, and decision situations implying ambiguous stimuli. Participants may come and go to decision-making opportunities in unpredictable ways, and what they bring with them is often not well-defined. Decision situations are also social opportunities, for giving blame or praise, enjoying taking decisions, confirming friendship or hostility, socialising young and inexperienced actors, or reassuring the old actors and so on. Decision-making situations can be so overloaded and complex that it is almost impossible to make decisions; actors and problems/solutions may be split up or re-formed (de-coupled or re-coupled) to make a decision; individual rationality may trump collective or organisational rationality. Solutions may also precede, or look for problems, rather than the other way round, which would be the logic of consequence (March, 1994).

Using this logic, one can look systematically for some of the features mentioned above. Are large project decision processes characterised by a lot of complexity that influences the rational calculation aspects, that is, making them characterised more by conflicts and ambiguity? Are actors and their arguments in public investment project processes characterised by 'local rationality', meaning that they do not care much about the wider aspects and balance of several considerations? Do major public projects feature the de-coupling of actors, problems and solutions, to be able to make a decision, or, on the contrary, favour coupling or re-coupling that furthers certain interests in the processes?

7.4 Analysing major public projects in a political environment

Types of projects

This chapter reports on a large study of 23 major public projects in Norway and analyses the decision-making processes, from the actors initiating them to the final decisions made, without delving into the implementation phase (Whist and Christensen, 2011). The decisions were mostly made during the last ten years, but some of the processes stretch back to the 1990s, and even before that. The major public investment projects are divided into three categories: ten *transport-/communication projects*, encompassing six bridge/road/tunnel projects, two railway projects, one shipping tunnel and one project related to air-traffic control; eight *miscellaneous projects,* representing two hospital projects, two cultural building projects, two sports projects, one science park and one customs building project; *military projects*, consisting of projects related to military platforms, for example, motor torpedo boats (MTB), frigates, military combat aircrafts and torpedo battery, and also one project developing new internal steering systems, ICT systems and internal cost reductions in the military organisation.

Rational calculation – definition and analysis of problems and solutions

Five indicators of organisational thinking in major public projects are:

1. Are the decision-making processes characterised by an unambiguous problem analysis? The importance of this indicator is, of course, that a clear and thorough problem analysis will make it easier to find an appropriate solution for the project, not to mention the importance for the legitimacy of the leaders to be able to explain or enthuse about why a certain project should be realised.
2. Do the number of problems defined increase during the process? Increasing complexity in problems may indicate ambiguous organisational thinking and a potential for conflict. But complexity may also have the potential of embracing more interests and can also cater for changing preconditions for major public projects.
3. Are the solutions proposed defined in an unambiguous way? Clear solutions early on in a decision-making process, for example, where to locate a new building, road or tunnel, may have advantages for getting support for central actors, but may also provoke resistance and conflict. An unambiguous solution may, on the one hand, be a rather broad concept, embracing different aspects, but it could also be quite a specific solution.
4. Does the number of solutions increase during the decision process? Such an increase often indicates conflict between different actors, and appeals from actors who have lost earlier in the process. To keep the process on

track, leaders often try to limit the number of solutions. But alternatives may, under certain circumstances, also enrich the process and give a wider selection of choices when preconditions are changing, particularly if they all are closely related to the problem(s) defined. However, this does not often seem to be to be the case.

5. Overall, based on the four single indicators, how do the processes connected to major public projects score on rational calculation or unambiguous organisational thinking? The processes scoring highest would have a clear problem analysis, limit the number of problems developing, and have a clearly defined solution rather than a multiplicity of solutions. One must also be open to the possibility that some processes are not that streamlined, but can still score relatively highly on rational calculation, for example, through motivating the project by highlighting the more consistent problems, and/or extending solutions to make better decisions when conditions change.

Overall, about half of the 23 major public projects had decision processes characterised by an unambiguous and thorough problem analysis, with the transport/communication projects scoring relatively highest. This, then, means that half of the projects had everything from ambiguous goals to a shallow and unsatisfying problem analysis. It is debatable whether this is a good sign or not. It is not easy to answer that, but one may take into account the complexity of the projects, and the limited capacity in the public apparatus to engage in such processes when there are also other decision-making processes to attend to.

About a third of projects had processes that eventually increased the number of problems, often making it less obvious what motivated the projects, and blurring the connections between goals and solutions, thereby making them more problematic to handle and get support for. This applied to only one in ten of the transport/communication projects, while 50–60 per cent of the projects in the two other categories added problems. This might reflect that communication projects, such as road projects, are, on the whole, relatively simple and less likely to attract too many problems. One extreme example of expanding the problem structure was the proposal for a shipping tunnel on the west coast of Norway. It started out as a question of security for ships, but eventually added problems of regional economic development, regional transport, tourism and so on. Paradoxically, this did not undermine the furthering of the project, at least not for being included in the national transport plan, even though it obviously scored rather low on rationality, and seemed to be a potentially 'hopeless' project.

Around 90 per cent of the project processes had unambiguous solutions for proposals concerning bridges, roads, tunnels, military platforms, buildings and so on, with little variation between the types of projects. For a relatively high number of these, the solutions were about the main concept, while there were still choices to be made between different variations. This showed a potentially common feature in public decisions overall, that is, a sequential method where broad, rather than specific solutions are more easy to agree on, but they later pave the way for decisions on more specific solutions, because actors start to work together, negotiate and get used to the thought of uniting around a project.

About 40 per cent of the project processes increased the number of main solutions before a decision was made, with military projects having the least, which may be natural since these are overall the largest projects. Depending on the rationality in the problem analysis, variations or extension of main concepts or solutions could be seen differently. With a clear problem analysis, variations of a main concept or solution may add to rationality, but new alternatives could undermine rationality, unless new conditions appear. Half of the projects with relatively clear solutions had an ambiguous problem analysis; too many solution variations, or too many new solutions, may add to confusion about the projects.

Adding together the four single indicators to a measure of the total rationality in organisational thinking in decision-making processes, shows that in about half of the processes, the thinking scored high or medium on rationality, with transport/communication scoring much higher than the other types of major public projects. There could be many explanations for this variation. One is that it is probably easier to build up expertise over a long period of time on building bridges, roads and tunnels, and they are relatively similar, as physical projects, which also adds to the rationality. Military projects are probably more unique and less frequent, as are some huge building projects (for example, the new opera house), and may be more complex to cope with. But the variation may also have something to do with the ability to organise the decision process, the general quality of the expert authorities, the quality of collaboration between politicians and expert authorities, and the plurality of stake-holders and so on. Some of the latter factors are discussed below.

Patterns of actors and influence

Decision processes related to major public projects are often very complex concerning actor patterns and dynamic relationships between actors, and these features may vary with different phases, so it can be difficult to grasp the overall pattern of influence.

The focus of the analysis is on four sets of actors and a measure of their relationships:

1. Is central government/the cabinet, a central actor in the processes? It seems evident that this is the case, but some processes are based on a regional/local level and do not have central government involvement, while some are unique and large, so that the government must be involved. Hence one can expect variation among the projects.

2. Are expert authorities, like central agencies, with regional and local branches, influential actors in the project processes? Overall, one should expect that this is the case, since they are the actors who have to get involved in the planning of projects, based on their formal role and expertise. But expert authorities may be outmanoeuvred or sidelined by political bodies or other actors, so one may also expect some variation here.
3. Is Parliament a central actor in public investment processes? Ultimately, Parliament is the actor deciding on most major public projects, and allocating money to them. This could, on the one hand, be just a passive role, accepting proposals from lower levels, expert or governmental authorities, but, on the other hand, it could be more actively initiating or interfering in project processes.
4. What is the role of external stake-holders in large project processes? This relates to the environmental perspective. Stake-holders in the environment may have direct interest in advocating, or preventing, a public investment project, and using different channels to further their interests. In doing so, they may form coalitions. Their influence would probably have something to do with how open some processes are concerning organisational thinking and patterns of actors, meaning that their influence will probably be highest when rationality is low, the access for external actors wide open and the possibility of getting coalition partners inside the public sector high.
5. Overall, how important are coalitions for the final decisions on major public projects? Generally speaking, coalitions of actors have the potential to be more influential than single actors, because of broader sets of interests, higher legitimacy and more expertise. But coalitions can be both constructive, furthering the main intentions of central public actors with a project, but also destructive, in the way of hindering projects, or furthering projects that are not well-planned, inappropriate, or doomed to failure.

Our study shows that central government was only a central and influential actor in about a third of the 23 major public projects, which seems rather a small share. It was more influential in the miscellaneous projects than in the transport/communication projects. This is easily explainable, since large national projects, like a bid to hold the Olympic Games, building a new opera house, museum, or hospital, and so on naturally involves central government, while road, tunnel and bridge projects are often initiated and financed on a regional/local level, involving central government to a lesser degree. Nonetheless the influence of central government seems to be weak overall, which may reflect the technical complexity of projects and the influence of expert authorities. Whether or not this may be a democratic problem will be discussed later.

Nearly 90 per cent of all the project processes were characterised by strong influence from the expert authorities on different levels, and there was not much variety among the types of projects. The fact that this actor group was the most influential overall reflects generally that professional expertise is very important in Norwegian politics and administration, with the strong formal anchoring of these authorities in major public project processes. Whether expert authorities, like agencies, are influential on a central, regional or local level depends on the type of project. Typical examples of strong regional expert authorities are the road agencies, which are very influential in road, tunnel and bridge projects, while the Air Force and Marine leaders are very influential in several of the military projects. Whether this feature is problematic or not would, of course, be related to the overall agreement and contact between political and expert actors, which seems to be quite strong in the Norwegian tradition (Olsen, 1983).

As expected, Parliament overall had very little influence over decisions in major public projects. This has generally something to do with the fact that many projects are actually decided upon in other decision arenas, and Parliament has merely a certifying role. This does not mean that Parliament is unimportant, because different actors, or groups of actors, can sound out project solutions with parliamentary parties, to increase their chances of getting them accepted in the end. In some major investment projects, particularly in the defence sector, Parliament, however, played a more activist role, with representatives from the Conservative and the Labour Parties on the defence committee, without actually increasing the rationality in the process. This illustrates the more general point that there is no guarantee that involvement from Parliament would necessarily result in better decisions, even though the institution, its parties, and individual politicians overall have a high legitimacy for involvement.

Concerning the influence of external stake-holders, only about 10 per cent of the projects showed any strong influence from these actors, with miscellaneous and military projects scoring higher than transport/communication. But there were signs of such influence in some projects. A large road project in Oslo was influenced to a certain degree by local business interests, in a constructive way; while rebuilding the Holmenkollen ski-jump saw some problematic influence from ski organisations. Business actors and trade unions influenced some of the military projects, for example, motor torpedo boats, frigates and combat aircrafts, participating in projects that were later seen as problematic or failures. Again this illustrates the more general point that certain decision-making features or organisational patterns, in this case, involvement from external stake-holders, may have both positive and problematic features.

Overall, around half of the projects had processes where the influence of coalitions was strong. The influence is strongest in the transport/communication projects where one often sees coalitions of both political and expert authorities, on the regional and local level, together with external stake-holders, with shared business interests. Around half of the miscellaneous projects also had import coalitions, mostly those that were not typically large national ones. Even though the military projects scored lower, the most typical example was the building of the motor torpedo boats, where a coalition of military leaders, parliamentary actors, business and trade union players dominated the process and decided against the interests and views of both government and the joint chief of staff. The general point here, again, is that coalitions, like other influences and actor patterns, may have features that both undermine and further a rational public decision-making process.

Influence patterns and organisational thinking

So far, discussion has been limited to major public projects, in relation to what characterises their pattern of actors, control and influence, on the one hand, and organisational thinking, or rational calculation, on the other. But how about the relationship between the two major components of public investment decision-making processes? Will a certain pattern of influence be combined with scoring high or low on rational calculation?

Overall, the projects can be categorised in three groups, concerning organisational thinking or rational calculation. Five major public projects scored high on rational calculation, with nine medium, and nine low. In the group of high scores, the share from the three main groups of public investment projects was fairly even, with transport/communication projects being overrepresented among medium-scoring projects, and the other two categories among those scoring low, to which 50–60 per cent of the miscellaneous and military projects belonged respectively.

Central government (cabinet and ministers) was far less influential in the major public projects, scoring low on rational calculation, than those scoring high or medium. These were projects where regional/local coalitions, or central professional authorities, tended to dominate, for example, some military projects. This means that the political executives had either not been involved or had problems obtaining influence, eventually leading to lower rationality in the organisational thinking about the projects. One possible overall conclusion could be that central government actors may participate in increasing the rationality in public investment projects, because they have a broader and more balanced view on the projects. But this conclusion may be modified, related to whether other features might also further rationality in the projects.

Concerning the influence of expert authorities, like agencies at a central level and their regional and local branches, this was very high, and evenly divided among the categories of rational calculation, which is somewhat surprising. But there is no measure on how the expert decision premises were balanced against other considerations in the projects, or how much conflict there was. Parliament had little influence, but was more involved in projects scoring medium or low on rational calculation, rather than high. This might be related to actors appealing to Parliament about projects, thereby making them more complex, or the active involvement of actors in Parliament in some projects, such as the military, which had problematic effects. The influence of external actors is concentrated in the projects scoring low on rationality, which might indicate that they represent interests furthering complexity and increasing costs. The influence of coalitions was higher among the projects either scoring high or low, which indicates the dual character of coalitions, that is, they might, on the one hand, add rationality and make projects run more smoothly, or, conversely, they may make projects more complex and problematic.

How about the connection between rational calculation and the development of project costs during the decision-making process? Even though it is obvious that project costs may have many influences other than poor thinking and planning, there seems to be some pattern in our data. The major public projects scoring high on rational calculation were under-represented among the projects having the highest increase in project costs during the decision-making processes, while there was no difference between the two groups scoring medium or low on rational calculation. In the group of projects scoring medium on rational calculation, the projects with the highest influence of coalitions were over-represented concerning increase in costs, which was also the case in the group scoring low on rational calculation, but the latter group also had the added feature of influence from external stake-holders, for example, the two sports projects and some military projects. So one may conclude that low rationality and high influence of coalitions and external stake-holders increase project costs, features that may be related to increased complexity and potential inconsistencies in planning and decisions.

What insights does this analysis add up to? Firstly, there are differences in rationality between types of projects, with transport/communication projects scoring highest, something that seems to be the result of a very competent expert authority on roads in close and constructive collaboration with regional and local political actors. Secondly, central political executives have problems obtaining influence in some projects, partly because of their very technical nature, and these projects are among those scoring lowest on rationality, which indicates that a central balance of different considerations, including costs, suffers in such projects, leaving room for improvement.

Thirdly, Parliament or, more specifically, some parties and representatives, seems to be of rather low importance in many major public project processes, and when they interfere it is connected with not scoring high on rationality. This may indicate that its role is sometimes more to do with furthering special interests than having a holistic perspective on public investments. Fourthly, coalitions seem to have some kind of dual role concerning rationality, and can both participate in clarifying projects, through expertise and support, but also make them more ambiguous and complex.

Lastly, a thorough project process, scoring high on rational calculation, seems to further cost containment, while the influence of coalitions and external stake-holders seems to increase costs during the decision-making process.

The explanatory power of the decision logics

Overall, the instrumental logic, in a hierarchical and 'negotiational' (that is, characterised by negotiations) form, offers the clearest explanations concerning public investment processes, showing that the decisions made are either the result of the actions and influence of top political executive leaders and expert authorities, or of coalitions, mainly inside the public sector but also with some external stake-holder involvement. So the formal structure concerning public decision-making processes is clearly reflected in the actual process and influence patterns. The other three logics have far less importance as explanations for the main features of the processes. The most visible effects of the other logics are the institution logic in the military projects. In four out of five of those projects, the institution path-dependency was of clear importance, together with the instrumental logic, represented by the arguments that the military platforms that existed should be developed further. This feature reflects problematic projects concerning rationality and costs.

The hierarchical version of the instrumental logic has more importance than the negotiational, but the latter is also significant through different types of coalitions. The three types of projects have different patterns concerning which hierarchical actors are important and which other actors they form alliances with. For the transport/communication public projects there are political and expert actors from the local, and in particular, the regional level, who are most important, often in internal coalitions, and sometimes in coalitions with external stake-holders. In the group of miscellaneous public investment projects, there is much more variety, but with most importance reserved for central government and its expert authorities/agencies. For the military projects the leaders of the specialised weapon branches or sub-sectors are the most powerful actors, often in alliance with parliamentary actors and external stake-holders, while the political administrative leadership in the Ministry of Defence and the joint chief of staff loses out in some of the decisions made.

The institutional logic has many aspects, but the focus is on the mechanism of path-dependency, meaning here the importance of physical path-dependency, and path-dependency relating to the fact that previous goals, problems, solutions and decisions may constrain current project processes. The latter is what Cyert and March (1963) label 'biased search', meaning that central actors in the decision-making process search where they have found central decision premises before, to save resources and increase security. The downside of such a strategy is, of course, rigidity and lack of innovation when the preconditions for projects are changing over time. Also those projects decided upon can turn out to be problematic afterwards for different reasons, for example, the building of motor torpedo boats and frigates that turned out to be failures, unnecessary and too expensive to use.

The environmental logic does not explain much of what is happening in public investment processes, but when it does, it is more about technical than institutional environment factors. The military projects show most features from this logic. In three out of five projects, the military leaders from the sectors involved formed alliances with industry leaders and trade union leaders. They had different respective interests – professional military, industrial innovation and profitability, and securing workers a job – these being united in different coalitions: coalitions that had the most important influence on the main result. But these broad coalitions had problematic results.

The last logic, the garbage can logic, has about the same relevance as the institutional logic and more than the environmental. Many projects have a rather complex combination of ambiguous goals, with an increasing number of problems and solutions, which makes rational calculation somewhat challenging. Typical for most of the military projects is some kind of local rationality that leads to features of collective irrationality. Military leaders and their coalition partners have a narrow and 'local' view of the need for the different military platforms, and decide on them, even though they are warned against and opposed by central political and professional actors. In the group of miscellaneous public investments, the decision on the National Museum was made possible through decoupling when a new location opened up. Building a new opera house in Oslo was originally tightly connected to a major restructuring of the road and tunnel system in Oslo, the latter being decoupled before the final decision on the opera house, but recoupled later on to allow the realisation of a large road restructuring. The Stad shipping tunnel had definite garbage can aspects, in that the solution came before the problems, which continued to arrive subsequently.

Implications and lessons learned

The first lesson learned about the analysis of the decision-making processes relating to the 23 major public projects in Norway, in a political context, is that they unsurprisingly showed features both of similarity and variety. There are overall similarities because of the formal structure surrounding the project processes, that is, the instrumental perspective giving an important set of explanatory factors. The formal strong role of different actors is reflected in their influential roles in reality. Political executives and representative bodies/actors on different levels are central actors in the decisions on large projects, sometime concentrated on one level, sometimes in more complex multi-level processes. These are the actors who formally decide on and give resources to the projects. The public expert bodies on different levels have the same unambiguous formal anchoring to the processes, often initiating, clarifying, certifying and securing the quality of the projects.

Explaining variation between types of projects, or within these groups, could also be related to the fact that public investment projects have different character and financial structures. This evokes different formal patterns of actors, problems and solutions. There are large national projects for which the central state is the main provider of resources, for example, a new national museum, opera house, hospital, Olympics bid, building of motor torpedo boats, frigates or military aircrafts and so on. There are also typical regional projects, with regional or local actors, for example, tunnel, road and bridge projects, while rail projects have both national, regional and local actors and ramifications.

Another explanation of variation is that the formal decision structure seldom completely determines which actors, in reality, will be activated to address which problems and solutions. Some actors will use this leeway or discretionary situation to be very active and use a lot of resources, some will be more interested in alliances and some will have capacity and attention problems. Since the control of actors in public decision-making processes is often far stronger than the control over how to define problems and solutions, this allows variety in how both internal and external actors define problems and solutions, and the pattern of conflicts and compromises, culminating in varied results.

The fact that the actors, and in particular, problems and solutions, are not always given in large project processes also makes it more likely that other logics may explain variety. Different cultures in different sectors or organisations may lead to different types of processes and decisions, which may also be influenced by different types of path-dependencies, as shown in the analysis. Garbage can logics may explain variety, because processes are open to coupling, decoupling or recoupling of actors, problems and solutions, often in unpredictable ways. Local rationality or complexity may also participate in explaining variety. Some public investment projects are also more vulnerable to the influence of external stake-holders because of their very nature.

A second lesson is that it is difficult to give an unambiguous answer about what a 'successful process' is where major public projects are concerned. The 'theoretical ideal' that is indicated contains two main elements (Dahl and Lindblom, 1953). One element relates to the participation and control side of the projects. A democratic and good process could either be characterised by strong hierarchical steering of the decision-making processes, or a more diverse and open negotiation or coalition process with high legitimacy, which reflects different democratic ideals. The processes studied have both these features. The second element is about unambiguous organisational thinking or rational calculation, meaning clear definitions of goals, problems and solutions. This element, however, is far more difficult to fulfill, as shown. Taken together, the ideal is that major public project processes are characterised by politicians and experts in public organisations who know what they want and collaborate constructively about projects and how they should be planned and implemented.

But even projects scoring highly on this ideal can be defined as problematic, and criticised. The costs can increase, regardless of fulfilling the ideals, and discussion may erupt as to whether this is caused by changing preconditions or bad planning. Media may define a project as problematic because of entrepreneurship by a political leader, or strong engagement from a group of actors, even though it is, in many ways, quite successful. The implementation and effects of projects can also influence how they are seen in retrospect, regardless of process features. An example of this is the new opera house in Oslo, where the process was long and partly problematic, and the opera rather costly to run, but which is now seen as a unique and successful project, mainly because of the architecture and location.

A third lesson is that coalition features in the processes, often seen as useful and democratic, may work rather differently, ranging from very problematic to quite constructive. The important difference seems to be whether political executive actors are involved or not. Coalitions may undermine the authority of central government in several of the military projects, because the leadership of the military sub-sectors, in particular in the Marine and Air Force, goes behind the back of the cabinet and chief-of-staff, and forms alliances with actors in Parliament, industry or trade unions, who may participate in problematic decisions and wrong investments. However, in some road projects the coalitions work in a positive way, with regional/local actors agreeing and working in collaboration with expert authorities and central government. A good example of such a constructive coalition, that was even extended to encompass private business interests, was the road project E18 Bjørvika in Oslo, consisting of a new tunnel under the new opera house, with a connecting traffic system.

A fourth lesson is that both features of cultural path dependency and of the garbage can logic in major public projects are problematic in achieving a successful result. When decision-making processes are too much characterised by 'arguments from the past', over-emphasising the continuity of former solutions, as in some military projects, the results are problematic. High complexity, loose coupling, local rationality, and unpredictability in actors, problems and solutions are also problematic. Local rationality is typical for some military projects, where the efforts to put the project into a wider and balanced frame may fail. The projects around the new national museum and new opera house are characterised by unpredictable de- and recoupling, which is also the case in some of the road projects. One example of the use of symbols is also interesting. The new opera house emerged during a long and complex process, and one of the factors leading to the final decision on it was the argument among central political actors in Oslo that the project was mostly concerned with city development (on the east side of the centre of Oslo), and not primarily about culture and opera, or a large and expensive tunnel and road project. Hence symbols and decoupling/recoupling may eventually lead to final decisions in complicated processes.

All the major public projects analysed have been subject to the Norwegian Quality Assurance Scheme administered by the Ministry of Finance from 2000. This system for the front-end of major public projects had two phases: one mainly for the political executives, relating to decisions on whether or not to start a major project, and one later in the planning stage, of a more technical nature, but both involving pre-qualified consulting firms as major experts (Christensen, 2011). There were many reasons for starting this type of scheme, that is, to choose the right projects overall, be more rational and efficient, and so on, but also to change the way such projects had traditionally been decided on, which was characterised by sector orientation, coalitions and bottom-up decision-making, often pressuring the central authority to accept a fait accompli. How do the main results in our study measure up to these goals? Overall, there is no strong impression that political executives have firm and holistic control of project decision-making processes. Central government/cabinet and Parliament only have strong influence in some of the project decision-making processes. Expert authorities are overall very influential, but it is difficult to analyse whether that is in line with the political executives. There are strong coalition features, which may, or may not, support strong political control, as shown. Local rationality still has a strong part to play in some projects. It is not easy to show the influence of technical, pre-qualified experts on the processes.

7.5 Concluding reflections

Coming back to the overall introduction on features of decision-making in a political context, one might ask whether the main results from this study indicate that the 'parliamentary chain' is working smoothly. The local and regional projects, primarily in transport/communications, seem to show that political executives and representatives, including municipalities and counties, are collaborating smoothly, in agreement with the expert authorities. The influence of local popular actors has not been particularly analysed, but conflicts do appear to be high. Actors on the central level, whether executive or parliamentary, seem to have limited influence in some projects, both at a central and regional level, which may raise democratic concerns. But since expert authorities are strong overall, they may act in accordance with the political executives, because they have been delegated with the authority to do so. Coalition features may be seen as important because they further participation, coordination and collaboration, but they can undermine the authority and influence of political actors, which may be problematic in a democratic sense.

If one refers to the complementary principles of democratic governance mentioned by Egeberg (1997), the relevance of the rule of law and people's civil rights are not in the forefront of major public projects. They are relevant concerning the organising of the processes, when and how to involve different stake-holders and so on, but seemed to evoke few concerns in the processes studied. The principle of professional competence is well taken care of through the work of the expert authorities, and their influence is strong. However their set of decision premises leans towards the concerns of political authorities, and may also be affected by the influence of coalitions and external stake-holders in some of the processes. This might be seen as democratic, even though it may be a challenge to the quality of the projects. The principle of affected parties, involving internal and external stake-holders, is evident in many of the processes, with diverse results for rationality.

Overall, the picture of decision-making processes connected to major public projects is fairly complex and hybrid, which is not all that uncommon when looking at other policy areas. This is true of all the principles of democratic governance mentioned, and the ways they are reflected in the organisation of decision-making processes. Public decision-making is complex, and demands a lot of consideration, which often makes it score high on democratic legitimacy, but not always so highly on rationality, effectiveness and efficiency.

Note

1. The method used in the empirical study referred to is not geared towards studying the development of informal norms and values in the actors central in the public investment projects, something that had been possible with a broad interview data or intensive analysis of historical documents.

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Concluding Note

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We started this book by saying that 'Large projects are complex undertakings which represent major investments. Commonly, significant problems arise later on because of failure at the start of a project in terms of establishing appropriate governance, choosing the concept, analysing the proposal and environment and maximising the utility of the investment, all within complex and political decision-making structures. While project management to "do the project right" has for long been the priority, project governance to ensure that "the right project is done" has been a secondary concern among many practitioners and is underrepresented in literature'.

We said that there had been a number of initiatives in recent years to improve governance systems but these were often based on normative views of 'best practice'. However, research has started to develop in this field, so this book has taken a theoretically rigorous but practically applied approach to understanding how project governance actually works in the reality of large complex projects.

We have gone from the environmental context through organisational strategy, into governance structures, into one project's proposal and how to assess a proposal, then how to design the project. We have taken a critical look at how project decision-making and progress occurs in a project domain, within the organisation, then within groups of organisations. We have then returned to consider the effect of the overall political environment. As Chapter 1 sets out the increasing need for a theoretically well-grounded understanding of project management, successive chapters take this forward with each approaching from different directions ('depart[ing] from more common normative/rational approaches to the nature of project governance, to embrace the psycho-social dimensions of decision making and the operation of power and interaction among project parties' in the words of Chapter 6) but always aiming to draw useful conclusions and give pragmatic guidance.

It would be difficult to summarise the wealth of analysis and guidance given in the preceding chapters, so a few themes only will be noted here.

We are trying to design our project governance system to increase the success of our projects. But Chapter 2 requires us to consider, in a much more nuanced way, what we mean by success, both project management success and project success, citing five levels of what success means. Indeed, part of what Chapter 1 was aiming for was getting the meaning of project success aligned with the meaning of success for the organisation. But the presence of multiple stakeholders within an organisation implies that the meaning of success is likely to be multi-faceted, ambiguous, and disagreed about, and Chapter 5 describes the effect this can have on the path that a project takes. Even more so where there are multiple organisations: Chapter 6 describes the 'ambiguity and equivocality of strategic expectations, project outcomes and project performance criteria … making the notion of shared project goal problematic in practice'. And when the unpredictability of projects is considered, Chapter 6 contends that it is 'necessary to rethink the possibility of predetermined success criteria'.

Complexity has been a key theme within the book. Complexity in the narrow sense of 'inter-connectedness' or 'structural complexity' is clearly important within projects, particularly in the feedback loops that can be set up. Chapter 4 explains how tightly-coupled systems can lead to feedback effects often termed 'Delay and Disruption' (Eden et al. 2000), and lists some common sources of disruption. Chapter 1 observes how the increased time-compression of projects has led to more structurally-complex projects (see Williams 1999), needing more agile responses. Chapter 6 mentions the 'escalatory spiral of decisions around risky ventures'.

But this last mention takes us beyond structural complexity into the human aspects of complexity. In a manner similar to Geraldi et al. (2012)'s summary of complexity into five dimensions (and drawing upon the well-known work by Shenhar and Dvir 2003), Chapter 4 divides complexity further into issues around pace, the definition of objectives, novelty, complexity (of the product), size, risk, design expectations, people and cultural conformance; covering not just the project organisation but the other organisations with which it interacts (as taken further in Chapter 6) and indeed the wider society in which it finds itself (as in Chapter 7 and Chapter 1). This chapter gives seven practical principles to apply to any project design.

'Project governance structures and processes themselves do not make decisions – they simply provide the framework within which decisions can be made. People make decisions' says Chapter 5, and complexity is known to make decision-making much more difficult. Designing a governance framework has to be based on an understanding of how people make those decisions within this environment. Initially in a project, people make decisions based on very little information (expanding the work of Williams, Samset and Sunnevåg 2009). Chapter 3 takes a more rationalist view where decision-makers have more knowledge and there are fewer epistemic uncertainties. But within this context of high complexity, ambiguous goals and reduced information, it is very difficult to make decisions. Chapters discuss the 'bounded rationality' of decision-makers, but Chapter 5 points to the work of March (1988) showing that 'the bounds of "bounded rationality" may in practice be so extreme as to essentially invalidate the whole idea of structured rational choice'. Thus Chapter 5, taking a theoretical rather than normative view, uses Strauss's ideas to talk about a 'social trajectory' and Bourdieu's ideas to explain how people think and behave within groups – generally moving towards ambiguous goals but with what can sometimes appear to be little rationality.

So we need to consider the implications of these issues for how we construct our governance framework. As emphasised in Chapter 1, this consideration has to be shaped based on the strategy of the organisation and the wider environment within which the organisation lies (Katuria et al 2007), and also by what is called in Chapter 1 the "organisational ecology". This follows the idea of the need for 'fit' in adopting business innovations (Kimberley and Evankisko 1981); specifically in designing project management and project governance systems, the need for 'fit' was an important result of the PMI Value Project (Thomas and Mullaly 2008).

Again we have to move outside the organisation to look at how groups work together, and Chapter 6 looked at how organisations (themselves consisting of individuals and groups of individuals) actually work together, following the type of analysis of Chapter 5. (And just as theory such as Bourdieu gives a basis for thinking how humans act within organisations in Chapter 5, so perhaps it gives a structure for how 'glory' projects develop within the wider field of society in Chapter 6). Trust is of course also an important part of how a project is set up (Chapter 3) and how project parties behave in a project – without which Chapter 6 describes the project as a 'time-bomb'. The case-study shows many of the effects that were discussed in the preceding chapters, and here perhaps more than anywhere we need to take a critical stance (the type of stance that Hodgson and Cicmil 2006 was influential in exploring) to be able to bring governance to major projects and also to give the basis for a proper analysis of contractual types and processes to organise project collaboration and avoid unhelpful behaviour by project participants.

The case-study in Chapter 6 describes a project firmly in the public and political domain, which brings us to the issues in wider society and the political domain. The effects of these issues are described in Chapter 7, and clearly cause many of the effects described in chapter 5 and then those in chapter 6. While the examples in this book are a mixture of public and private projects, it is not surprising that it seems to be particularly the large public projects that are affected by ambiguities of goals, complexity, political biases within decision-making groups, power-relationships and complexities of how 'capital' is defined within the public arena – throughout all areas of public projects although Chapter 7 brings some domain specificity to this.

The requirements of the political environment (for example influencing the way politicians and public servants speak and act, and move between posts) leads to such ambiguity that the analysis that Chapter 1 shows is needed, is that much more difficult, particularly in a globalised society. Having said that, of course these features are very important within private projects also, and it could even perhaps be surmised that complexity and feedback increases with increased time-compression in the private sector. Chapter 1 shows some interesting examples of how wider societal trends shape project-management tools and indeed project behaviour, such as the effect of 'Impatient capital' leading to the development of Earned Value (and indeed into more early cancellation of projects).

Consideration of governance of projects requires us to move forward from the common normative models of how things 'should' be done. These often do not seem to reflect the actualities of projects, which is an important motivation for research in this area (Cicmil et al., 2006). We need rigorous theoretically grounded tools to understand and analyse why project participants behave in the way they do and how real projects result in the behaviours that they do, and to consider how we might govern them in some way more effectively. We have had to move into the 'third wave' described in Chapter 1, but without losing hold of the major steps forward that have been taken, such as the OGC governance tools and PRINCE2 (Chapters 4, 5), the Norwegian Quality Assurance Scheme (Chapter 2), and APM tools (Chapter 3). We have had to have a mature understanding of the environment around the organisation – strategic and political – and how that shapes project goals and project behaviour. We have also had to have a deep understanding of the behaviour of individuals within organisations and organisations within groups. Power relationships, ambiguity, communication, social geography, bias and the difficulty of rational decision-making particularly in the context of structural, behavioural and political complexity, have all had to be considered. But armed with this deeper and more well-founded understanding, these chapters have given clear advice on how our projects can be initiated, assessed, financed, planned and executed more efficiently, effectively, and how they might have more impact, relevance and sustainability.

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Index